



Comparison of differences in measures of acquired information, anxiety, creativity, and student interest for two methods of teaching : lecture and problem solving
by Kitty Kienle Dick

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of Master of Science in Psychology
Montana State University
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Abstract:

Two methods of teaching, problem solving and lecture, were used in an introductory psychology course. Students in the two groups were compared on four measures: 1) general knowledge in psychology, 2) situational anxiety, 3) creativity, and 4) interest in psychology.

It was hypothesized that: 1) the problem solving group would show greater achievement scores on a test that measures generalization and application of knowledge learned in psychology, 2) the problem solving group would have a higher level of situational anxiety than the lecture group, 3) the problem solving group would show greater scores on a test for creativity, and 4) the problem solving group would have greater interest in psychology than the lecture group.

Pre and post test scores were obtained on each of the measures and percentage of change scores were calculated for each student.

These scores were used in an analysis of variance. The results indicated that there were no significant differences between the groups and thus the hypotheses were not supported.

The author concluded that method of presentation of class material does not appear to make a difference in student acquisition of class material. This conclusion is limited to those classes which have time constraints as opposed to a programmed learning situation where the student learns at his own pace.

One factor that could affect acquisition of knowledge is the student's own desires and expectations. These could be of more importance than the method of presentation of class material.

It is suggested that future studies investigate the linkages between teaching and learning rather than the technology of teaching. Perhaps by studying the similarities between teaching methods some of these linkages can be clarified.

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COMPARISON OF DIFFERENCES IN MEASURES OF ACQUIRED INFORMATION,
ANXIETY, CREATIVITY, AND STUDENT INTEREST FOR TWO METHODS
OF TEACHING: LECTURE AND PROBLEM SOLVING

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KITTY DICK

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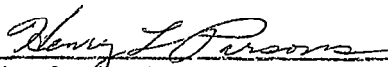
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Bozeman, Montana

March, 1973

ACKNOWLEDGEMENTS

I am grateful to my thesis advisor Dr. M. Paul Willis and to my graduate committee for providing the guidance and assistance necessary for the completion of this study.

My sincere gratitude goes to the many friends, who gave me the encouragement I needed throughout this endeavor.

A special thanks goes to Sonja Holt who allowed me the use of her class and also provided me with her opinions and criticisms at the critical beginning stages of this study. Without her assistance, this study would not have been possible.

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LIST OF ABBREVIATIONS

GKPT - General Knowledge Psychology Test

RAT - Remote Associates Test

STAI - State-Trait Anxiety Inventory

ABSTRACT

Two methods of teaching, problem solving and lecture, were used in an introductory psychology course. Students in the two groups were compared on four measures: 1) general knowledge in psychology, 2) situational anxiety, 3) creativity, and 4) interest in psychology.

It was hypothesized that: 1) the problem solving group would show greater achievement scores on a test that measures generalization and application of knowledge learned in psychology, 2) the problem solving group would have a higher level of situational anxiety than the lecture group, 3) the problem solving group would show greater scores on a test for creativity, and 4) the problem solving group would have greater interest in psychology than the lecture group.

Pre and post test scores were obtained on each of the measures and percentage of change scores were calculated for each student. These scores were used in an analysis of variance. The results indicated that there were no significant differences between the groups and thus the hypotheses were not supported.

The author concluded that method of presentation of class material does not appear to make a difference in student acquisition of class material. This conclusion is limited to those classes which have time constraints as opposed to a programmed learning situation where the student learns at his own pace.

One factor that could affect acquisition of knowledge is the student's own desires and expectations. These could be of more importance than the method of presentation of class material.

It is suggested that future studies investigate the linkages between teaching and learning rather than the technology of teaching. Perhaps by studying the similarities between teaching methods some of these linkages can be clarified.

I. INTRODUCTION

This study compared the differences between a lecture method and a problem solving method of instruction in a college level introductory psychology class. These methods were compared on, a) acquisition of general knowledge in psychology, b) anxiety in the class situation, c) creativity, and d) interest in the subject matter of the class.

For decades studies have been done comparing different methods of instruction. The results of these studies are not encouraging. In essence, these results are conflicting, for no one teaching method has emerged as a superior method in terms of acquisition of the class material by the students involved.

The following are seven examples of the work that has been done in the area of comparing methods of instruction. Scheidenmann (1927) compared a project course developed by Seashore, (1928) with a lecture-discussion method.¹ He found no significant difference between the average final examination scores of the students for both methods.

Greene (1928) studied the relative effectiveness of lecture and individual reading as methods of college teaching. One group of students received the class material through lecture and the other group read the

¹The project course consisted mainly of supervised individual study, conferences with the instructor, and writing of reports on eight projects which made up the course content.

material. Each class covered four topics in their respective methods. The results showed that there was little difference between the average scores on class tests for the two groups. These results agree with the results of Scheidenmann. However, Greene further concluded that the lecture class tended to bring both the best and the poorest students toward the class average. Greene summarized that the lecture method might be advantageous for poorer students while individual study might be better for good ones, since the good students in the reading group were more confident of their knowledge than were those in the lecture group. On a test given a few weeks later, however, the lecture group showed a greater retention of the material than did the reading group.

Guetzkow (1954) compared three methods of instruction at the college level: recitation, discussion, and tutorial. When the groups were compared on an objective final examination over the course material, he found no difference among the groups. The author generally concluded that his study confirms the conclusions that have been derived from experiments on instructional procedures since the 1920's: that there is no consistent difference among methods for acquisition of class content.

Rohrer (1957) studied the effect of class size on achievement and student attitude in a college level American Government class. His most significant finding was that amount of achievement as measured by

a standardized test, attitude of the students toward the difficulty of the class material, and their interest in it varied as a function of the course instructor and did not vary as a function of the size of the class. There are two characteristics of these classes that Rohrer felt should be mentioned when generalizing his results. First, the classes were introductory rather than advanced. Second, they required students to acquire general principles and processes rather than to develop skill in applying principles and processes.

Remmers (1933) studied the differences between examination scores on course content for students being taught in a large lecture method and a small recitation method. He found no significant difference between the two groups.

Marr, Plath, Wakeley, and Wilkins (1960) tested the assumption that something is being taught by the lecture method that the student cannot get for himself by reading the textbook. The two groups he used were a lecture method and a non-lecture group. This non-lecture group met once a week and the instructor answered specific questions the students raised concerning the reading assignment. However, no discussion was allowed in these groups. Both groups had the same text and were given exams. The criteria for comparison of the groups were a series of four objective tests, and an evaluation form that was filled out anonymously by all students. A separate analysis of variance was done on each test and it was found that those in the

lecture group did significantly better ($p < .01$) on the final examination than did those in the other group. Also, the students with higher grade point averages did better than students with lower grade point averages when all students received similar instruction. An analysis of variance was then done on the variables of instructor, methods, and ability level of student (as measured by grade point average). None of these variables were found consistently significant over groups except that students with higher grade point averages did better in each method. (Marr, et al, 1960) concluded that students who are taught by the lecture method do better on examinations than do the non-lecture students.

In the area of programmed learning, Roderick and Anderson (1968) studied the differences in achievement in an introductory psychology class for a programmed class and a class reading text book style summaries of the same class. The programmed class used the first four sets of the Holland-Skinner program (1961). The results revealed that college students who completed these sections of the program scored no higher on an achievement test given immediately after completion of the program than those who studied the summary. But the high school program group was superior to the summary group in retention scores on a delayed measure.

A recent trend in comparative teaching methods studies seems to be toward studying variables that occur in a teaching situation along

with the teaching method to see if certain variables that affect the learning situation can be identified. Many of these variables are classed as non-cognitive e.g. personality variables. Hall (1970) hypothesized that the congruence between the teacher's actual teaching style and student's ideal teaching style would correlate higher with the learning that occurred in the college classroom than with either of these constructs alone. He found that actual teaching style was generally a better predictor of learning than were the fit scores between actual and ideal teaching style. Lippman (1970) studied the unique properties of two types of instruction and the characteristics of students likely to perform best in each method. He found no significant difference between methods.

