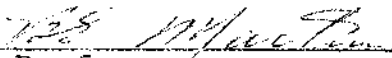


AN EVALUATION OF A CONTINGENCY MANAGEMENT APPROACH
IN TEACHING AN INTRODUCTORY PSYCHOLOGY COURSE


APPROVED:


Graduate Committee:

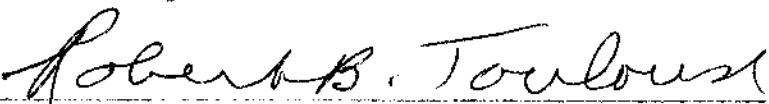

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The problem of this study was to compare the effect of a contingency management approach with that of a lecture approach in an Introductory Psychology course. The purposes of the study were: (1) a comparison of the achievement levels of students enrolled in an Introductory Psychology course when taught by a lecture method, as opposed to a contingency management approach to instruction; (2) a comparison of the results of instruction as measured through the administration of the relevant parts of the Psychology Department's departmental examination for graduate studies; (3) an analysis of the relevance of the power component, as measured by the Mycom electronic learning computer, on the achievement level of the contingency management approach students.

To try to determine if attitudes toward the course, the Psychology Department, the University, and Academia differed significantly between the two groups, a Scale of Academic Attitudes was constructed. This instrument was administered anonymously upon completion of the course.

Hypotheses One and Two predicted that there would be a significant difference between the mean scores of the

contingency management approach students and the lecture approach students as measured by a comprehensive final examination and the relevant parts of the Psychology Department's departmental examination for graduate studies. A test of significant difference by using analysis of variance indicated that no statistical difference existed in both cases. These two hypotheses were rejected.

Hypotheses Three and Four predicted that the power component of the Mycom electronic learning computer would be of value for predicting the final examination scores and the Psychology Department's departmental scores for the contingency management approach students. Using analysis of variance in each case hypotheses Three and Four were accepted at the .001 and .01 levels respectively.

An attitude scale was administered to the subjects at the conclusion of the courses with the contingency management subjects responding more favorably toward the course, the Psychology Department, the University, and Academia than the lecture approach students. A t-test was used to determine if there was any significant difference between the two groups on each of the items on the questionnaire.

Upon the basis of the findings of this study it was concluded that there was no significant difference between the two methods of instruction (Hypotheses One and Two). It was also concluded that the power component of the Mycom electronic learning computer was of value in determining

achievement levels on the two instruments used for the contingency management approach students, and that these students tended to favor this mode of instruction as evidenced by the responses on the attitude questionnaire administered at the conclusion of the course.

It is recommended that further research in methodology be initiated to try to determine more effective modes of instruction.

AN EVALUATION OF A CONTINGENCY MANAGEMENT APPROACH
IN TEACHING AN INTRODUCTORY PSYCHOLOGY COURSE

DISSERTATION

Presented to the Graduate Council of
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

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CHAPTER I

INTRODUCTION

The effectiveness of teaching a college level course through the traditional lecture method has long been questioned. Under the present teacher regime, it is probably true that with a minimal amount of participation on the part of the individual student the probability that any significant changes in his behavior will result is slight. In the typical classroom the student's level of involvement generally consists of attendance, although even this may not be the case. In order to obtain the maximum amount of change, certain principles must be adhered to in any course of instruction.

It is known that immediate knowledge of results is important in a learning situation, but this is not generally the case (1, 5, 7, 17, 21, 27, 28). Also, actual participation of the student in laboratory experiences which utilize the principles he has been exposed to facilitates learning, but this is a rarity (23). In short, most instructors do not use the principles of learning which they might actually be attempting to teach in their approach to teaching.

An approach to teaching which incorporates the known scientific principles of learning should result in an increased level of subject matter competence on the part of students.

Such an approach could be applied in the teaching of any subject matter, but should be especially applicable to a discipline which is scientifically orientated and requires an appreciation of the principles of science (37). It is believed that psychology is such a discipline and that such an experimental approach will not only enhance the student's retention of the subject matter, but will facilitate his ability to critically analyze data ostensibly reported as being scientific.

Statement of the Problem

The problem of this study was to compare the effect of a contingency management approach with that of a lecture approach in an introductory psychology course.

Purposes of the Study

In order to clarify the problem with which this study was concerned, the following specific purposes include:

- (1) a comparison of the achievement of students enrolled in an introductory psychology course taught by a lecture method with that of students taught by a contingency management approach.
- (2) a comparison of the results of instruction as measured through the administration of the relevant parts of a Psychology Department's departmental examination for graduate studies.
- (3) an analysis of the relevance of the power component, as measured by the Mycom electronic

learning computer, on the achievement level of the contingency management approach students.

Hypotheses

To carry out the purposes of this study, the following hypotheses were formulated:

1. There will be a significant difference between the mean scores of the contingency management approach students and the lecture approach students as measured by a comprehensive final examination constructed by the faculty of the Psychology Department.
2. There will be a significant difference between the mean scores of the contingency management approach students and the lecture approach students as measured by the relevant parts of a Psychology Department's departmental examination for graduate studies.
3. The power component of the Mycom electronic learning computer will be of value for predicting the final examination scores of the contingency management approach students.
4. The power component of the Mycom electronic learning computer will be of value for predicting performance on a Psychology Department's departmental examination for graduate studies for the contingency management approach students.

Background and Significance of the Study

The early works of John B. Watson (33, 34) laid the foundation for behaviorism as we know it today. His work

was significant in that it called for an objective approach in psychology and the social sciences. He attacked the traditional mentalistic concepts and made an objective approach into an active movement (35). Adherence to this approach requires a new concept of what man's relationship is to other living organisms. He viewed man as essentially a behaving organism who could be understood through principles of behavior formulated through research with infrahuman species. While man's behavior was more complex and diversified the principles underlying his behavior were essentially the same as those present in any behaving animal (32).

