8-1976

A Comparison of Laboratory and Non-Laboratory Course Designs as a Setting for Increasing Agreement with Course Materials

J. Michael Gautney
Western Michigan University

Follow this and additional works at: https://scholarworks.wmich.edu/masters_theses

Part of the Educational Psychology Commons

Recommended Citation
Gautney, J. Michael, "A Comparison of Laboratory and Non-Laboratory Course Designs as a Setting for Increasing Agreement with Course Materials" (1976). Master's Theses. 2316.
https://scholarworks.wmich.edu/masters_theses/2316

This Masters Thesis-Open Access is brought to you for free and open access by the Graduate College at ScholarWorks at WMU. It has been accepted for inclusion in Master's Theses by an authorized administrator of ScholarWorks at WMU. For more information, please contact maira.bundza@wmich.edu.
A COMPARISON OF LABORATORY AND NON-LABORATORY COURSE DESIGNS AS A SETTING FOR INCREASING AGREEMENT WITH COURSE MATERIALS

by

J. Michael Gautney

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 1976
I wish to express my deepest appreciation to Dr. Richard Malott for his encouragement and supervision during the course of this study and the writing of this thesis. I express my gratitude to Dr. Paul Mountjoy, Dr. Brian Iwata, and Barb Fulton for their criticisms and suggestions in preparing this report. The friends I made, the financial aid of an Assistantship, and the intellectual stimulation provided by the faculty of the Psychology Department have made my graduate study a truly rewarding experience.

J. Michael Gautney
INFORMATION TO USERS

This material was produced from a microfilm copy of the original document. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the original submitted.

The following explanation of techniques is provided to help you understand markings or patterns which may appear on this reproduction.

1. The sign or “target” for pages apparently lacking from the document photographed is “Missing Page(s)”. If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting thru an image and duplicating adjacent pages to insure you complete continuity.

2. When an image on the film is obliterated with a large round black mark, it is an indication that the photographer suspected that the copy may have moved during exposure and thus cause a blurred image. You will find a good image of the page in the adjacent frame.

3. When a map, drawing or chart, etc., was part of the material being photographed the photographer followed a definite method in “sectioning” the material. It is customary to begin photoing at the upper left hand corner of a large sheet and to continue photoing from left to right in equal sections with a small overlap. If necessary, sectioning is continued again — beginning below the first row and continuing on until complete.

4. The majority of users indicate that the textual content is of greatest value, however, a somewhat higher quality reproduction could be made from “photographs” if essential to the understanding of the dissertation. Silver prints of “photographs” may be ordered at additional charge by writing the Order Department, giving the catalog number, title, author and specific pages you wish reproduced.

5. PLEASE NOTE: Some pages may have indistinct print. Filmed as received.

Xerox University Microfilms
300 North Zeeb Road
Ann Arbor, Michigan 48106

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
MASTERS THESIS

GAUTNEY, James Michael
A COMPARISON OF LABORATORY AND NON-LABORATORY COURSE DESIGNS AS A SETTING FOR INCREASING AGREEMENT WITH COURSE MATERIALS.

Western Michigan University, M.A., 1976
Psychology, general

Xerox University Microfilms, Ann Arbor, Michigan 48106
# TABLES OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDEX OF FIGURES</td>
<td>V</td>
</tr>
<tr>
<td>INDEX OF TABLES</td>
<td>VI</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>METHOD</td>
<td>7</td>
</tr>
<tr>
<td>RESULTS</td>
<td>17</td>
</tr>
<tr>
<td>DISCUSSION</td>
<td>35</td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>39</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>40</td>
</tr>
<tr>
<td>APPENDIX</td>
<td>43</td>
</tr>
</tbody>
</table>
## INDEX OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Percentage answered &quot;yes&quot; on each question on the &quot;Belief&quot; questionnaire</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>Frequency of student pairs that shaped a lever press response over thirty-minute intervals</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>Scattergram of the rat laboratory groups first shaping experiment finishing time versus their second shaping experiment finishing time over thirty-minute intervals</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>Percentage of students answering &quot;yes&quot; on the &quot;Rat Phobia&quot; questionnaire. Questions surveyed previous exposure to rodents in general and specific reports of anxiety students have about working with rats</td>
<td>28</td>
</tr>
</tbody>
</table>
# INDEX OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Questions on the &quot;Belief&quot; questionnaire. Students answer each question &quot;yes&quot; or &quot;no&quot;</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Questions on the &quot;Rat Phobia questionnaire. Students answer questions 1, 3, 4 and 6 to 13 &quot;yes&quot; or &quot;no&quot;. Questions 14 to 25 require students to rank each question on a 1 to 5 scale. One being &quot;no problem&quot; for the student and 5 being &quot;very upsetting&quot;.</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Percentage answered &quot;yes&quot; on the &quot;Belief&quot; questionnaire.</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>Percentage answered &quot;yes&quot; on the &quot;Rat Phobia&quot; questionnaire.</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>Percentage of the students ranking each question of the &quot;Rat Phobia&quot; heirarchy a 4 or 5 (5 - very upsetting).</td>
<td>33</td>
</tr>
</tbody>
</table>
Systematic evaluation of class structures has put education on the road to becoming more efficient at helping students master course materials. Elements of good systems design include an analysis of the current system, a statement of the behavioral objectives, implementation of the new system, an evaluation, and a recycling phase (Malott, 1973; Knezevich, 1973).