Spielberger (1970) investigated anxiety and drive theory in computer assisted learning. The findings supported the importance of a conceptual distinction between anxiety trait and anxiety state. Brown (1970) studied the effect of learner control in automated instruction. He found that learner control did not improve performance in comparison to the no control group.

The above studies represent individual efforts to compare different methods of instruction. Another approach that is taken by some investigators interested in teaching methods and their differences is to review many studies done over a period of years and to consider these results in addition to their own investigations. One such study

was done by Longstaff (1932). After considering the work that had been done by other investigators, he stated that: "The experimental evidence submitted to the present time tends to support the general conclusion that there is little difference in student achievement in large and small classes and, also that it makes little difference as to what method of presentation of materials of the course is used [pg. 337]."

Longstaff (1932) also studied two methods of instruction, a lecture-quiz and an all-lecture method. He compared them not to determine the relative value of the two methods but to determine whether the lecture-quiz method was superior under normal, practical conditions. He correlated class grades, as determined by a pre- and post-test, and the College Ability Test (CAT). With respect to final grades earned in the course, Longstaff found that one method was as efficient as the other. However, the lecture-quiz group did slightly better but this difference was not significant.

Ten years later, Wolfle (1942) reviewed investigations of teaching methods in psychology. He emphasized that elementary courses in psychology are usually taught in one of three ways: 1) a lecture method with a lecture in every class period given by one man or by several members of the department, 2) a lecture method that meets for most of the time, but once or twice a week the group is divided into small discussion or quiz sections, these sections are taught by junior members of the department, and 3) a class which is divided into

small discussion groups, each of which is taught by the same instructor every day. Added to any one of these methods, as a portion or elective supplement of the course, could be an elementary laboratory. In concluding the review of the studies, Wolfle said that all the studies done to that date on class size and method of instruction could be summarized by Longstaff's statement of 10 years earlier.

Birney and McKeachie (1955) made a survey of research that compared methods of instruction in psychology that had been published since 1942. They concluded that after three decades of research Longstaff's statement was still not outdated.

Dubin (1968) examined the data of over 80 studies comparing different teaching methods. He "added up" the data of these studies, rather than the conclusions of their authors, and reported no significant difference among the different teaching methods in learning of the class material. This learning was usually measured by a written final examination. Dubin concluded as did the three previous studies reviewing the literature, that no particular method of presentation of the class material is clearly superior. He suggested that one problem with these studies is that they have investigated the technology of teaching rather than the linkages between teaching and learning. However, one similarity among the studies examined by Dubin, as well as those examined by Longstaff, Wolfle, and Birney and McKeachie, which might explain the lack of apparent difference among methods of

instruction was the measure of learning: namely, the written final examination. A more appropriate measure of the acquisition of knowledge might be a test which measures not merely the recall of facts but rather the generalization and application of knowledge. This assumes that, in fact, different teaching methods should result in differences not measurable by a standard final examination. This assumption does not include possible differences, between the groups attributable to teaching method, on a measure of retention. Studies by McQueen (1962) and Coop (1970) suggest that a difference may be expected.

McQueen (1962) did an experiment on the teaching of psychology and compared two methods of teaching. A control group met three times a week for lecture-discussion and read one text book (the conventional method). The experimental group read the same text book, plus two additional volumes of selected readings in general psychology, and met one day a week for a lecture-discussion meeting. Eight bi-weekly examinations were given to both groups and these exams were the basis of analysis between the groups. It was found that the control group did significantly better ($p < .05$) on these exams but that the groups did not differ significantly in scholastic ability. Scholastic ability was determined by the accumulative grade point average of each student. McQueen makes two conclusions that might explain these results. First, that perhaps the experimental method could be improved if the students

were given guidance in their extra readings, for example if study questions were used to direct their reading. Secondly, he felt that the students in the experimental group were not accustomed to the responsibility and had not developed the study habits necessary to perform at their best in the experimental method. From the above conclusions, it is suggested that study questions used to direct students reading could improve the individual study method.

Coop (1970) investigated the effects of different student cognitive styles on achievement in two methods of teaching. The cognitive styles used in this study were those categories defined by Kagan, Moss and Segel (1963). These were descriptive analytic style, inferential categorical style, and relational-contextual style. The two methods of teaching consisted of a teacher-structured presentation and independent-problem solving. The students used in this study were education majors. The teacher-structured presentation class was not strictly a lecture type class because it also included lecture-discussion, group discussion, and the analysis of audio and video tapes of classes. The independent problem-solving class was given film scripts of typical problem situations faced by teachers in the classroom. Besides the scripts they were also provided with discussion guides which served as self-instructional materials in classroom-interaction analysis techniques. The students in this group could either work alone or work in a group in analyzing the problem and

obtaining the necessary information to answer the problem posed by the script. Each student then wrote his (her) solution and it was given to the teacher. These students were not required to attend class and were given 14 days for each unit of study. An analysis of variance was done on the variables. A significant difference was found between the two methods in terms of achievement in factual content material on an objective test: the teacher-structured presentation group was found to be superior to the individual problem solving group. But there was no significant difference found among the cognitive styles and no interaction between teaching methods and cognitive styles. Coop made a few comments about his finding that the teacher-structured presentation method was found superior both in factual content and conceptual generalization achievement. He felt one reason for these results could be that students are more used to this method of teaching because most of their college classes are similar to this method. In addition, the individual problem solving class is less structured than what students experience in other classes. Because of this the individual-problem-solving method appears to demand more internal motivation than the other class since students are not required to attend class every day. These two considerations might account for the poorer showing of the individual problem solving group.

Coop's (1970) study points to a possible solution to McQueen's (1962) suggestion for study guides. These are individual problems

that require the gathering of certain information and the eventual formulation of a solution. A variation on this type of problem made in the present study, is the situation problem. These situation problems are not scripts but require the practical application of information. In addition, because of the criterion used in developing these problems, the students have to show a certain degree of mastery or expertise on the topics of the problems. These two characteristics of these situation problems differentiate them from study questions. They require the student to utilize facts of psychology in order to find a solution to a unique situational problem.

The conclusions drawn by McQueen (1962) and Coop (1970) suggest that a factor which may have contributed to the individual study group's poorer performance was that the situation of the class was new to them. Coop (1970) suggests that the individual study group was not accustomed to the lack of structure experienced in the individual study situation. A factor that could be at work here is anxiety, propagated by two factors, the new situation and the lack of structure.

Pickrel (1958) found that anxiety can affect test performance. He studied the differential effect of manifest anxiety on test performance. He found that in simple measures, where the subjects are confronted with a simple task, there was no significant difference between an anxious group and a non-anxious group. But when the measures

became more complex, that is, when there were a number of competing alternatives in a task, the non-anxious group's performance was superior to the anxious group's performance. It appears then that anxiety can have an effect on test performance.

In considering the idea of the less structured atmosphere of the individual study group, McKeachie (1951) tells us that anxiety can have an effect on classroom performance. He found that anxiety is a motivating force in performance but that if it is not resolved or does not have an outlet, it can inhibit performance. McKeachie points out two sources of anxiety in the classroom. First, the student experiences anxiety on entering the class because of his dependency on the teacher for grades. Then second, the student's anxiety is heightened or reduced by the teacher's teaching behavior. Anxiety can best be controlled, says McKeachie, in a highly structured situation. If the instructor does not provide such structure, the typical student may be deprived of a mechanism for handling his anxiety.

From McKeachie's findings and discussion it appears important to determine the effect a new teaching method has on students in terms of anxiety. The study of a new teaching method also should involve an examination of the teacher's teaching behavior. If the teaching method creates excessive student anxiety, it may not be an optimum teaching method for acquisition of knowledge because of possible inhibiting effects on performance.