Much of the criticism to this approach stemmed from the need to extrapolate data obtained from infrahuman subjects (2, 4, 16). This is no longer a valid argument since considerable experimentation with humans has been documented (3, 11, 24, 29, 30, 31). The most prominent leader in applying principles of learning to teaching has been B. F. Skinner (24). He pioneered the work with programmed instruction and pointed out the value of using teaching machines (6, 22). The use of programmed instruction allows the student to progress at his own speed and gradually acquire more complex behavior through carefully structured steps or frames (23). Using programmed textbooks allows the immediate reinforcement of a response in that the student can immediately determine if he has made the correct selection. It has the advantage of providing only positive experiences in that the student rarely makes a mistake and obtains immediate feedback concerning his response.

The disadvantages of programmed instruction are that the frames may be too difficult or too easy. Certain assumptions concerning the student's previous experiences must be made when any programmed material is constructed. Concern must be with the total population as opposed to the exceptional cases if the program is to be generally applicable. In the case of linear programming, if the frames are extremely difficult, the student does not pick up the cues necessary for successful completion of the next frame and consequently fails. On the other hand, redundancy may cause lack of interest and subsequently result in boring the student.

Obviously the value of any program is only as good as its relevance to the behavioral repertoire possessed by the student, a factor which is dependent upon the competence of the program's constructor. A more serious flaw lies in the fact that the student can ignore or skip frames before completing the ones previously required. This flaw can be eliminated through the use of teaching machines such as the Mycom electronic learning computer.

Teaching machines offer advantages not present in a programmed textbook. They allow a more controlled evaluation since the recorded response can not be altered by the student after he has responded. Also, the student can not look ahead at the answer before completing the frame as is possible with a programmed textbook. The advantages of self pace and

immediate feedback are still available, and as Stoluraw (26) has pointed out, a teaching machine has infinite patience.

The advantages of using programmed instruction and instrumentation in teaching have been substantiated through the findings of Keller (10), Lloyd and Knutzen (13), Shepard and MacDermot (19) and McMichael and Corey (15), to name a few of the more recent studies. It was generally found that students tended to score significantly higher on examinations when compared with students taught by traditional lecture methods. Despite the increased work load required of the students they generally reported a favorable attitude toward the course.

Through the construction of a well-integrated program additional benefits may be accrued. Skinner (21) has written that typically progressive education meant a modification of the more discernable forms of aversive control such as the birch rod, to more sophisticated modes, such as teacher and peer vituperation and ridicule associated with failing to perform. He views this as just as inadvisable and detrimental to the educational process. Aversive control competes with the desired discriminations and interferes with the learning process (21). Often a problem is created in an educational setting in that the teacher must respond adversely toward his students. Through the process of generalization the teacher tends to acquire aversive characteristics. By employing programmed instruction it is possible to eliminate the necessity

that aversive stimuli be associated with the teacher. Programmed instruction frees the teacher to respond more positively toward his students and maintain a more personal and social atmosphere.

The classroom instruction time should be viewed as an environment in which the student's interest in continuing in the program is maintained. The student must feel that the classroom time is more than the dissemination of facts if he is to continue coming to the class. Therefore, slide-shows, outside speakers, and clarification of any misunderstandings should occur during this time. The instructor should express a genuine concern for the success of the student, thus reinforcing the student's continued participation in learning the subject matter. These techniques maximize one's probability of success through the use of what Skinner (20) has called conditioned reinforcers, which, when properly employed, are powerful motivators.

The virtues of a student self-pace approach as advocated primarily by Keller (8, 9) are many, but one inherent problem persists. Many students procrastinate and do not leave themselves enough time to complete the course requirements. This weakness has been remedied to some extent by the inclusion of a "Dooms Day" contingency as advocated by Malott (14) and later by Whaley and Malott (36) and served to motivate the students to complete the requirements in a reasonable amount of time. This means that the student is required to complete a specified

amount of the requirements by a given date. Such a contingency ultimately exists at any rate in that the term eventually ends. By having the requirements broken down throughout the semester, the student is not likely to delay completing the course requirements. This contingency is therefore a necessary component of the system.

The above and many other considerations establish the necessity of a study such as the following. The main aspects were:

(1) The study would determine the effectiveness of a unified contingency management approach in teaching a college level psychology course.

(2) Favorable results in student performance on a Psychology Department's departmental examination for graduate studies would lend generality to the approach.

(3) If a significant F ratio ($p < .05$) would occur when the power measure and performance on the comprehensive final examination were considered, then this would lend support to the use of modified techniques of evaluating student proficiency.

(4) If a significant F ratio ($p < .05$) would occur when the power measure and performance on a Psychology Department's departmental examination for graduate studies were considered, then this would also lend generality to this approach.

Definition of Terms

For the purpose of this study the following definitions were formulated:

Contingency Management--Contingency management refers to a general approach to the management of behavior in respect to performance in that the behavior is analyzed, and reinforcement is contingent upon approximations of the desired behavior. This means that the student will not be reinforced until he has made the response designated as the correct one.

Dooms Day Contingency--This term refers to the requirement that a specified amount of the course requirements must be completed in the allotted time if the student is to escape being penalized. For this study, the penalty consisted of lowering the student's grade one letter.

Mycom unit--This term refers to the Mycom electronic learning computer which analyzes the student's response based on the logic previously programmed into it and either signals correct (a green light flashes) or incorrect (a red light flashes). If the response was correct, the student proceeds to the next question. If the response was incorrect, the student continues to select alternatives until the correct one has been made.

Power--Power will be defined as the number of times the student selects an alternative on the Mycom unit. There are six possible selections per question. This measure is cumulatively recorded for each student participating in the contingency management approach and a quantifiable figure obtained at the end of the course.