A behavioral approach to educational technology introduced by Keller (1968) features self-paced instruction by the student, unit mastery, emphasis on textual materials, optional lectures and demonstrations, and the use of student proctors. In recent years, many investigators have compared traditional teaching methods with the use of such contingency management procedures.

McMichael and Corey (1969) and others (Sheppard and MacDermot, 1970; Alba and Pennypacker, 1972; Born, Gledhill, and Davis, 1972) have compared traditional lecture procedures with those of contingency management. The effectiveness of testing procedures such as quizzes over small units of material versus hour exams covering larger segments of material have been studied (Malott and Svinicki, 1969; Malott and Janzerak, 1970; Born, Gledhill, and Davis, 1972; McMichael and Corey, 1969; Stalling, 1970; Hess, 1971). Interview methods of testing student mastery of materials (Alba and Pennypacker, 1972; Johnston and Pennypacker, 1971; Ferster, 1968), attendance (Bacon, 1974) and study times (Born and Davis, 1974) have also
been investigated. In all cases, results indicated contingency management procedures to be the most effective method of teaching. Today different combinations and applications of these methods are being used with much success in teaching introductory psychology courses (Malott and Svinicki, 1969), upper level psychology courses (Hess, 1971; Bacon, 1974), engineering (Koen, 1970), and statistics (Meyers, 1969).

However, the literature reports only a small number of applications of educational technology involving laboratories. Many of those courses probably do have laboratory classes to accompany them. But to date the emphasis has been on evaluation and validation of classroom procedures.

None of the references to laboratory classes found in the literature go into much detail about the type of experiments involved or why they are even included in the course structure. Keller (1968) briefly mentioned a laboratory associated with his description of a revolutionary method of teaching psychology, as have Johnston and Pennypacker (1971), in discussing their interview method of evaluating student mastery of reading materials. In an undergraduate course, Lloyd and Knutzen (1969) used completion of simple laboratory experiments as one of the criteria for achieving each grade level. Along with other requirements, students earned a grade of "C" by shaping a lever press response in a naive laboratory rat. Students earned a grade of "B" by completing experiments in lever-press extinction, reconditioning, and demonstrating various ratio
schedules of reinforcement, as well as experimental write-ups.

Perhaps Malott and Svinicki (1969) provide the most extensive description of an introductory level laboratory-course. Four laboratory experiments and laboratory reports were required for the course. Initially, laboratory met two days a week for fifteen weeks. Later, because few students completed these requirements, several changes were put into effect. The student had to complete four experiments, demonstrate the animals behavior to the class teaching apprentice, and turn in an "A" level laboratory report of the experiments. Laboratory met four days a week for 7\(\frac{1}{2}\) weeks. This resulted in fewer than twelve students out of approximately a thousand failing to complete all four experiments, with none failing to finish the first three. This course, Psychology 150, is the one studied for this report.

Lectures and demonstrations have typically played the role of reinforcers for good performance in behavioral instruction systems (Lloyd, Garlington, Lowery, Burgess, Eules, and Knowllington, 1972; Woodarski and Buckholdt, 1972). Such demonstrations come in the form either of students observing someone else performing an experiment or going into the laboratory and perform simple experiments themselves.