Many investigations have been done relating creativity and problem solving. In research, creativity and problem solving have been combined under the title of "creative problem solving". One trend in this area of research is to determine the effect of creativity on problem solving ability. An example of such a study is Eisenstandt's (1966) investigation of problem solving in creative and non-creative college students. His main hypothesis was that since creative subjects are supposed to have a heightened ability to observe accurately, they would then respond differently to a threat situation than would non-creative subjects. His results revealed that creative individuals do have faster solution times, probably resulting from their more accurate observations. But his results did not indicate that the groups differed in a threat situation. Eisenstandt (1966) concluded that what separated the creative from the non-creative individual is the efficient solution of the problems. Maier (1969) studied a slightly different aspect of creativity and problem solving. He investigated whether subjects superior in solving difficult problems having objectively correct solutions also achieve solutions rated as 'creative' for a problem with several possible answers. His results indicate that those individuals who reached an integrative (creative) solution to the Changing Work Procedure (CWP) problem were found to have solved significantly more of the objective problems than did the individuals who had other solutions not designated 'creative.' The object of the

CWP problem is to find a solution to the problem of changing the work assignments of three workmen so that the most efficient use of time is achieved. Maier (1969) concluded that those individuals who are innovative problem solvers, as tested by the CWP problems, are likely to be more successful in finding solutions to other problems. However, he cautions that they may not be successful on all other types of problems.

The common denominator between creativity and problem solving, according to Davis (1966), is that uncommon responses are required by both. Given that creative people are more efficient problem solvers, and assuming Davis is correct, it is reasonable to suggest that experience in finding solutions to unique problems might increase a person's creative ability.

Informal discussions with students and teachers involved in college level introductory classes suggest that these classes are often uninteresting and monotonous. It is possible that significant differences in instructional methods could be revealed by some appropriate measure of student interest. An assumption made by the present experimenter is that if a specific method of instruction bores the student involved, then student interest in the given subject matter will likely decrease. Similarly, if a teaching method is perceived by the student as 'interesting,' 'exciting,' etc., then it may very well lead to increased student interest in the given subject matter of the class.

The present study was designed to examine the variables discussed above: teaching method (specifically problem solving versus lecture), anxiety, creativity, and student interest. A number of hypothesis are proposed as to the differences that will result between the groups experiencing the different methods of teaching: 1) the problem solving group will show greater achievement scores on a test that measures generalization and application of knowledge learned in psychology, because they have been solving problems that required them to use facts they have gathered from many sources in psychology, 2) the problem solving group will have a higher level of situational anxiety than the lecture class because the problem solving method probably will be new to most of the students, 3) the problem solving group that had experience finding solutions to problems during the quarter will show greater scores on a test for creativity, and 4) the problem solving class will have greater student interest in the class and therefore greater interest in the subject matter of the class.

II. METHOD

Subjects

Two groups were randomly selected from an introductory psychology class containing 131 students, during the Spring quarter of 1972. Each student on the class rolls was assigned a number, then a table of random numbers was used to choose 48 students. There were twenty-four subjects in each group, 12 males and 12 females. Eighty-three students were not involved in either group. The 24 students in the lecture group were left in the class with the 83 non-participating students. The 24 students in the problem solving group met in another classroom. These classes began on March 28 and ended on June 9.

The average age for both groups was 19 years. The mean grade point average in Group I was 2.94 and in Group II it was 2.78. One student in Group I had three credits in psychology and one student in Group II had four credits in psychology. All other subjects had no previous credits in psychology.

In Group I, eleven students were taking the introductory class to meet a requirement of their curriculum. In Group II fourteen students were taking the class for this reason. The rest of the students were not filling a requirement in taking the class. Group I was made up of 19 freshmen, 3 sophomores, 1 junior, and one student who did not respond to this question. In Group II there were 20 freshmen, 1 sophomore, 1 junior, 1 senior, and 1 student who did not respond to this question.

Design

Group I was the lecture group, (controls) and Group II was the problem solving group, (experimentals). Pre- and post-test scores were used to calculate a "percentage of change" score for each student on each of four tests described below. "Percentage of change" scores were obtained from the following formula:

$$\frac{B - A}{T} \times 100 = \text{percentage of change}$$

A = first score on the test
 B = second score on the test
 T = total possible score for the test

These "percentage of change" scores were used as the dependent variable in an r(B)C unreplicated nested model of an analysis of variance. In this design, subjects were regarded as a random variable, teaching method (lecture vs. problem solving) was the fixed constant "nest" variable and the four "tests" were regarded as categories of a regular fixed-constant variable.

Tests

Four tests were used to measure different aspects of the learning situation: 1) general knowledge in psychology, 2) anxiety, 3) creativity, and 4) interest in psychology. These tests were given to all Ss in both groups.

To test for broad content learning in the two groups, a "General Knowledge Psychology Test" (GKPT) was constructed from two sources: 1) questions supplied by different publishers as sample questions for introductory psychology textbooks, and 2) questions submitted by staff members of the Montana State University Department of Psychology (c.f. Appendix I). The GKPT questions were selected, by the investigator, for their general character, i.e., they were not directed toward a specific text or class but rather attempted to cover the general field of psychology. The purpose of the GKPT was to provide a measure of knowledge of psychology, representing a content domain which was presumably of greater scope than the typical "text-oriented" final examination in introductory psychology classes.

To measure anxiety in the class situation, the State-Trait Anxiety Inventory (STAI) was used (Speilberger, 1970). Two forms of this test were used, the A-state and A-trait forms. A-state is defined, as being "a transitory emotional state or condition that is characterized by subjective consciously perceived feelings of tension and apprehension. A-state may vary in intensity and fluctuate over time and it measures a reaction taking place at a particular moment in time and at a given intensity" (Speilberger, 1970). This form of the test presumably measures the "situational anxiety" present in each group, reflecting possible group differences created by the two teaching methods. The trait anxiety (A-trait) form of the STAI was also given to both groups

in an effort to determine whether the groups differed in terms of a disposition toward anxiety. A-trait, on the STAI, refers to ". . . relatively stable individual differences in anxiety proneness. . ." (Spielberger, 1970). The A-trait form, presumably, measures differences "between people in the tendency to respond to situations perceived as threatening" (Spielberger, 1970).

There are 20 items on each scale of the STAI. On the A-state the Ss are instructed to indicate how they feel right now in terms of the items. Or as in the experimental condition, how the students felt in their respective classes. For each item or statement they had a choice of four responses: 1) not at all, 2) somewhat, 3) moderately so, or 4) very much so. For the A-trait, Ss indicated how they "generally" felt. The items were rated as follows: 1) almost always, 2) sometimes, 3) often, or 4) almost never. Scores were then given to each response and a total score was derived.

College undergraduates were used as subjects in collecting test-retest reliability data for A-state and A-trait scales of the STAI. For the A-trait scale, test-retest reliability ranged from .86 to .73. The test-retest reliability for A-state ranged from .16 to .54. (Spielberger, 1968).

The STAI A-trait scale has been correlated with other measures of trait anxiety. These were IPAT (Cattell and Scheier, 1963), the Taylor Manifest Anxiety Scale (Taylor, 1953), and the Zuckerman Affect Affective

Checklist (Zuckerman, 1960). For college females the test showed correlations of .75, .80, and .52 respectively, and for college males they correlated .76, .79, and .58 respectively. (Speilberger, 1968).

The Remote Associates Test (RAT) was given to both Group I (lecture) and Group II (problem solving) (Mednick and Mednick, 1967). This test was used in an attempt to determine whether the different instructional methods (group treatments) resulted in differences on a measure of "creativity". The RAT purportedly measures a specific aspect of creativity, an associative aspect. This is the ability to recognize relationships between "seemingly remote ideas and forming them into new associative combinations...the more mutually remote the elements of the new combinations, the more creative the process or solution" (Mednick et al, 1967).

The RAT consists of 30 groups of words. The Ss are instructed to find a fourth word that is related to the other three in each group. The fourth word can be related to the others for various reasons. The scoring key consists of the words that are correct responses for each group. Those responses that are correct are graded, those that are not correct are not scored.

From normative data collected on a number of college undergraduate samples, odd-even reliability was calculated with the Spearman-Brown odd-even coefficient of correlation. For male undergraduates at the University of Michigan, correlation was .91 for test form 1. Female

students at Bennington College had a correlation of .92 for test form 1, and for University of Maryland undergraduates the correlation was .86 for test form 2 (Mednick et al, 1967). Test form 1 and 2 were given to a group of undergraduates and a correlation of .81 was found between the two forms (Mednick et al, 1967).