Limitations of the Study

Any time a comparison of two methods of instruction is undertaken, the tacit assumption that all courses labeled thusly are the same must be made. To the extent that the defining characteristics of the two methods are not clearly delineated in reality, a comparison of two specific courses was conducted. This is the most salient limitation of the study.

Basic Assumptions

It was assumed that the subjects in this study would not differ significantly from any other college students enrolled in an Introductory Psychology course at North Texas State University during the Spring semester of 1971. It was further assumed that the experimental sections would not differ significantly from the control sections on general ability to do college course work. The Scholastic Aptitude Test (S.A.T.) scores of the two groups were compared, using a t-test, in an attempt to minimize the possible contaminating effects of one group being significantly higher than the other in academic achievement. The t value obtained ($t=.1141$) was not significant at the .05 level, and this was taken as implicit evidence that the two groups were equal in achievement level and general intellectual ability.

Finally, it was assumed that the instructors were equally competent in their respective approaches to teaching the course

materials and that all of the students performed at their best on the comprehensive final examination and the Psychology Department's departmental examination for graduate studies.

Summary

In this chapter the historical background for this study was briefly presented. A general statement of the problem, including the purposes was also presented. As a natural outgrowth of these data, formalized hypotheses were constructed, as well as, statements of the significance and limitations of the study.

To clarify the presentations, terms not considered to be generally known were included in a definition of terms section. Finally, the basic assumptions necessary to conduct the study were outlined.

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CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter contains a brief history of the rudimentary beginnings of programmed instruction and the use of teaching machines. It will deal primarily with a Skinnerian model and culminate with the more recently published examples of systems that approximate the one designed for this study.

One of the earliest recorded instances of the use of the principles underlying programming was attributed to the great teacher Socrates. Lysaught and Williams (73) relate how Socrates developed a program for teaching geometry, which Plato recorded in Meno. There were additional instances of the use of positive reinforcement (candy) being given to students who correctly recited their syllabus, but no real systematic attention was given to ferreting out the important principles so that they could be more efficiently and effectively applied to education.

The lack of an empirical approach in psychology and education plagued researchers up until the nineteenth century. The attendance to elements of consciousness and related unobservable phenomena hindered the advancement of programmed instruction and the use and development of teaching machines. It was necessary for educational researchers to first to come the conclusion that they were dealing with behavior before any truly significant advancements were possible.

William James (60) and John Dewey (28) were two of the first investigators to voice a growing dissatisfaction with the currently popular methods of introspection and the phenomena of consciousness as espoused by the popular schools of thought (81). This occurred just before the turn of the century, and in 1904 Cattell (19) spoke at Columbia University and related that psychological research was then as nearly objective as the physical sciences. In 1911 the idea that behavior was the true subject matter of psychology was accentuated when Max Meyer published the first book on psychology that contained the word "behavior" in the title (78).

These early beginnings toward objectivity were neatly brought together, forged into a viable movement, and defended, a decade later by John Watson (103, 104, 105). Thus the necessary ingredients were available for Pressey to develop the first recognized teaching machine (85). The principle of self-instruction through immediate knowledge of quiz results was the main variable investigated by Pressey and the followers he attracted (5, 25, 85, 86). Essentially then, these researchers used Pressey's machine and relatively unsophisticated programs. It is encouraging to note that they managed to report favorable results in a majority of cases despite the presence of an appalling lack of control and variability resulting from their limited technology and the lack of any unifying and definitive theory.

The spark that was missing from Pressey's experiments was supplied by the research conducted by B. F. Skinner (91, 92, 93, 94, 95, 96). Skinner's theory provided the ingredient of programming instructional materials that Pressey's machines needed (73). Skinner realized that the individual student was not receiving the benefit of the number of reinforcing contingencies available in the classroom and sought to program them into small steps and also provide immediate reinforcement for correct behavior (81, 92, 93, 97).

These innovations coupled with the advancing technology of teaching machines provided the impetus for the research that immediately began to follow (23, 24, 40, 41, 51, 52, 53, 54, 58, 66, 84). The primary advantages were apparent in the increased amount of control one had over the student's exposure to complex materials (9) and the fact that the bias possible through experimenter contact was minimized (83, 87, 88, 89). For if the program were effective, achievement differences should not be found, since, theoretically, differences in acquisition are a function of the basic abilities a student brings into the learning situation with him. If these basic capabilities were identified for each student, then it should be possible to arrive at equal levels of achievement (not rate of acquisition) through the use of an effective program designed for each student (36, 37, 38, 39).

Along the same lines, Green (47) states that the concepts of difficulty, attention span, and other related purported

phenomena lose their meaningfulness and become ambiguous when the position is taken that learning is the acquisition of a set of discriminations. He cites a number of his studies that support his contention (44, 45, 46, 48) and further states that, "the complex learning with which programmed instruction is concerned is a form of discrimination learning" (47, p. 96). If this be the case, then additional variables that were heretofore not considered observable or controllable in the educational environment can be explained and manipulated. For, Ferster and Skinner have stated that, "by the manipulation of schedules, a wide range of changes in behavior can be produced, most of which would previously have been attributed to motivational or emotional variables" (35, p. 2). From this point of view it then places within the realm of the teacher a kind of accountability previously considered beyond the control or scope of the teacher's duties. If the student fails to maintain an interest in the material or displays a lack of achievement, then the proper contingencies of reinforcement have not been adequately programmed or manipulated. The reasons for the student's failure are transferred from the student to the educator and the mode of instruction he employed.

In order for a student to receive reinforcement in the classroom it is necessary that he make a response. Therefore active participation is a necessary precondition. Research using different audio-visual aids and methods of active student participation have been conducted with favorable results

(2, 22, 30, 34). The act of simple participation greatly raises the probability that the student will be reinforced. This is not to say that a student could not receive reinforcement covertly simply from knowing that he knew the right answer, as this is obviously the case in the majority of the traditional, lecture setting, but this approach has proved to be less successful, especially with the students who need it the most.