Laboratory demonstrations may have several objectives. According to Keller (1968) demonstrations motivate student performance in regular course work. This is a contingency arrangement in which the students behavior for maintaining
a certain level of performance in their course is rewarded by being allowed to participate in or observe further demonstrations of course materials.

Another possible objective of laboratory demonstrations is to increase the students' "belief" in or agreement with the concepts being presented in the course. Students observe for themselves how various principles work while performing simple laboratory experiments.

While illustrating several elementary principles, laboratory demonstrations may also accomplish a third objective, increasing skill at applying those principles covered in the laboratory experiments. These skills would then help the student in future courses or in day to day situations.

The final objective of laboratory demonstrations is the increase in student mastery of the course materials. These four objectives; increasing motivation, agreement, skill level, and mastery of course materials are probably interrelated, making it difficult to tease out each one for separate measurement.

Though the course structure of Psychology 150 has undergone a variety of changes, the laboratory section has remained much the same since its initial description (Malott and Svinicki, 1969; Malott and Palm, 1971).

The purpose of this study is to evaluate the objectives of Psychology 150 in providing a set of laboratory exercises that increases student agreement with the principles of behavior,
begin to shape skill at applying the principles demonstrated in the laboratory and help to increase mastery of course materials.

In this study I evaluated the objectives of the laboratory in three ways. First, by observing differences in skill of application of the concepts demonstrated by students in laboratory experiments; second, by evaluating changes in agreement with the principles of behavior on pre- and post-test "belief" questionnaires; and third, by calculating the statistical difference in the final examination grades of each group.

Access to the laboratory of Psychology 150 is not contingent upon a certain level of performance in classwork. However, each semester, students in Psychology 150 do evaluate the role of laboratory demonstrations as a reinforcing stimulus through course and laboratory evaluations. Generally students rate the laboratory experience as one of the best things about the course.

In a review of methodological procedures, Woodarski and Buckholdt (1972), express concern for the lack of control of biasing factors in research on behavioral instruction, making interpretation of experimental results ambiguous at best. Some examples of bias are assignment of subjects to groups, and the absence of pre- and post-test measures. They also describe some changes in experimental design that will produce more reliable and conclusive results. The present study utilizes those changes in designs.
Reports of fear of rats is a variable which might decrease the speed with which students can do the initial shaping experiment. Preliminary work indicated that these reports of fear decrease by the end of the first set of laboratory experiments. Therefore, pre- and post-test questionnaires were given to both groups in the study to assess this factor.
METHOD

**Subjects**: Sixty-eight student volunteers participated - 28 male and 40 female - from an introductory psychology course, at Western Michigan University. These students were neither psychology majors nor minors.

**Setting**: All observations took place in four 20' x 25' laboratory classrooms. These classrooms seat a maximum of 24 students at 12 carrels, each equipped with a scientific Prototype Skinner box model '25.

The students used naive male albino rats of Sprague-Dawley strain.

**Procedure**: During week one of classes, I described the study to seven sections of students, requesting volunteers for the study. Students responded by signing a permission-to-participate contract, permitting me to collect data. It listed the required activities of each group in which the volunteers could be placed. I then randomly assigned volunteers to one of two groups, a laboratory group and a non-laboratory group. Students worked in pairs with someone from their own group.

During week two of the semester I gave both groups the pre-test questionnaires and assigned the laboratory group their first rat.

The pre- and post-test measures consisted of a "Belief" and a "Rat Phobia" questionnaire. The "Belief" questionnaire contained 19 questions designed to find out whether the stu-
dent had had previous exposure to the principles of behavior, and the extent to which the students said they agreed with the concepts taught in class and laboratory. Table 1 lists the questions asked; students answered "yes" or "no" on each.

To assess the fear of rats, each group took a "Rat Phobia" questionnaire (See Table 2). It surveyed previous exposure to rodents in general. Students answer "yes" or "no" to each of these questions. A final section of the questionnaire constructed a hierarchy of potential anxiety-producing stimuli the student must deal with in order to handle their rats. Students ranked each level on a 1 to 5 scale, 1 being "no problem" through 5 being "very anxiety-producing".