The RAT scores were also correlated with faculty ratings of 20 architectural students for creativity. These raters had been advising and evaluating these students in their designs and models for at least one year. This correlation was found to be .70 ($p < .01$) (Mednick et al, 1967).

To determine the amount of interest in psychology that existed in both groups before the class began, the students were asked to rate themselves on a scale from 0 to 100 as to how much interest they felt they had in psychology compared to other college students in general (c.f. Appendix II). "Interest" was defined on this scale as an active interest, i.e. planning to do some work in the subject of psychology such as, take another psychology class and/or read a psychology book on their own.

Procedure

When the students were tested on the four measures described above, each test was given to each student twice to get a pre- and post-test score. The learning test, the creativity test, and the interest scale were given at the beginning and at the end of the course.

The anxiety scale was given at the beginning of the course and at mid-quarter. This mid-quarter testing for anxiety was considered desirable in order to get a measure of anxiety during the period of teaching. The experimenter felt that if this test, which purports to test a transitory situational anxiety, were given at the end of the quarter, the anxiety possibly created by the teaching methods might no longer be of sufficient strength for measurement. For, at the end of the quarter, the student might well consider himself as "out of", or nearly "out of" the situation.

Group I was taught introductory psychology in a conventional lecture method. These Ss attended class four times a week for four academic credits, three days were spent on lecture and one day a week was reserved for a film on some aspect of psychology. These students were held responsible for reading the text and for taking five exams during the course.

Group II was an individual study, problem solving group. This group was given nine problems during the quarter, one problem a week (c.f. Appendix III). Each problem covered one or two aspects of psychology and these topics corresponded to those being lectured on in Group I. At the end of the quarter, both groups had covered the same material but in their respective ways.

The problems for Group II were developed by the investigator using some introductory texts as sources (e.g. CRM Books, 1970). A

number of criteria were used in problem development. First, each problem covered a different but specific aspect of psychology each week. Second, the problems allow the students a wide range of solutions, because there are no objectively correct solutions. The students could then have a choice of perspective for their solutions. Third, the problems were to involve practical application of knowledge and were designed to challenge the student's imagination when he was seeking a solution. These problem situations were intended to differ from those in which common sense alone would be sufficient for an effective solution. If the student did not show in his solution that he had adequately mastered outside readings on the topics of the problem, he did not receive a good grade on the problem.

The grading system for the problems considered in Group II was based on two criteria. The first criterion was apparent coverage of the expected minimum outside reading material identified for each problem. Specifically, each problem had a list of topics handed out along with it, and the student, in finding a solution, was required to touch upon these relevant topics. The second criterion was adequate "depth" of the solution, i.e., did the student merely make a brief outline of what he had covered in the outside readings or did he, in his solution, show that he was applying the information correctly to the problem. In other words, did the solution show that the student understood what he was talking about. Since no one solution was "the"

correct answer for these problems, grading was probably not as reliable as it would have been with problems having only one correct solution. Each solution was graded on its individual merit. The scoring of the problems was done by the investigator and a student assistant. The first problem was graded exclusively by the investigator. During the second week, a student assistant was given the above criteria and the rest of the problems were graded by this assistant. To keep the investigator up to date on the students' progress with the problems, the investigator and the assistant consulted often during the quarter. No effort was made to determine interrater agreement between the grades on the first problem and the grades on the problems that followed. The graded solutions were handed back to the students each week.

During the week the students in Group II would do individual readings and study on the topic for the week. They collected their psychology information from individual readings of the text, from the references they were given, and from the references they had found on their own. These Ss were instructed to find a solution to the problem using whatever relevant information they had gathered from these readings. They were assigned the same textbook as Group I (Hilgard, Atkinson and Atkinson, 1971) but they were also given a supplementary list of references to use as additional sources of information to solve the problems (c.f. Appendix IV). These references were on reserve in the library and consisted mostly of an assortment of chosen

texts, introductory and upper level psychology texts, that provided a presumably wider view of the different aspects of psychology than that covered in a typical introductory class.

Group II was required to attend class only once a week, on Fridays. On this day, these students handed in their individual solutions to the week's problem. In this class, the students discussed, with as little direction as possible from the instructor, problems and questions that had come up during their individual problem solving. This interaction among students helped supplement their individual readings. The students in this class had no lecture periods and were largely responsible for finding the facts necessary to solve the problems.

III. RESULTS

The mean percentage of change score for Group I (lecture) on the GKPT, is 14.14 as compared to the Group II (problem solving) mean of 7.45 (see Table I). This difference, while not significant at the .05 level, is in the opposite direction from that which was hypothesized.

The mean percentage of change score for Group II on the A-state scale of the STAI is 6.30 while it is -.37 for Group I (see Table I). This difference, while in the hypothesized direction, is not significant at the .05 level. This suggests that the problem solving situation created more situational anxiety for Group II than the lecture situation did for Group I.

The two groups did not differ much in their mean percentage change scores for the RAT. The mean for Group I is 6.25 and 5.83 for Group II (see Table I). These results are not significant at the .05 level, and show a difference between the groups that is contrary to the hypothesis that Group II would have higher percentage of change scores for the creativity scale.

Also, there was not much difference in the mean percentage of change score for the groups in interest, with -1.04 for Group I and -2.04 for Group II (see Table I). These results are contrary to the hypothesis that Group II would have more interest in the subject matter of the class, although the difference is not significant at the .05 level. These results show that both groups had a negative mean

percentage of change score, i.e. both groups decreased in interest for the subject matter of the class from the beginning to the end of the course, but that Group II had a slightly greater drop than Group I.

The mean scores for the A-trait scale of the STAI did not reveal a significant difference between the groups. Group I had a mean score on this test of 39.70 and Group II had a mean of 35.08. A t-test was run on these scores and the group difference was not significant at the .05 level. This result shows that neither group revealed a significantly greater tendency to be anxious on this test.

An r(B)C model of an analysis of variance was done, with "r" representing the number of individuals randomly selected for each "B" group nest. The "C" variable represented the four tests given to each group. The results of the analysis of variance revealed no significant variation at the .05 level, between the two teaching methods for the measures used (see Table II). The "tests" variable did reveal significant differences ($p < .001$) in mean percentage of change scores. The "tests x groups" interaction, however, was not significant ($p > .05$) (see Table II). Thus, the method of instruction variable did not produce significant differences in over-all (across tests) means nor in the pattern or trend of the separate test means.

TABLE I

Means and Standard Deviations for the Percentage of
Change Scores for Each Test and Each Group

	Group I		Group II	
	Mean	SD	Mean	SD
GKPT	14.16	7.09	7.45	5.58
STAI (A-state)	-4.37	12.91	6.20	11.13
RAT	6.25	6.91	5.83	8.28
Interest	-1.04	18.28	-2.04	16.67

TABLE II

Variance Table for Group I and Group II on All Measures

	Sum of Squares	df	Mean Squares	F-ratio	p
Individuals	5555.2576	46	120.7665	---	
Blocks (groups)	.2375	1	.2375	<1	>.05
Columns (tests)	3549.2504	3	1183.0835	7.6440	<.001
B x C	1054.4078	3	351.4693	2.2709	>.05
Remainder rC/B	21358.7390	138	154.7735	---	
Total	31517.8923	191			

IV. DISCUSSION

The analysis of variance revealed no significant differences to support the hypotheses of this study. One thing to consider in interpreting these results is that the students in the problem solving class were exposed to a situation that was for most of them a new situation. The students in the problem solving class were tested with no allowances being made for their adjustment to this new situation. This novelty could possibly account, in part, for Group II's lower scores on the GKPT, creativity scale, and interest scale and their higher scores on the A-state scale, although none of these scores were significant. This conclusion is similar to the conclusions drawn by McQueen (1962) and Coop (1970).