Skinner (92, 96) believes that this participation should be made in such a way that the student must construct his answer in a systematic way. Freeman (31) has found that a systematic program yields better results than a nonsystematic approach. The idea of small steps or successive approximations toward the terminal response is also espoused by Skinner and others since it results in a high level of reinforcement and tends to minimize or completely eliminate student failure (51, 54, 55, 56, 92, 93).

The question of the response mode has been investigated by researchers other than Skinner with somewhat conflicting findings. Tobias and Weiner (101) found no significant differences between three different response modes. These consisted of writing the answer (Skinner's constructing), selecting the answer (Pressey's approach) or just "Thinking" or reading the answer. The study by Alter and Silverman (3) yielded similar results and also found no difference in achievement on delayed recall among the three modes of response. But Goldbeck and Campbell (43) and Krumboltz and Weisman (68) found

differences between the mode of response when the recall of the material was delayed.

The minimization of failure is advocated by Skinner because of the avoidance and escape behaviors generated (95, 96). This point has also been made by Ferster (32) and in the experimental realm of animal research by Azrin (7), who reported that punishment typically lowers the rate of emitted responses. The manipulation of contingencies of reinforcement in lieu of aversive control continues to be advocated by Skinner in his most recent publication (97) as well as in his personal addresses (98). He rather adamantly insists that the negative feelings of anti-intellectualism and destruction of school property prevalent today are a direct function of the methods of aversive control typically employed by the educational community (98). Educators are, therefore, directly responsible for the diminished esteem and lack of respect accorded them, according to Skinner.

The role of the teaching machine and programmed instruction in the classroom and the entire educational system is not clearly understood by many people. There is a tendency for one to consider the teaching machine as just another audio-visual aid, but as Green has commented, "the teaching machine is not simply another audio-visual aid. It represents the first practical application of laboratory techniques to education" (47, p. 122). The term "education" has been construed to mean elementary and possibly secondary education by many, but

deGrazia and Sohn (26) envisioned the widespread use of teaching machines and programmed instruction at the college level. This was as early as 1964, just two years after the founding of the Journal of Programmed Instruction. They further stated, ". . . the effectiveness of teaching at the college level, by far inferior, has not been even considered" (26, p. 27). The application of this new technology may extend itself beyond the limits conceived of by some of its early pioneers.

The effective implementation of programmed instruction requires that some objective criteria be selected as the terminal behavior desired. This has led to a widespread interest in what has become known as behavioral objectives. Early proponents of analysis of behavior and its specification were Bobbitt (14), Charters (20), and Tyler (102). As early as the mid-twenties, they were emphasizing performance of specific behaviors as goals of education. This first took the form of classroom description of behavior and attempts at an objective description of curriculum construction. Later, Tyler (102) extended this approach to include a behavioral approach to test construction. Much has been written about behavioral objectives since that time, and it is interesting to note that a beginning programmer can obtain a programmed book on how to prepare behavioral objectives (74).

The adoption of an objective approach has been supported by an educator and philosopher such as Brubacher (17, 18). He stated that, "The purpose of educational philosophy is

pragmatic" (17, p. 3). If this is an acceptable premise then the rationale for a behavioral approach is overwhelmingly supported.

Such a rationale assumes that one must first see that the student acquires a minimum base from which he can proceed. The goal need not be perfect total performance, but it should at least be perfect performance of a necessary minimum (27). Brubacher has further stated that, "As a matter of fact, no learning or thinking, not even that arising out of a problem situation, can start without some base. This is a cardinal point which those engaged in teaching should never overlook" (17, p. 7). The typical use of practice in education coupled with the casual use of reinforcement has resulted in characteristically poor student performance (31). The use of noncontingent teacher attention and praise has not been adequate for establishing desired student performance levels in the majority of cases.

The use of programmed instruction in conjunction with an acceptable teaching machine sets up the desired effective contingencies of reinforcement necessary for maximum student performance. By definition, "The relationship between behavior and a reinforcement, by virtue of which the behavior is strengthened is called a 'contingency of reinforcement'" (84, p. 207). The use of teaching machines may also be helpful in getting the student to start responding to the materials. The novelty of manipulating the machine should be reinforcing.

enough initially to maintain student participation until the programmed contingencies of the material become effective.

Another advantage of machine use of materials over non-machine use of materials is the elimination of undesirable forms of obtaining the correct answer, such as turning the page and looking ahead to find out the correct answer before completing the question (53). For as Green has pointed out, "Such supplemental information increases the probability of correct response and possibly decreases the learning that can be acquired by working through the material" (47, p. 195).

When the overall advantages of machine presentation of materials versus non-machine or inadequate machine presentation of materials are evaluated, the outstanding difference lies in the relationship to the total stimulus-response cycle.

Proter has succinctly summed up this major difference:

The true teaching machine covers the whole stimulus-response mechanism, including feedback, reinforcement, and extinction, whereas the other devices when modified or adapted affect only a portion of the complete learning process (84, p. 145).

Boehm (15) has reported that Skinner states that the more efficient acquisition of basic skills through his approach facilitates generalization, which is his way of talking about the acquisition of concepts. The article by Boehm is a comparison of the approaches taken by Skinner and Crowder. Skinner deals mainly with a linear approach to programming while Crowder advocates an intrinsic, branching type of approach. Both have reported considerable success with their

methods. But as Lumsdaine (71) has pointed out, the crucial differences may not be in the acquisition rate, but in the retention level after the passage of a period of time. If fading, as typically used by Skinner, works along the same principles of partial reinforcement, then a later evaluation should reveal a significant difference in retention for the fading group. Lumsdaine has reported such findings (71).