In this study, the laboratory group performed three of the four laboratory experiments that the non-participants of the study performed. They were shaping a lever press response, a successive discrimination training, and a chaining experiment (Malott, 1967). After finishing these three experiments students completed the post-test measures, and then shaped a lever press response in a new rat.

The non-laboratory group began laboratory during week ten of classes, after covering most of the reading materials, T.V. tapes, and lectures. At that time they completed post-test measures and shaped a lever press response in their rat.

Seventy-seven students did not volunteer to participate in the study. They performed the normal course requirement of four laboratory experiments, shaping, discrimination training
Table 1. Questions on the "Belief questionnaire. Students answer each question "yes" or "no".
Table 1

1. Have you had any previous experiences where the principles of Behavior were discussed? If yes, explain.

2. Do you think that you do things because of what has happened in the past when you did them?

3. Do you believe that if something good happens as a result of some behavior that it is more likely that you will do that behavior again?

4. Do you believe that if something bad happens as a result of you doing something that you will be less likely to do that something again?

5. Do you believe that someone or something else can have control over the way you do something?

6. Do you believe that if you gave a small child a piece of cookie each time he made an attempt to talk that you could teach him to talk sooner than most babies?

7. Do you believe that if the only time you play with your little brother (if you had one) was when he started crying that after awhile you'd be spending all your time playing with your little brother?

8. Would you live in a commune?

9. Would you live in a house that offered cheap rent in exchange for being responsible for certain duties around the house?

10. Suppose your child was banging his head on the floor. Would you record the number of times he banged his head if a psychologist asked you to?

11. If your child is supposed to take out the garbage but doesn't, would you be willing to record the number of times he does when he's supposed to, versus the number of times he doesn't when he's supposed to?

12. If you wanted to quit biting your nails would you be willing to record the number of times you bite your nails each day?

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
13. If you had a friend that said very naughty words whenever he talked to someone and you want to help him say nicer things, would you record the number of times he said naughty words in conversation?

14. For your same friend would you buy him a beer or slap him on the back and tell him that you really like him as a friend each time the number of naughty words was less than the previous conversation?

15. If a person is saying crazy things, do you believe that you could change the way he is talking by not paying attention to him when he is talking crazy and smile and be real friendly when the talk is normal?

16. Do you believe that if someone is rubbing his ear when he's dealt a royal flush while playing poker, that he'll be more likely to rub his ear in the next round of cards?

17. Do you believe that if a large dog really scares you, that you'll be afraid next time you see a dog?

18. Do you believe that if every time you drive down a certain street you get a traffic ticket that you'll probably not drive down that street again?

19. If every time you walk on ice with leather sole shoes you fall down, you'll stop wearing leather sole shoes to walk on ice?
Table 2. Questions on the "Rat Phobia" questionnaire. Students answer questions 1, 3, 4 and 6 to 13 "yes" or "no". Questions 14 to 25 require students to rank each question on a 1 to 5 scale. One being "no problem" for the student and 5 being "very upsetting".
Table 2

1. Have you had previous experience with any type of rodent?
2. If yes, what type?
   Rats_____Mice_____Squirrels_____Guinea Pigs_____Other
3. Were you ever bitten by any of the animals listed in question 2?
4. Do you not like any of the animals listed in question 2?
5. If yes, which ones?
   Rats_____Mice_____Squirrels_____Guinea Pigs_____Other

Are you concerned about:
6. Being bitten by your lab rat?
7. Being defecated on by your lab rat?
8. Being voided on by your lab rat?
9. Catching some disease from your lab rat?
10. Being scratched by your lab rat?
11. Dropping your lab rat?
12. Having your lab rat get away?
13. Are you allergic to rats?

Rank the following items:
14. Knowing of the existence of rats in the world:
15. Being in the same room with a caged rat:
16. Being in the Psych 150 rat room:
17. Watching another person handle a rat:
18. Standing next to a person handling a rat:
19. Holding a rat with gloves on:
Table 2 (continued)

20. Touching a rat (without gloves) that someone else is holding:

21. Taking a rat from cage to Skinner box across the room with gloves and returning it:

22. Taking a rat from cage to Skinner box across room without gloves and returning:

23. Getting a rat and playing with it without gloves:

24. Letting a rat crawl up your arm:

25. If you answered yes to #1 on page 1, briefly list the experience.
chaining, and various fixed-ratio schedules of reinforcement.