The problems that the students in Group II had to work with were probably the biggest single factor they had to adjust to in the class. This situation of solving problems consisted of two specific features. One was the individual study required of the students and the other was the total student responsibility for finding the solutions to the problems. A majority of the students in Group II were freshmen. Most students at this level of their college education are not given the freedom that was given to Group II. Students at this level are usually taking lecture type classes. This limited experience could have influenced performance in the present investigation. This is not to say that such students are incapable of handling the responsibility of an individual study class but rather that they may require some

experience with independent study in order to learn "how to handle" such opportunity. Perhaps if students had an opportunity to be in a class of the problem solving type for a quarter or two before being tested, they might better adjust to the new situation. Then they might exhibit better performance on tests such as those employed in the present study.

Also to be considered in interpreting the results of the present study is McKeachie's (1951) discussion of anxiety and its sources in the classroom. One source of anxiety is the teacher's teaching behavior. McKeachie found that the more structured a class is the better control the students have over their anxiety. The teaching behavior in the problem solving class was designed so that the instructor did not dominate or lead the class, but allowed for student direction. The students also determined the direction of their solutions. This relatively unstructured situation that encompassed quite a bit of student freedom could be the source of much anxiety for Group II. McKeachie also discussed the inhibiting quality of anxiety. Anxiety can be a motivating factor in behavior but it can inhibit behavior if it is not resolved. This inhibiting factor could account, in part for the slightly lower, though not significant, scores Group II received on the tests used in this study.

Another factor to consider in looking at these results is that the scores for Group I, on the GKPT, might have been confounded by

the fact that within one or two days before these students took the post-test of the GKPT they were given their final class examination. This examination was not comprehensive but it did encompass the last topics covered in the class. The preparation for this test could account, in part, for the higher scores Group I received on their percentage of change scores for the GKPT.

This study encompassed a number of limitations that can be attributed to the tests used in the study. Specifically, although the GKPT was developed on a number of criteria that differentiated it from the usual classroom final examination, the test form was that of a final examination, that is, multiple choice. Possibly the test, because of its form, did not differentiate enough from the usual final examination to distinguish the two groups on general knowledge in psychology.

Also, the creativity test used in the present study presumably measured an associative aspect of creativity. Perhaps the problem solving class did have an effect on student's creativity but not on the specific associative aspect measured by the RAT. If this assumption is correct, then, perhaps a different measure of creativity might reveal a difference between the groups used in this study.

The Problems and the Problem Solving Class

The primary purpose of the problems given to Group II was to give these students an opportunity to "work with or apply" the facts which they were collecting in psychology. This was in contrast to Group I

which was not given this same formal opportunity in class. In one sense, of course, both groups did in fact "use" the information which they were learning--Group I while being tested on classroom tests, and Group II while finding solutions to the problems. In the testing situation, for Group I, the "use" of the information was in a typical recall or identifying situation. In the problem solving situation, a student in Group II had to go a step beyond this recall and organize or integrate the information which he had learned in order to come up with an individual solution to a specific problem.

The routine character of the problem solving class progressed and changed during the quarter. It began very much like a lecture class where the students sat in rows facing the instructor with very little interaction between the students themselves. The students seemed to be waiting for the instructor to make comments on the ideas that were brought up in the discussion.

The first week's problem was discussed with relative vigor by 6 or 7 students, with the rest of the class remaining silent. The discussion was very loose and at times diverged far from the problem's topic. This was one problem in the class, to keep the discussion fluid but also to keep it on the designated topic of the problems. From this first discussion it was clear that many of the students did not really understand many of the concepts they were discussing. They would use concepts incorrectly or else substitute an incorrect word

for a concept they did not fully understand. However, many of these types of errors were cleared up during the class discussion.

The class during the next two weeks progressed to a situation where the students sat in a large circle. This arrangement took the focus of attention off the instructor and more student interaction resulted. The students began to comment on each others' remarks, and for long periods of time instructor comments were not necessary to keep the discussion going, as was necessary earlier in the quarter. This situation lasted for the remainder of the quarter.

The solutions to the problems also changed as the quarter progressed. The first problem given to the class was on sensation and perception in outer space. This problem allowed for a great deal of imagination and the students made the comment that they really enjoyed working with it. However, the solutions to this problem were very weak in terms of the students' use of concepts in perception and sensation. It was fairly clear in some of the solutions that the students had not read anything about perception or sensation but were having a good time exercising their imaginations. If problems of this type are used in the future, it is suggested that the more "restricted" problems be given to the students first. Later on in the quarter the more "unstructured" problems, i.e. those that allow for more use of imagination, might be given. In the problems that followed during the quarter, it appeared that the students were acquiring a better understanding of the psychological concepts that were being covered.

During the quarter, some of the students attempted to find solutions to the problems without considering psychological concepts. They would instead refer to other disciplines as references. This approach was not accepted by the instructor or the experimenter unless these references were used in conjunction with psychological concepts. By the end of the quarter the solutions were better for most of the students because most of them were doing more research for their solutions.

V. CONCLUSIONS

This study can be added to the many that have compared teaching methods for student acquisition of classroom material, and have typically found non-significant results in these comparisons. From these studies it appears that method of presentation of class material, within the range of methods employed, really doesn't seem to make a difference in terms of the student's acquiring class material, when this acquisition is evaluated by student examination performance. Students apparently learn the material more or less irrespective of how it is presented to them.

A similarity between these methods is that all of them confine the student to a limited time situation, i.e. a class that lasts a quarter or a semester. In contrast would be a programmed learning class where the student keeps his own pace in acquiring classroom information. A class like this might reveal differences when compared with other methods of teaching on student acquisition of class material. Differences could also result if the groups were compared on their retention of the class material. The present study did not attempt to ascertain differences in this area.

One factor that might help explain the seeming lack of significant differences between teaching methods is the apparent tendency of students to learn the class material in the amount and depth that meets his own desires and expectations. Possibly, each student's acquisition of knowledge depends on his capabilities, of course, but also on what

satisfies him, rather than on the method of presentation of the information.

However, Dubin (1968) may have a point when he says that research in comparing teaching methods has to change its emphasis from the technology of teaching to the linkages that exist between teaching and learning. One way these linkages could be examined may be to study the similarities between teaching methods instead of the differences. A specific method of doing this could be the use of some principles found in learning theories.

Hilgard (1959) discusses learning theories and their application to instruction. Some of the principles of learning discussed in this context are, for example, the idea (from S-R theory) that the learner be an active rather than a passive participant. In this theory the significance of the learner's responses are emphasized. Hilgard states that this idea can be exemplified in the statement 'learning by doing'. Different teaching situations require different responses from the students while they are acquiring the class material. These different responses could be examined to see if some of them facilitate better acquisition of class material than others. For example, does a class that requires the student to read a text and take tests have better student acquisition of material than a class that requires students to give class presentations or write essays. The differences between what could be termed the active and the passive learner might

be studied within a given method or between different methods.

Another learning principle discussed by Hilgrad comes from cognitive learning theory. That is, cognitive feedback can be an effective reinforcer. The differences or similarities between student acquisition of class material could be studied in a class that provides the students prompt reports on their progress and in a class where students are not given prompt progress reports but must wait a week or two for test results.

Perhaps the study of learning principles such as these could help in the clarification of what makes methods similar in terms of student acquisition of knowledge. When these similarities have been discovered, then the linkages between teaching and learning may be more clearly established. Conceivably these linkages could then be used to provide opportunities for optimum student learning in the classroom.