Recent experimental findings which have incorporated many of the principles outlined have been reported by Keller (63, 64, 65), Lloyd and Knutzen (69), Malott (75), McMichael and Corey (76), and Sheppard and MacDermot (90). While the control established over student behavior has been far from superior, the control has been significantly superior to typical educational techniques. This has been evidenced in the general findings of significantly greater gains in performance by those students exposed to a systematic behavioral approach. The greater efficiency and effectiveness of programmed contingencies has been generally demonstrated through superior student performance on final examinations when compared to non-experimental or "traditional" techniques of instruction.

Such experimental findings have not been entirely convincing nor have they eliminated many of the problems associated with programmed instruction. One problem facing programmers is the lack of agreement concerning what is or is not an ideal example (58). Also, many educators are reluctant to delve into programming and are either completely unaware of

its possibilities or are just apathetic to the new technology (49). Another objection lies in the efficiency of programmed instruction. For Gleason has written:

Is efficiency a dirty word? Many people would say it is and would object strenuously to the demonstrated capabilities of programmed instruction to increase the efficiency in terms of time and energy expenditure of students in achieving stated objectives (42, p. 475).

Thus, the supposed advantages which proponents of programmed instruction and behavioral techniques have advanced (107) are not seen as advantages at all by some opponents, but as definite disadvantages.

Summary

Approaches to higher education have been many and diversified. A behavioral approach was historically suggested by many authors but not successfully implemented until the beginning of the nineteen hundreds by Watson.

Toward the middle of the nineteen hundreds Skinner supplied the missing theory for an entirely objective and empirical approach to education and a large number of related studies have continued to be performed by adherents to his system.

The major issues seen as advantages by proponents and disadvantages by opponents of behavioral techniques in education were also discussed.

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CHAPTER III

METHODS AND PROCEDURES

This chapter deals with a description of the subjects, design of the study, description of the instruments, procedures for collecting data, and procedures for treating the data.

Subjects

The subjects for this study were selected from four sections of Introductory Psychology during the Spring semester of 1971. This course was required for students majoring in psychology as well as many other majors, but was a popular course as indicated by the large number of students who enrolled in it as an elective. The classification breakdown revealed that approximately 65 per cent of the subjects were freshmen, 25 per cent were sophomores, and the remaining 10 per cent were juniors and seniors. There were 80 subjects who completed the course requirements in the contingency management sections, to be referred to as the experimental group, and 66 subjects who completed the course requirements in the lecture approach sections, subsequently referred to as the control group.

Design of the Study

During the fall semester of 1970 the faculty supervisor rated the instructors teaching the Introductory Psychology courses. The ratings were based on subjective evaluations drawn from his experience as to what constitutes good instruction. In his opinion the two instructors selected for this study did not differ significantly in their possession of expertise in teaching. The ratings were accomplished through a reliance upon at least two separate observations of the instructor's lectures. No significant deviations from what was considered a normal level of competency was found.

The sections selected for the study were the ones assigned to the two instructors. The assignment of sections was accomplished by the faculty supervisor, and the name of the instructor teaching a particular section is not generally available to the student ahead of registration time.

Also, no prior knowledge as to which classes would be conducted differently was available to prospective students. The first time that a student knew that he would be in a course which was not to be conducted in the traditional lecture method was at the first day of classes.

The material presented to each section was of the same content. This content was taken from Rach (2) and included chapters 2, 6, 7, 8, 9, 10, 11 and 12 of his textbook. The only significant variation was in the manner of presentation.

The control group sections met the standard three hours of lecture time per week with attendance being required. The experimental group sections met in the scheduled classroom setting one hour per week, with attendance being mandatory on that day. This attendance requirement was made to serve as a control in that it assured an equal minimal level of student-instructor contact. The selection of a particular period during the scheduled classroom hours was purely arbitrary. For the experimental group, the remainder of their time was spent in the testing room where they worked through the course content in programmed form on the Mycom electronic learning computers.

For purposes of this study only four specific sections were evaluated. However, the comprehensive system was designed to handle many more students than those in the experimental group. Consequently, all those instructors wishing to include their sections were allowed to participate. This amounted to having to process 700 students.

The system was designed with three major aspects in mind: specification, observation, and consequence. Specification required that the basic requirements of the course be precisely defined for the students. In order to do this it was necessary to review carefully the material in the textbook and design a series of multiple-choice questions for each chapter. Some of the questions used were supplied by the publisher (4). All of the questions were evaluated in

terms of difficulty and representativeness of the material to sample selectively from each chapter, so that if a student were capable of passing these questions, he should be knowledgeable on the remainder of the unsampled material as well. Tests were then prepared for each chapter individually containing eight questions.

To insure further the high degree of specification established by careful selection of test questions, students were required to pass seven of eight questions on each chapter exam. Secondly, six possible answers to each question were used to prohibit students' passing tests by guessing. If the student met the criterion of passing these difficult eight questions, he was given credit for mastery of all the materials in that unit.

Observation dealt with the workings of the system itself and the collection of data. All testing was done by individualized computers supplied by the Mycom Corporation. These efficient, compact machines are capable of randomizing answers to 100 different sets of 100 questions each with a variety of different programs. The answer to each problem was predetermined by the program or "logic" in the machines which was adjusted with a special key when the student requested a test. The machine allowed the student to dial his choice of answers, and this was recorded on a counter if he was correct. If the student dialed an incorrect answer, he was required to re-dial until he located the correct response.

Thus, the machine not only recorded whether or not the student was correct, but it also forced him to find the appropriate answer to the question he missed before allowing him to advance. Each question on the test form was worked through in this fashion, and when he had completed the test, the numbers on the counters indicated whether or not he had passed.

When a student failed, he was allowed to retake the exams until he passed; therefore, many different forms of the test had to be prepared for each chapter so he would not be likely to retake the same test. This method also attempted to prevent students from taking a test with the purpose of memorizing the test in order to pass a chapter without studying the material.

Although it was recognized that through repeated testing the chapter could eventually be passed without having read the material, presumably, when this was the case, a certain amount of learning took place. The power component, when evaluated, would specify the amount of learning which took place through testing.