Both study participants and non-participants took part in all other regular classroom procedures such as daily quizzes, class discussions, and watching T.V. tapes, accounting for the first half of the daily class activities. Both groups also had the option of taking the midterm and final exams.

The general class procedure for Monday through Wednesday was as follows for each group. Class began at one minute past the hour. For the first 5-10 minutes, Teaching Apprentices (T.A.'s) made announcements to the class; they led a short discussion of the reading materials, and then answered questions over the objectives. No later than 10 minutes after the hour, students took a ten point multiple-choice quiz. After the quiz was over and the quiz forms were picked up, the T.A. read the quiz answers to the students. The laboratory part of the class began usually no later than 25 minutes past the hour. Once the laboratory time began, the laboratory group started to work on their experiments. Until week ten, the non-laboratory group was free to leave for the day. Laboratory typically lasted from 20 to 30 minutes.

After assignment of a rat, student pairs spent the first two days gentling their rat. Gentling consisted of the rat being put in the Skinner box, and being handled by the student. On the third day of laboratory the students dipper trained their rats and they began their shaping experiment. Using
special recording sheets, students in the laboratory group recorded the time they took to shape a lever press response in their first rat.

On Wednesday of each week, I did reliability checks on student recording by randomly selecting one student pair from each laboratory classroom and recording the time they started and finished laboratory that day. Then, comparing my recorded time with the one recorded on the students laboratory sheet, I praised them for their recording accuracy if their start and finish times were within one minute either way of my recorded time. I considered this to be satisfactorily reliable. Those that were more than a minute from my recorded time were asked to be more accurate. The T.A.'s were asked to remind the class each day to record their laboratory start and finish times.

At the end of the semester I recorded student scores on a 50 point final examination and calculated the difference in means for each group.
RESULTS

Questions asked on the "Belief" questionnaire appeared earlier in Table 1. The percentage of those students answering "yes" to all questions except number one appear in Fig. 1. A "yes" answer on this questionnaire meant that the student agrees with the statement presented. Question number one (not shown) revealed that approximately 29% of the students in each group had previous experience with the principles of behavior. The algebraic sum of pre-test data reveal a mean difference of -3.67% between groups on each of the remaining eighteen questions, with the laboratory group answering "yes" more often than the non-laboratory group to only five of eighteen questions. On the post-test the laboratory group answered "yes" more often than the non-laboratory group to all eighteen of the questions, yielding a mean difference of 18.94% between groups. The difference in means on the pre-test for the laboratory group (55.58) and the non-laboratory group (59.26) results in a t-value of .617 (df = 18), not significant at the .05 level. However, the post-test difference in means for the laboratory group (73.16) and non-laboratory group (55.26) results in a t-value of 3.29. This is significant at the .05 level. The data suggest that a person with laboratory experience is more likely to agree with the principles and applications dealt with in the course than a person without such experience.

17
Figure 1. Percentage answered "yes" on each question of the "Belief" questionnaire.
The percentage change between pre- and post-test "Belief" questionnaires for each group is presented in Table 3. A plus percent indicates an increase in the percent of students agreeing with a question. For the laboratory group, there was a range of 4% to 30% increase in agreement with all questions on the post-test. Percentage change for the non-laboratory group on the pre- to post-test ranges from 3% to 27% increase on five questions. There was no change on two questions and a decrease in percent answered "yes" on ten questions. Therefore, while the laboratory group agreed more often on only five of the eighteen questions on the pre-test "Belief" questionnaire, they agreed with all questions of the post-test questionnaire more often than the non-laboratory group.

The frequency of student pairs in each group finishing their shaping experiment within successive thirty-minute intervals are presented in Fig. 2. Mean shaping times for the laboratory group on their first shaping experiment (140.88) compared with the second shaping experiment (160.65) yield an increase of 19.77 minutes to shape a lever press response in a naive rat. The mean shaping time for the non-laboratory group was 158.24 minutes.