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APPENDIX I

APPENDIX I

General Knowledge Psychology Test

1. An experiment involves the manipulation of _____ variables, the observation of the effects of this manipulation on _____ variables, and the control of _____ variables.
 1. dependent, independent, extraneous
 2. independent, dependent, extraneous
 3. dependent, independent, intervening
 4. independent, dependent, intervening
2. Drives concerned with the physiological processes of the body are called:
 1. learned drives
 2. survival drives
 3. primary drives
 4. secondary drives
3. A mechanism of defense that excludes unacceptable ideas from the consciousness is:
 1. regression
 2. projection
 3. repression
 4. rationalization
4. A young duckling has an innate instinct to follow behind only its own mother wherever she walks.
 1. true
 2. false
5. Normal children sometimes count each crack in the sidewalk and carefully avoid stepping on any. These counting rituals may become very important to a child. Although they may not indicate any behavior disorder in the case of a youngster, these rituals resemble:
 1. obsessions
 2. conversions
 3. delusions
 4. phobias
6. Anxiety differs from fear in that it is:
 1. recognized as being dangerous by the anxious person
 2. based on fact
 3. ill defined and not clearly perceived by the anxious person
 4. none of these

7. In Pavlov's classical conditioning experiment, at the beginning of training, a buzzer sounds. Some meat powder is placed on a dog's tongue and the dog salivates. The salivation is the:
 1. conditioned stimulus
 2. unconditioned stimulus
 3. conditioned response
 4. unconditioned response

8. Which of the following classifications includes all reinforcement schedules:
 1. variable ratio and fixed interval
 2. continuous and intermittent
 3. fixed ratio and variable interval
 4. fixed ratio and fixed interval

9. The areas of the brain responsible for thinking, learning, and memory are called:
 1. association areas
 2. somesthetic sensory areas
 3. motor areas
 4. none of these

10. Which of the following statements is correct:
 1. the null hypothesis states that a normal distribution is achieved by chance in many situations
 2. the null hypothesis assumes that there is no difference between two groups or that no significant difference exists between control and experimental groups
 3. the null hypothesis refers to the acceptance of a false hypothesis by an experimenter
 4. the null hypothesis states that if two sets of data are positively correlated, a high value in one set can be used to predict a corresponding high value in another set

11. The statistical method used to isolate the elements of intelligence is called:
 1. the median
 2. the correlation study
 3. the cross-sectional study
 4. factor analysis

12. Manifestation of the functioning of a nervous system as seen from the outside is observed as:
 1. behavior
 2. experience
 3. personality dynamics
 4. psychophysics

13. Whether or not a noisy place is too noisy to permit the understanding of human speech depends on whether or not the speech itself uses familiar word sequences.
 1. true
 2. false

14. A familiar object, when viewed from a distance of 6 feet, then from a distance of 12 feet:
 1. casts the same size image on the retina
 2. appears about the same size
 3. appears quite a bit dimmer
 4. all of the above

15. The experimenter pours a glass of water into a tall thin flask. In which stage of development is a child who realizes for the first time that there is the same amount of water in the flask as there was in the glass:
 1. sensory-motor
 2. preoperational thought
 3. concrete operations
 4. formal thought

16. The correlation between IQ scores of individual twins reared together is greater than that for identical twins reared apart. What does this indicate?
 1. heredity plays no part in IQ
 2. intelligence is completely determined by environment
 3. environment has little or no effect on IQ
 4. environment has some effect on intelligence

17. As adults get older, they get more intelligent in terms of IQ.
 1. true
 2. false

18. Extinction of an operant response is accompanied in the laboratory by:
1. regular reinforcement of the conditioned response
 2. never again reinforcing the conditioned response
 3. preventing the subject from performing the conditioned response
 4. none of these
19. The phi phenomenon involves seeing:
1. movement when none exists
 2. movement twice as fast as it really is
 3. no movement when it exists
 4. none of these
20. People have a "need" to dream in order to keep an even disposition.
1. true
 2. false
21. The Stanford-Binet scale is an:
1. interest test
 2. aptitude test
 3. IQ test
 4. none of these
22. A character disorder involves:
1. disturbances of affect, such as extreme elation and depression
 2. disturbances of bodily function
 3. disturbances of trait or pattern, with little anxiety
 4. disturbance of perception and thought, such as delusions and hallucinations
23. Manifestations of the functioning of a nervous system as seen from the inside is observed as:
1. behavior
 2. experience
 3. personality dynamics
 4. thinking
24. A person is always aware of where the parts of his body are at any given moment because of:
1. homeostasis
 2. equilibrium
 3. the proprioceptive sense
 4. the peripheral sense

25. Depth or distance perception depends on the degree to which out two eyes rotate toward each other to look at the same object.
1. true
 2. false
26. A control group is set up in order to:
1. ensure that any changes in the independent variable are caused by the dependent variable
 2. control the variations in the independent variable
 3. control the variations in the dependent variable
 4. ensure that any changes in the dependent variable are not caused by any factor other than the independent variable
27. In the Pavlov experiment described in question #7, what is the buzzer?
1. conditioned stimulus
 2. unconditioned stimulus
 3. conditioned response
 4. unconditioned response
28. An EEG records:
1. evoked potentials
 2. summated activity of many cells
 3. output from selected single neurons
 4. Alpha and Beta rhythms but not Delta rhythms
29. The less regularly a person or animal has experienced a reward for some particular act, the more persistent he will be in repeating the act.
1. true
 2. false
30. A teenager can remember everything about his childhood except his mother's death when he was seven. This example illustrates:
1. motivated forgetting
 2. repression
 3. both
 4. neither
31. You are investigating a new species. You find that its Weber Fraction ($\Delta Y/Y$) for touch is much smaller than it is for vision. You would conclude that its:
1. absolute threshold for touch is lower than that for vision
 2. absolute threshold for vision is lower than that for touch
 3. sense of touch is more sensitive than for vision
 4. sense of vision is more sensitive than that for touch

32. One theorist considers it useful to examine relationships in terms of the child-adult-parent components of the personality, this is called:
1. transactional analysis
 2. the learning theory of personality
 3. client-centered therapy
 4. "will to power" theory
33. In designing an experiment, the researcher arranges for the experimental group and the control group to be identical in everything except the:
1. independent variable
 2. dependent variable
 3. extraneous variable
 4. intervening variables
34. A person who is very actively opposed to sex education, sex literature, and discussion of sex on TV is quite possibly trying to control his own sexual impulses.
1. true
 2. false
35. A curve is described as skewed when:
1. it has more than one mode
 2. the scores cluster about some point other than the center of the distribution
 3. the scatter-plot pattern indicates a negative correlation
 4. there is a symmetric distribution with the mean, the median, and the mode the same
36. The ability to tell which direction a sound comes from depends on the fact that we have two ears:
1. true
 2. false
37. In the process of shaping behavior, the experimenter leads the organism toward the complete correct response by:
1. using sex as a motivator
 2. reinforcing responses that look good
 3. reinforcing successive approximations to the ultimate response
 4. letting the animal reinforce the experimenter's behavior

38. A researcher records the songs of killer whales and white whales. What method of investigation is he using:
1. experimental
 2. naturalistic
 3. statistical
 4. comparative
39. Children of different ethnic groups sometimes score differently on IQ tests. This indicates that:
1. IQ tests reflect educational opportunity
 2. IQ tests are not culturally fair
 3. IQ tests reflect culture learning
 4. all of the above
40. Which of the following is not a cause of stress?
1. motivation
 2. conflict
 3. anxiety
 4. frustration
41. Anything that increases the frequency of the response it follows is a(n):
1. pellet
 2. reinforcer
 3. punishment
 4. extinction method
42. Which of the following is a monocular cue for depth perception?
1. convergence
 2. retinal disparity
 3. accommodation
 4. none of these
43. In a learning experiment involving instrumental conditioning, the behavior that is reinforced is the:
1. behavior which occurs naturally
 2. any trial behavior
 3. trial and error behavior which shows the animal "understands"
 4. behavior which occurs immediately before the reinforcing stimulus is presented to the animal
44. An individual who disguises a source of conflict by ascribing his motives to someone else is:
1. projecting
 2. regressing
 3. rationalizing
 4. none of these

45. The double-blind technique (in which a type of pills are administered but neither the subject nor the experimenter knows which is which) is often used in drug research. The function of the procedure is to:
1. manipulate the independent variable
 2. measure the dependent variable
 3. control extraneous variables
 4. create intervening variables
46. The structure of the eye that is analogous to the film in a camera is the:
1. lens
 2. iris
 3. fovea
 4. retina
47. The left hemisphere of the human brain seems to be primarily associated with.
1. visual performance tasks
 2. speech
 3. motor functions
 4. representation of the left side of the body
48. Two psychological dimension of color are brightness and saturation. The third is:
1. intensity
 2. purity
 3. hue
 4. solidity
49. A pigeon is conditioned to peck a key. He is reinforced after every 17 pecks. He is on a:
1. variable-ratio schedule
 2. variable-interval schedule
 3. fixed-interval schedule
 4. fixed-ratio schedule
50. Color blindness is:
1. usually the result of prenatal injury
 2. usually severely incapacitating
 3. more prevalent in men than in women
 4. most often manifested in no color vision whatsoever