The testing room was open approximately thirty-six hours per week and was staffed by five work-study students who served as "testers." Their duties were to give the students their examinations and record passes and failures when the students finished. The testers were not to answer any questions concerning the course materials but rather referred the student to the formalized complaint form which

was to be filled out by the student and taken to the monitor on duty.

The system was monitored by seven instructors who also had classes in the program. The monitor's duty was to keep the system running efficiently, since facilities were extremely limited. The monitor also took data concerning tests given hourly and daily, and kept a record of the average time a student took to complete a test unit.

A very important role of the monitor was to handle student complaints concerning ambiguity and inaccuracy of questions on the test forms. A formal complaint procedure was provided for students to present objections to questions which was evaluated by the monitor. If the student's objection was justified, the forms containing the question in error were removed and corrected accordingly. The student was also given immediate credit, and if this resulted in a change from a failure to a pass, the monitor so marked the student's test form.

For the student, the system was designed such that when material had been read and prepared, he came to a testing room for examination (see Appendix A). On arrival he filled out a test data form indicating the material over which he wished to be tested. Two lights above the testing room door indicated whether he might enter or not. A green light indicated that there were machines available and he could be tested immediately. Red indicated that all machines were temporarily in use and

he must take a number and wait until he was called on the public address system.

When the student entered the testing room, he presented his test data form and student identification card to the tester. The tester selected the appropriate test form from the file, took the student to an available unit, and set the machine for the correct answer logic. Above each desk was located a reflector which the student turned to red when he had finished and the tester then returned to mark his score. The student's pass or failure was indicated by counters designating problems completed and problems correct, information which the tester recorded on the student's data form, and the test form was collected. The tester then stamped the data form with a hand counter, and if the student had passed, the form was filed in the appropriate instructor's test slot. Failures were stored in a separate fail box for later reference, and the time of the failure was recorded on each form.

A second set of counters and independent power supply recorded the total number of responses made per test form, and these data were recorded on each test data form irrespective of the pass or failure disposition of the form. These data when taken cumulatively throughout the semester for each student represent the "power" component of the system.

The third and possibly the most important aspect of the system was consequence. Consequence refers to the appropriate administration of reinforcers and punishers. If these stimuli

are not systematically and precisely applied, then the desired or target behavior is not likely to increase in frequency. In this case, the desired academic materials will not be learned by the students. Consequation is necessary throughout each level of operation and must also be applied to those faculty and paid students operating the system also if an effective and efficient operation is to be maintained.

The system operated only because of effective consequences which at the first level of analysis were in effect in the testing room. When a student passed with seven or eight correct questions, he was given immediate credit for complete mastery of the material in that chapter, and credits were recorded and posted on grade charts outside the testing room. When a student completed six or fewer correctly, the consequences for failure were a 20 minute time-out period, during which time he could not re-enter the testing room. This mild punishment attempted to reduce the frequency of failure and induce students to prepare well for the tests. Secondly, students attempting to pass by memorization would fail many exams before succeeding, thus spending more time waiting out failure punishment than would be spent learning the material from their books.

Aside from these consequences, students were subjected to what was called the "Dooms Day Contingency" which maintained steady work throughout the semester. Students were required

following this schedule throughout the semester, the students would complete the course requirements and be given an A for that portion. If a student failed to meet a deadline and had not made previous arrangements to do so, he was dropped one letter grade. Although this consequence may seem severe, it was necessary to keep the students working in the program.

Just as contingencies were in operation on students, consequences were necessary to maintain the behavior of those running the system itself. With the paid testers, working pay could be manipulated relative to their behavior on duty, and violations of the specified rules could result in work dismissal. Just as testers were under supervision, rules and consequences needed to exist for monitor duty also. Tardiness and noncompletion of assigned work were strictly enforced by a monetary fine system, and periodic checks were made by the program supervisor. These fines are specified by Appendix D.

Independent of monitor contingencies, instructors were required to file Dooms Day reports indicating the names of students not fulfilling weekly quotas. This forced instructors to maintain contingencies on their students and keep abreast of each individual's progress. An instructor's classes could also be expelled from the system if he repeatedly violated monitor rules.

For the entire program to operate efficiently then, there had to be contingencies on all persons involved, not just students. The system actually consisted of a hierarchy

of several smaller systems which controlled each other. Students under the control of instructors and testers in the testing situation were all supervised by the monitors. Students in turn served as a quality control function through the test question complaint procedures, and the entire program was checked and balanced through the program supervisor.

Instruments

The comprehensive final examination was constructed by members of the Psychology Department faculty during the fall semester of 1970. It consisted of 150 multiple-choice questions having four alternatives per question. It was administered to those individuals taking Introductory Psychology during that semester; and an item analysis was computed. There were 319 students in the sections who took the examination. A reliability estimate (coefficient alpha) was obtained and equalled .8247. According to Nunnally (1), "It (coefficient alpha) represents the expected correlation of one test with an alternative form containing the same number of items. The square root of coefficient alpha is the estimated correlation of a test with errorless true scores" (1, p.196). The overall mean and standard deviation for the entire sample was $\bar{X}=72.11$, $S.D.=12.31$. The instrument contained 150 multiple-choice items.

A Psychology Department's departmental examination for graduate studies was obtained from a committee member. The

examination consisted of five subtests, of which three were considered relevant to the course work covered in Introductory Psychology. These were the subtests on Learning, Statistics and Experimental, and History and Systems. These were sections three, four, and five respectively of the instrument. The mean (\bar{x}), standard deviation (S.D.), and coefficient alpha (r_{kk}) of the three sections used were computed with the following results:

Learning (section 3) $\bar{x}=13.4$, S.D.=4.98, $r_{kk}=.8416$

Statistics (section 4a) $\bar{x}=12.70$, S.D.=4.56, $r_{kk}=.8148$

Experimental (section 4b) $\bar{x}=15.5$, S.D.=2.52, $r_{kk}=.2548$

History and Systems (section 5) $\bar{x}=13.15$, S.D.=2.33, $r_{kk}=.1409$.