A scattergram of the laboratory groups experiment completion times appear in Fig. 3. The dashed line indicates the type of results that would be expected had there been no change in shaping times from the first to the second shaping experiment. In this case, seven pairs fall above the line,
Table 3. Percentage answered "yes" on the "Belief" questionnaire.
Table 3

<table>
<thead>
<tr>
<th>Quest. #</th>
<th>Laboratory Group</th>
<th>Non-Laboratory Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent Pre-test Score</td>
<td>Percent Post-test Score</td>
</tr>
<tr>
<td>1</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>58</td>
<td>88</td>
</tr>
<tr>
<td>3</td>
<td>81</td>
<td>97</td>
</tr>
<tr>
<td>4</td>
<td>69</td>
<td>91</td>
</tr>
<tr>
<td>5</td>
<td>67</td>
<td>88</td>
</tr>
<tr>
<td>6</td>
<td>53</td>
<td>76</td>
</tr>
<tr>
<td>7</td>
<td>44</td>
<td>74</td>
</tr>
<tr>
<td>8</td>
<td>19</td>
<td>38</td>
</tr>
<tr>
<td>9</td>
<td>78</td>
<td>91</td>
</tr>
<tr>
<td>10</td>
<td>50</td>
<td>71</td>
</tr>
<tr>
<td>11</td>
<td>58</td>
<td>74</td>
</tr>
<tr>
<td>12</td>
<td>72</td>
<td>76</td>
</tr>
<tr>
<td>13</td>
<td>50</td>
<td>65</td>
</tr>
<tr>
<td>14</td>
<td>56</td>
<td>65</td>
</tr>
<tr>
<td>15</td>
<td>67</td>
<td>94</td>
</tr>
<tr>
<td>16</td>
<td>42</td>
<td>56</td>
</tr>
<tr>
<td>17</td>
<td>44</td>
<td>71</td>
</tr>
<tr>
<td>18</td>
<td>47</td>
<td>65</td>
</tr>
<tr>
<td>19</td>
<td>75</td>
<td>82</td>
</tr>
</tbody>
</table>
Figure 2. Frequency of student pairs that shaped a lever press response over thirty-minute intervals.
FREQUENCY OF STUDENT PAIRS

laboratory group
first shaping experiment
n=17 pr

laboratory group
second shaping experiment

non-laboratory group
shaping experiment
n=17 pr

THIRTY-MINUTE INTERVALS
Figure 3. Scattergram of the rat laboratory groups' first shaping experiment finishing time versus their second shaping experiment finishing time over thirty-minute intervals.
seven fall below the line and three fall exactly on the line. An important thing to note here is that of the eleven student pairs to finish within the first 120 minutes, eight of them fail to improve their shaping time on the second experiment. Of these eight, six took 60 to 243 minutes longer to complete the second experiment. Therefore, there is no evidence of any difference in skill levels as a result of having had a laboratory versus no laboratory experience.

Scores for each group on a 50 point final examination were compared. The difference in means for the laboratory group (36.9) and the non-laboratory group (31.7) results in a $t$ - value of 1.435 (df = 66), not significant at the .05 level. Thus there is no statistical evidence indicating any increased mastery of the course materials as a result of having had laboratory experience.

The "Rat Phobia" questionnaire appeared earlier in Table 2. Pre- and post-test percentage answered "yes" to seven of thirteen questions on the first half of the questionnaire appear in Fig. 4. A breakdown of the percentage answering "yes" on each question and the percentage change is presented in Table 4. Results for the laboratory group yield a slight drop in report of fear on six of the seven questions. The non-laboratory group show a drop on only five of the seven questions.

The percentage of students ranking questions of the "Rat Phobia" hierarchy (questions 14 to 24) "upsetting" (4 or 5)
Figure 1. Percentage of students answering "yes" on the "Rat Phobia" questionnaire. Questions surveyed previous exposure to rodents in general and specific reports of anxiety students have about working with rats.
Table 4. Percentage answered "yes" on the "Rat Phobia" questionnaire.
<table>
<thead>
<tr>
<th>Quest. #</th>
<th>Laboratory Group</th>
<th></th>
<th></th>
<th></th>
<th>Non-Laboratory Group</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent Pre-test Score</td>
<td>Percent Post-test Score</td>
<td>Percent Change</td>
<td>Percent Pre-test Score</td>
<td>Percent Post-test Score</td>
<td>Percent Change</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>28</td>
<td></td>
<td></td>
<td>41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>44</td>
<td>53</td>
<td>+ 9</td>
<td>62</td>
<td>68</td>
<td>+ 6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>53</td>
<td>44</td>
<td>- 9</td>
<td>59</td>
<td>44</td>
<td>-15</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>61</td>
<td>53</td>
<td>- 8</td>
<td>53</td>
<td>38</td>
<td>-15</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>58</td>
<td>56</td>
<td>- 2</td>
<td>71</td>
<td>53</td>
<td>-18</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>39</td>
<td>32</td>
<td>- 7</td>
<td>35</td>
<td>41</td>
<td>+ 6</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>64</td>
<td>53</td>
<td>-11</td>
<td>77</td>
<td>53</td>
<td>-24</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>69</td>
<td>44</td>
<td>-25</td>
<td>74</td>
<td>41</td>
<td>-33</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>3</td>
<td></td>
<td></td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
appear in Table 5. The laboratory group showed a drop to near zero "upsetting" on questions fourteen to sixteen and a drop to zero on questions seventeen to twenty-four. The non-laboratory group showed no drop in percentage answered "upsetting" on four questions and a slight drop on the other seven questions. These results indicate even though the laboratory group's report of anxiety about working with rats in general decreased to zero or near zero they still report specific fear of handling and transporting them.