51. Concepts are formed by:
1. association
 2. generalization
 3. discrimination
 4. all of these
52. The CNS (Central Nervous System) consists of:
1. the brain
 2. the brain and peripheral nerves
 3. the brain and the spinal cord
 4. the brain, spinal cord, and peripheral nerves
53. A man is perceived as being normal height even though he is 100 yards away. This is an example of:
1. the phi phenomenon
 2. size constancy
 3. interposition
 4. relative height
54. The function of the inner ear is to:
1. amplify sound waves
 2. transmit neural impulses to the brain
 3. collect sound waves
 4. transform sound waves into neural impulses
55. Perceiving a solid object to remain the same although we view it from a variety of angles is called:
1. transformation constancy
 2. shape constancy
 3. size constancy
 4. affective constancy
56. Which hormone is secreted by the pituitary gland?
1. somatotrophic hormone
 2. TSH
 3. both 1 and 2
 4. adrenaline
57. Muscles and glands are known collectively as:
1. inhibitors
 2. facilitators
 3. effectors
 4. effectors

58. In the course of operant conditioning, an experimenter may condition a rat to press a bar only when a green light is on. In this case, the green light is a(n):
1. generalized stimulus
 2. unconditioned stimulus
 3. discriminative stimulus
 4. none of these
59. Functional fixity reduces the likelihood of:
1. set
 2. creativity
 3. incidental learning
 4. negative transfer
60. In which stage is a month old baby?
1. anal
 2. genital
 3. latent
 4. oral
61. Permitting an individual to make a response which leads to the avoidance of or escape from an aversive stimulus is:
1. negative reinforcement
 2. positive reinforcement
 3. punishment
 4. classical conditioning
62. The principle of closure is illustrated by:
1. \triangle
 2. 000 00 000
 3. both
 4. neither
63. Which of the following is an example of imprinting?
1. a dog can be taught to respond to a given command
 2. a dog will salivate in anticipation of food
 3. dogs that have contact with humans before the age of 13 weeks make good pets
 4. with good training, a dog can be made to perform tricks
64. A young man sits staring into space, hands stiffly crossed in front of his chest. He has to be carried from place to place. He would be described as:
1. paranoid
 2. compulsive
 3. catatonic
 4. hebephrenic

65. The perception of an object's color is determined by the wavelength of the light which the object reflects to the eye.
1. true
 2. false
66. The current view of the nature-nuture issue is that:
1. every characteristic is determined solely by either heredity or environment
 2. heredity is the controlling factor in most traits
 3. the determination of most traits depends on an interaction between heredity and environment
 4. none of these
67. An experimenter presents the subject with a stimulus of given intensity and asks whether the subject detects it. The experimenter is probably trying to establish:
1. the difference threshold
 2. the absolute threshold
 3. Weber's law
 4. Fechner's law
68. Tolerance of frustration:
1. rarely depends on the person's physical condition
 2. is identical from person to person
 3. seems to depend on the person's life experience
 4. none of these
69. A research method that is particularly valuable in studying the nature-nuture issue is:
1. longitudinal studies
 2. co-twin studies
 3. cross-cultural studies
 4. cross-sectional studies
70. Cognitive dissonance occurs when the individual perceives an inconsistency between his:
1. attitude and his opinion
 2. beliefs and his actions
 3. his impulses and his ego
 4. none of these

71. The differences between classical conditioning and instrumental conditioning lies in:
1. classical conditioning is associated with involuntary responses while instrumental conditioning is associated with voluntary responses
 2. there is no difference
 3. instrumental conditioning is associated with involuntary responses while classical conditioning is associated with voluntary responses
 4. both 1 and 3
72. The learning by an adult of a foreign vocabulary is an example of:
1. serial learning
 2. paired-associate learning
 3. trial-and-error learning
 4. one-trial learning
73. The number that represents the sum of all scores divided by the number of scores is the:
1. mean
 2. range
 3. mode
 4. median
74. Which of the following is true:
1. cones are most useful in dim light
 2. cones are most heavily concentrated in the fovea
 3. cones are sensitive only to light and dark
 4. none of these
75. Which of the following factors is helpful in determining the direction from which a sound is coming?
1. monaural cues
 2. binaural cues
 3. both
 4. neither
76. A stimulus which increases response strength is called _____ while a stimulus which suppresses response strength is called _____.
1. a positive reinforcer; negative reinforcer
 2. punishment; a negative reinforcer
 3. a positive reinforcer; punishment
 4. none of these

77. A conflict arising when an individual must accept or reject a goal having both desirable and undesirable aspects describes a(n):
1. avoidance-avoidance conflict
 2. double approach-avoidance conflict
 3. approach-approach conflict
 4. approach-avoidance conflict
78. What determines an individual's response to stress?
1. the behavior he has learned in the past
 2. the kind of conflict involved
 3. both
 4. neither

APPENDIX II

APPENDIX II

Interest Scale

Below is a scale ranging from 0 to 100%. Rate yourself as to how much interest you feel you have in psychology compared to other college students in general. Decide where you are on this scale, then put the numerical value for this position on the line below the scale.

Interest here should be defined as an active interest, in which you plan to do some work in the subject of psychology, for example:

do you plan to take another class in psychology after

this one

or will you read a book in psychology on your own

0% _____ 100%

APPENDIX III

APPENDIX III

Problems Given to Group II

Problem 1

You are on your first trip into outer space. All the sensory and perceptual cues that you have learned to function under on earth are being left behind you as you speed into space. Your mission is to relay the experience of being out in space in your ship and outside of the capsule.

What are the perceptual and sensory cues that people use here on earth? Using these cues describe how the space experience might differ from the perceptual experience on earth. What kinds of new situations might you be faced with as far as the senses are concerned? Describe them. How would your perception differ?

In building space stations in which men would have to live for months at a time, what cues would have to be built into the system to make it like earth and to compensate for the lack of cues in space?

topics; perception; cues, perceptual con-

stancies

sensory

sensory organs

Problem 2

You are an experimenter working in a psychology laboratory and you have just received a grant from the government to study the effects of drugs on human beings. Since this grant provides for a series of experiments, it has been left up to you, as the experimenter, to decide on the drug you would like to study, first.

Devise an experiment to study the effects of the drug you have chosen. Consider your independent and dependent variables, and the control of extraneous variables. Describe your study in terms of subjects, procedure, and apparatus. Propose some hypotheses as to what you might expect the results of your study to be. Justify these hypotheses with some facts of physiology.

In making some hypotheses consider what effects your drug, or any drug, might have on human physiology. What part of the human body, for example might be most affected by drugs, why?

topics: scientific inquiry, the experimental
method
human physiology
drugs effect on human physiology.

Problem 3

You and another person are having an argument about politics. The topic of the argument has a high emotional quality for both of you.

Generally, what kinds of physiological changes could occur in these two people from a point before the argument began to a point when the argument was at its height?

Consider the changes in a person's physiology as he goes from a calm situation to a highly emotional situation. What physiological systems are working to make these changes? What are the changes?

topics: physiology and emotion

body chemistry

Problem 4

You have been appointed the director of a school for deaf children. Some of the children in this school have normal mental development but others do not, that is some of the children are retarded. This retardation has resulted in speech deficiencies in some of the children.

Describe the program that you will propose, to be put into effect by which these children will learn basic day to day activities such as dressing themselves, feeding themselves, and keeping their rooms neat. Eventually you hope that many of the children will leave the school and go into society. If this occurs some children will have to be taught to communicate. Even if this doesn't result in normal speech but only in signing, they need to communicate both at the school and in society.

Consider that one program may not be effective for both the normal children and the retarded ones. If not, describe both programs and how they will differ and why. If the same program would be effective how does it work for both groups?