A modified version of the material covered in these subtests was constructed, and the finished instrument contained 100 multiple-choice questions. The split-half reliability coefficient was .9113 for this version of the instrument.

Procedures for Collecting Data

The experimental subtests worked through the specified course content using the Mycom electronic learning computers throughout the semester. They were required to complete a minimum of one unit (consisting of one chapter) every two weeks, but were otherwise free to work at their own rate. The data generated here were recorded cumulatively for each subject. These data consisted of a total cumulative figure representing the total number of responses each subject made

throughout the semester, a breakdown of the total number of responses required to complete each unit, and the total number of trials necessary to complete each unit.

The comprehensive final examination and the departmental examination for graduate studies were available throughout the semester and could be taken upon request by the student at anytime after completion of the course requirements.

Those students not finishing the course requirements before the last week before scheduled finals were administered either the comprehensive final or the departmental examination during the scheduled class times for the week. This resulted in about one-half the subjects taking the comprehensive final and the other one-half taking the departmental examination. The remaining instrument was taken at the scheduled final examination time for each section.

In an attempt to measure attitudes toward the course, the Psychology Department, the university, and academia, a 30-item questionnaire was constructed and administered to each student after he had completed both examinations. This instrument is reproduced in Appendix L, and no prior validation procedures were conducted. Therefore, no psychometric criteria are claimed for the instrument and its use was merely to try to determine if differences would exist between the groups.

Essentially the same procedure was utilized in testing the control subjects. During the classtime the week before dead week one-half of the subjects were administered the

comprehensive final examination, and the other one-half of the subjects were given the departmental examination. The other instrument was taken during the scheduled final examination time for each section. The attitude questionnaire was taken upon completion of the two examinations.

Procedures for Treating the Data

The null hypothesis that there would be no difference between the groups was tested at the .05 level of significance (two-tailed test) for all hypotheses.

Hypotheses One and Two, that there would be a significant difference between the two group means on the two final examination measures, were tested by use of analysis of variance.

Hypotheses Three and Four, that the power component of the Mycom electronic learning computer would be of value for predicting final scores on the two final examination measures for the experimental sections, were tested by use of analysis of variance. The subjects were divided into five groups of equal number based on the power figure. A five-level analysis of variance was then computed using the subject's score on the final examination (Hypothesis Three) and then again using the subject's score on the departmental examination (Hypothesis Four).

To determine if the early administration of either the final examination or the departmental examination had any significant effect on the subject's subsequent performance

was determined by computing a two-way analysis of variance for each instrument.

The items on the attitude questionnaire which appeared to discriminate between the two groups were statistically analyzed through the use of t-tests. The score, per subject, per item, was determined by weighting the levels of attitudes. The least favorable attitude received a score of one, and the most favorable attitude received a score of five. Therefore, the higher the score the more favorable the attitude.

Chapter III has presented a description of the subjects involved in the study plus the procedures involved in their selection. A rather detailed explanation of the design of the study and the comprehensive system involved was also given. Finally, the procedures for collecting and treating the data were outlined.

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CHAPTER IV

PRESENTATION AND DISCUSSION OF RESULTS

The problem of this study was to compare the effect of a contingency management approach with that of a lecture approach in an Introductory Psychology course. The purposes of the study were (1) to compare the achievement of students enrolled in an Introductory Psychology course when taught by a lecture method, as opposed to a contingency management approach to instruction; (2) to compare the results of instruction as measured through the administration of the relevant parts of a Psychology Department's departmental examination for graduate studies; (3) to analyze the relevance of the power component, as measured by the Mycom electronic learning computer on the achievement level of the contingency management approach students.

To determine if attitudes toward the course, the psychology department, the university, and academia differed significantly between the two groups an attitude questionnaire was constructed. This instrument was administered anonymously upon completion of the course.

A total of 146 subjects were utilized in this study. The experimental group was comprised of 80 subjects, and the control group consisted of 66 subjects. The analysis of variance data

for Hypothesis One, that there would be a significant difference between the mean scores of the contingency management approach students and the lecture approach students as measured by the comprehensive final examination constructed by the faculty of the Psychology Department, is presented in Table I.

TABLE I

THE OUTCOME OF THE ANALYSIS OF VARIANCE
ON THE COMPREHENSIVE FINAL EXAMINATION

Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level	P
Between	1.0183	1.	1.0183	0.0058	0.937
Within	25297.4258	144.	175.6766		
Total	25298.4414	145.			

The computed P level was not statistically significant. This means that no statistical differences between group scores existed and the two methods did not produce differential results.

An analysis of the mean score of the contingency management approach students and the lecture approach students as measured by the relevant parts of a Psychology Department's departmental examination for graduate studies is given in Table II.

TABLE II

THE OUTCOME OF THE ANALYSIS OF VARIANCE ON A
 PSYCHOLOGY DEPARTMENT'S DEPARTMENTAL
 EXAMINATION FOR GRADUATE STUDIES

Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level	P
Between	0.0060	1.	0.0060	0.0001	0.988
Within	7957.4766	144.	55.2603		
Total	7957.4844	145.			

From an examination of Table II it can be ascertained that no significant difference between group scores existed. This means that the two methods did not yield statistically significant differences between group scores and the two methods can not be considered as being different.

An analysis of the power component of the Mycom electronic learning computer and the final examination scores of the contingency management approach students is outlined in Table III.

An examination of Table III indicates that the F level exceeds the .05 level of significance and is significant at the .001 level. This means that there is a statistical difference between the five group means.