Of the fifty-seven times reliability checks were made during the course of the study, there were forty-nine occasions in which students were within 1 minute of the time recorded by the observer. This means that 85.9% of the time students were considered to be satisfactorily reliable.
Table 3. Percentage of the students ranking each question of the "Rat Phobia" hierarchy a 1 or 3 (3 = very upsetting).
<table>
<thead>
<tr>
<th>Quest. #</th>
<th>Laboratory Group</th>
<th>Non-Laboratory Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent Pre-test Score</td>
<td>Percent Post-test Score</td>
</tr>
<tr>
<td>14</td>
<td>44%</td>
<td>3%</td>
</tr>
<tr>
<td>15</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>16</td>
<td>7%</td>
<td>3%</td>
</tr>
<tr>
<td>17</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>18</td>
<td>6%</td>
<td>0%</td>
</tr>
<tr>
<td>19</td>
<td>11%</td>
<td>0%</td>
</tr>
<tr>
<td>20</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>21</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>22</td>
<td>14%</td>
<td>0%</td>
</tr>
<tr>
<td>23</td>
<td>25%</td>
<td>0%</td>
</tr>
<tr>
<td>24</td>
<td>33%</td>
<td>0%</td>
</tr>
</tbody>
</table>
DISCUSSION

The data of this study suggest that the laboratory section increased student agreement with the principles of behavior presented in the laboratory. It fails, however, to show any increase in mastery of non-laboratory course materials or of simple laboratory skill.

The "Belief" questionnaire presented in this study was designed to measure agreement with the principles of behavior. The rationale was that "belief" or agreement with the principles of behavior - positive answers to a question - was roughly equal to the probability of their use in the future. Increasing agreement and subsequently the probability of use in the future is an important objective. Increasing the probability of use also raises the possibility that individuals will have more systematic control over their environment leading to a more productive and presumably happier life.

Increased agreement may be attributed to students in the laboratory group receiving more in vivo experience with the principles of behavior than did the non-laboratory group.

Data obtained on the "Belief" questionnaire may have been confounded by both groups viewing T.V. tapes that featured application of elementary principles of behavior to humans and animals. As a result, the non-laboratory group was not completely naive to all forms of laboratory demonstrations. A greater difference in agreement might have been found had neither group seen the tapes.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
The laboratory course studied here is one from which students can typically earn a final grade of "A" or "B". Failure of students to achieve mastery of course materials could be due to the population involved. For students not majoring or minoring in psychology the consequences for mastery of course materials may not exist or have only minimal intrinsic value.

There are also several possible reasons why no difference in skill level was found. First, measuring the skill of shaping a behavior is dependent on many variables other than ability to discriminate successive approximations and provide reinforcement accordingly. Deprivation level and the manner in which the rat was gentled will affect the rat's performance in the Skinner box. Second, because of space and time and other resource limitations students were forced to work in pairs cutting sample size and the amount of potentially available data in half. Also, informal interviews at the end of the study revealed that many students switched off with their partners, confounding any possibility of accurate individual data. As in the failure to achieve statistical difference in mastery of course materials, a reason for no increase in skill level is that the consequences for becoming an expert behavior shaper are non-existant. Finally there is a possibility that shaping times are not a valid measure of skill learned in the laboratory.