Discuss the possibility that these children will forget from day to day what they have been learning. Is forgetting of this type possible? If so, how and why? If forgetting occurs how would you handle the situation in your program? Are these children capable of complex forms of learning? Consider if there are any factors that

should be given special consideration as a result of their deafness?

topics: learning
conditioning
reinforcement theory
memory
forgetting
language (psycho linguistics)

Problem 5

You and a group of people are witnesses to a crime. The crime is the theft of a book. You and the other people who were witnesses are interrogated by the police as to what occurred. Each person answers the questions put to him, however you notice that each person's version of what happened varies, because of this each report is a little inaccurate. The kinds and degree of inaccurate reporting vary, but generally each person shows some distortions and omissions in recall.

Distortion of recall may increase as the complexity and emotionality of an incident increases, is this true? If so, why?

What might be responsible for inaccurate recall of previous experience? Is inaccuracy of recall related to faulty memory or faulty perception? Could it be related to both, why?

In terms of three factors of memory and perception: leveling, assimilation, and sharpening describe how the above situation occurs.

Discuss how perception and memory may interrelate in situations of recall.

topics: perception
memory
the effect of emotions on perception
and memory

Problem 6

Andy P. is a middle aged construction worker. He is not very satisfied with things lately. He feels he has problems in his life and these problems are getting out of control. Because of these feelings, he decides to seek some professional help. He goes to a counselor.

Discuss the possible assessment procedure that the counselor might go through in understanding Andy. That is, what aspects of Andy's personality would the counselor assess and what aspects can he assess.

Using 4 theories of personality discuss in what terms the counselor would describe Andy's personality. That is, using the terminology of each approach discuss how each approach looks at personality.

P.S. (Don't include in your solution a description of what problems Andy has. That kind of thing would be done after the assessment.)

topics: personality theories
personality assessment

Problem 7

I. Sally S. is a student at a large university. She is an average student and has an active social life.

Describe the kind of behavior Sally S. might engage in if she were using the following defense mechanisms:

- a. dissociation
- b. reaction formation
- c. repression
- d. rationalization
- e. projection
- f. substitution

She may be using all of these mechanisms for one group of problems or she may use each one for a different problem. What role do these defense mechanisms play for Sally S. or for anyone else who uses them? Do they serve a useful purpose?

What happens to a person who, in his everyday behavior, consistently exhibits exaggerated defense mechanisms? Could they be said to be exhibiting abnormal behavior? Do all of us exhibit exaggerated behavior like this sometimes?

II. Tommy T. has been seeing a clinical psychologist for three months now. Since he has been going to him he feels that he is beginning to solve some of his problems. When Tommy first came to the

psychologist, he was diagnosed as exhibiting a behavior disorder called neuroses.

Describe some of the reactions (behaviors) that can occur in neurosis.

A more serious form of behavior disorder can be found in the psychotic disorder. What kinds of reactions are exhibited in psychosis? What does a person experience who has a psychosis?

topics: defense mechanisms
abnormal behavior
neuroses
neurotic behavior: ex. obsessive-
compulsive reactions, etc.
psychoses
psychotic reactions: ex. manic-
depressive reactions, etc.

Problem 8

You and one of your friends from high school enter the same university as freshmen, during the fall quarter. You both received the same kinds of grades during high school and you both received about the same scores on the college entrance exams. On arriving at school you both get settled and begin the quarter enthusiastically.

But as the quarter progresses you notice that your friend isn't doing too well in his school work. You get the feeling that he is slacking off. Since you were relatively close to him in high school you know something about him. In high school he always had a high image of himself as a student. His grades bore out this image because he was a B+ student. He didn't have to work particularly hard to get these grades, he got them without much effort. His teachers always liked him and he was a popular person within his high school associations.

You were both excited about the prospect of going to college, at the beginning of the first quarter, but now at the beginning of the second quarter you get the feeling that your friend has lost a lot of his enthusiasm for school. He cuts classes a lot now and has a 'what the hell' attitude almost all the time now.

Well into the second quarter your friend comes to you and complains about the headaches he has been getting recently. You suggest that he go to the student health center, but when he does, they can't seem to

find an apparent cause for them. They assure him that it's not his eyes and most probably it's not a serious condition like a tumor. So he comes back to you and you talk it over. You decide that it's best to wait and see what happens before you get too excited about it.

After returning to school after vacation you and your friend get together. He says he feels great and that he hasn't had a headache throughout the whole vacation. As the third quarter begins so do your friend's headaches. About the middle of the third quarter your friend, without warning, drops out of school.

Discuss some possibilities of what could have affected your friend so that he became disenchanted with school and eventually dropped out. Consider the needs, drives, and incentives that could have affected his behavior. Discuss theories of motivation that could bear on this person's behavior.

If someone was to test your friend in terms of physiological responses such as GSR or blood pressure, what would he find, considering that your friend seemed to be in an emotional and tense state. Can emotional problems or disturbances be manifested in physical terms? If so, discuss this in terms of the above situation.

In terms of Maslow's hierarchy of needs, discuss the motives that may have been present in your friend's activity.

topics: theories of emotion
 theories of motivation
 cognitive dissonance
 Maslow's hierarchy of needs
 psychosomatic illnesses
 physiological responses to emotion

Problem 9

This is your chance to save the world. It is some time in the 1970's. The prospects of nuclear war have become so frighteningly real that both Russia and the United States have made one last-ditch effort at negotiation. For a variety of reasons, the Russians have insisted that preliminary talks take place between students selected at random from the two countries; you are chosen in a lottery as one of the five students to represent the United States. The meetings take place in Geneva. For weeks you and four other young Americans have sat across a large table from your five Russian counterparts. You have been briefed daily by people from our Department of State as to what you should say, what you can offer, what you must demand. But ultimately, the decision on what to say rests with you and your colleagues. Until a day or so ago, it seems as if the meetings must end indecisively, for the Russians have categorically turned down each suggestion of good faith you have made and have offered little or nothing acceptable in return. But at the last moment the Russians come up with the following daring proposal; Both countries will, in the next six months, destroy all their nuclear weapons and will promise not to manufacture new ones for at least five years. At the end of the six months, the heads of both governments will meet here to discuss the next step in the negotiations.

Two of your American colleagues (whom you have nicknamed the liberals) are much in favor of agreeing to the proposal. They point out that a nuclear war is almost inevitable unless both sides make some kind of show of good faith and that the destruction of all nuclear arms by the two countries will ease the immediate threat sufficiently for calm and reason to prevail. The other two American students (whom you call the conservatives) are totally opposed. They point out that Russia has a history of not living up to her international agreements and that we would have no effective means of inspecting the destruction of her weapons. The Soviets might well decide to hold back a sizable number of nuclear bombs and warheads and then six months from now, be in a position to threaten the entire free world with complete destruction if we did not capitulate. The liberal students offer as a counterargument the fact that if we do not negotiate in some way, the present situation will surely escalate and the free world will probably be destroyed anyway. The conservatives remark that at least if we retain our arms, we can also destroy Russia.

After considerable heated debate, the conservatives make a new suggestion. They propose that we make a great show of accepting the Russian offer, but then secretly hold back a sizable number of nuclear arms ourselves, "just in case". The liberals insist that the Russians will surely get wind of this and, taking it as proof of their prior

fear that Americans cannot be trusted, will attack at once.

It is obvious that you will cast the deciding ballot. You, in casting this ballot, have to consider such questions as: what is the best way to make sure that the United States is not destroyed? Should the Russians' proposal be accepted or rejected? If accepted should we really destroy all our nuclear arms, or should we fudge a little and hold a number of bombs ready "just in case"?

What is it about human nature that has made conflicts like this so prevalent in the past? How is it possible that the Russians see the Americans in such a different light than that in which the Americans see themselves?

What is it about a group that makes its members behave so differently than they do as isolated individuals? Have social scientists discovered anything about groups in conflict that will help you to the wisest decision in this case or, at the very least, help you to structure the situation better in your own mind?

topics: social psychology; groups, groups
in conflict
group behavior
the individual in groups

APPENDIX IV

APPENDIX IV

Reference List Given to Group II

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