More work needs to be done in the area of defining and
measuring laboratory skills. One suggestion for change in experimental design is to have each student work independently and to control as closely as possible the deprivation levels and gentling and handling of rats. Another is to study only a group of students majoring or minoring in psychology, following them through several courses to see if any skills acquired in the first laboratory class generalize to other psychology courses. Presumably these students would be more aware of the long term consequences for mastery of course materials and development of laboratory skills. Students with laboratory experience might also be more likely to use the concepts they learned, even in everyday life settings. Better ways to assess skill and possibly belief in the principles of behavior might be to ask students if they plan to use the principles of behavior or describe a situation and have them describe what they would do.

Results obtained on the "Rat Phobia" questionnaire are consistent with data collected in earlier work (Gautney, 1975) and a pilot of the present study. Essentially it was found that student reports of fear of working with and handling rats decreased as a function of repeated exposure in a non-threatening environment. Given data such as this, it is understandable that the laboratory group would decrease its reports of fear of rats. However, the non-laboratory group showed a decrease in reports of fear also. Prior to the start of class, the T.A. brought the rats used by the laboratory
group and the non-participants of the study into the classroom. The non-laboratory group was not only able to see the rats in their cages for the first half hour of class, but also when students in the laboratory groups handled and transported rats to their Skinner boxes at the start of the laboratory sessions. According to Bandura (1969) modeling is an effective means of changing behavior, especially those involving irrational responses to certain stimuli. It therefore seems reasonable that this same modeling effect was responsible for changes in the non-laboratory group's responses concerning rats.

The data presented in this study are important for two reasons. First, it represents a beginning in the analysis and evaluation of a previously ignored area of behavioral instruction. Second, failure to achieve significant differences in skill level and mastery of course materials demonstrates the need for further investigation and development of more efficient laboratory course delivery systems. Such research should not be limited to only psychology but should include laboratory exercises in the other sciences as well.
CONCLUSION

This study has shown that an increase in agreement with course concepts was obtained by a group of students given a laboratory experience in addition to the regular course work. It failed however, to demonstrate any statistical difference in increasing mastery of course materials, nor was there any increase in simple laboratory skills.
REFERENCES


APPENDIX

During the oral examination over this study many constructive and useful suggestions were presented by the examining committee. The purpose of this section is to preserve those suggestions in order to ensure a successful follow-up to this study.

Quite possibly the most important question raised was how the dependent variables could be improved to be a more sensitive measure of the independent variable. There are two options: improve the existing dependent variables or design new ones.

It is not clear that the "Belief" questionnaire completely accomplishes its intended objective of measuring agreement with the principles of behavior. All questions are keyed in one way, therefore catering to individuals that are more likely to answer all questions "yes" or "no". However, considering the large differences obtained on the pre- and post-test measures, the data can not be entirely discounted. An improvement in this questionnaire, would be to arrange questions in such a manner that this confounding variable could be eliminated.

Other measures such as undercover back-up interviews and data on the number of students that take more courses in psychology could be used to supplement data collected by the "Belief" questionnaire.

More attention needs to be given to the relationship be-
between fear of lab animals and laboratory work. From the data collected in this study it is reasonable to assume that in a course designed to teach a thousand students there are a fair number that are uncomfortable working with rats. If the laboratory is to achieve its objectives some type of desensitization program needs to be instituted as a regular procedure in psychology.

It may be that the objectives of the laboratory presented earlier in the text of this study are incorrect or incomplete. If this is indeed the case the corrections should be determined and evaluated. It would be pointed out that there may be a difference in the objectives of major/minor versus non-major/non-minor laboratory classes. It is important that this distinction be made when deciding what the objectives of laboratory demonstrations are.

Given that the laboratory does teach students simple laboratory skills, a more effective means of measurement needs to be found. One suggestion was that a second experiment 2 or 3 might be a more sensitive measure of an increase in skill level. However, considering the number of negative comments from students on having to shape a lever press response in a second naive rat, a second experiment 2 or 3 as a measure is not a very practical idea.

Another possibility is to give students a special laboratory oriented knowledge test. This could be given in the form
of a written test or actual identification of laboratory skills from a T.V. tape.

Once an effective means for evaluating laboratory skills has been devised, the next step is to test for generalization of those skills from the experimental animal laboratory to applied settings.