TABLE III

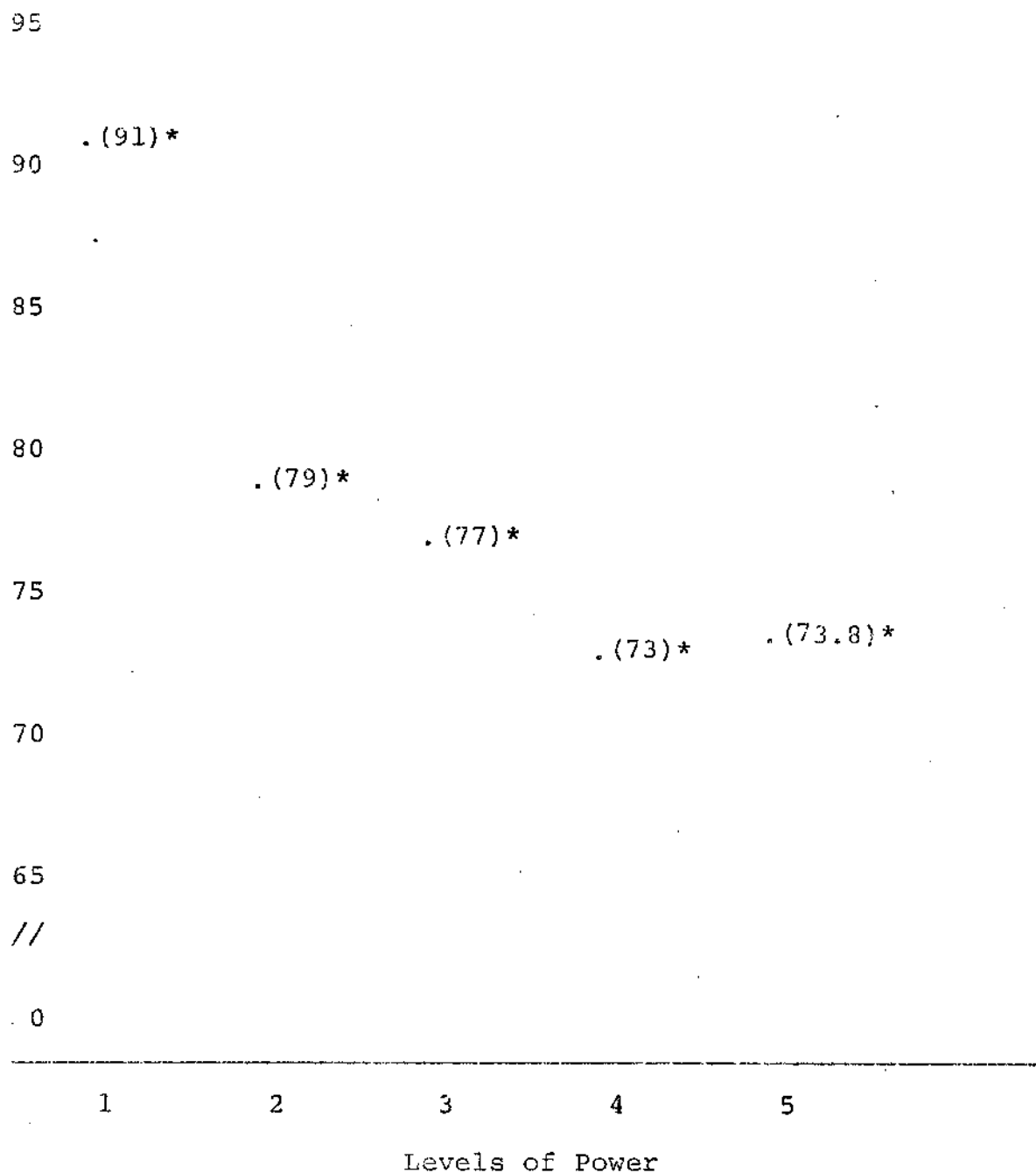
THE OUTCOME OF THE ANALYSIS OF VARIANCE OF THE
POWER COMPONENT AND THE COMPREHENSIVE
FINAL EXAMINATION

Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level	P
Between	3515.4248	4.	878.8562	5.1025	0.001
Within	12918.0625	75.	172.2408		
Total		79.			

The use of Tukey's range test for the parallel comparison of the five groups indicated that at the .05 level of significance the following groups differed from each other significantly: groups 1 and 4, 1 and 5, 1 and 3, and 1 and 2.

To depict the relationship between the five groups, the mean for each group was plotted against the five levels of power and is presented in Figure 1.

An analysis of the power component of the Mycom electronic learning computer and the contingency management approach student's scores on a Psychology Department's departmental examination for graduate studies is presented in Table IV. An examination of Table IV indicates that the F level exceeds the .05 level of significance and is significant at the .011



*Group Means on the Comprehensive Final Examination

Fig. 1--Group Means on the Comprehensive Final Examination as plotted against the 5 levels of power. There are 16 subjects per level of power with a total N of 80.

TABLE IV

THE OUTCOME OF THE ANALYSIS OF VARIANCE OF THE
POWER COMPONENT AND A PSYCHOLOGY DEPARTMENT'S
EXAMINATION FOR GRADUATE STUDIES

Source	Sum of Square	Degrees of Freedom	Variance Estimate	F Level	P
Between	797.8250	4.	199.4562	3.5364	0.011
Within	4230.1250	75.	56.4017		
Total	5027.9492	79.			

To effect parallel comparisons of the five groups, Tukey's range test was employed. The following groups differed from each other significantly: groups 1 and 4, and 1 and 5.

To depict the relationship between the five groups, the mean for each group was plotted against the five levels of power and is presented in Figure 2.

To determine if early administration of the comprehensive final examination resulted in significantly different scores from subjects taking the comprehensive final examination at the scheduled time, a two-way analysis of variance was computed. The 2x2 design for this analysis is presented in Figure 3. The same design was used for both instruments.

A presentation of the comprehensive final examination data is given in Table V.

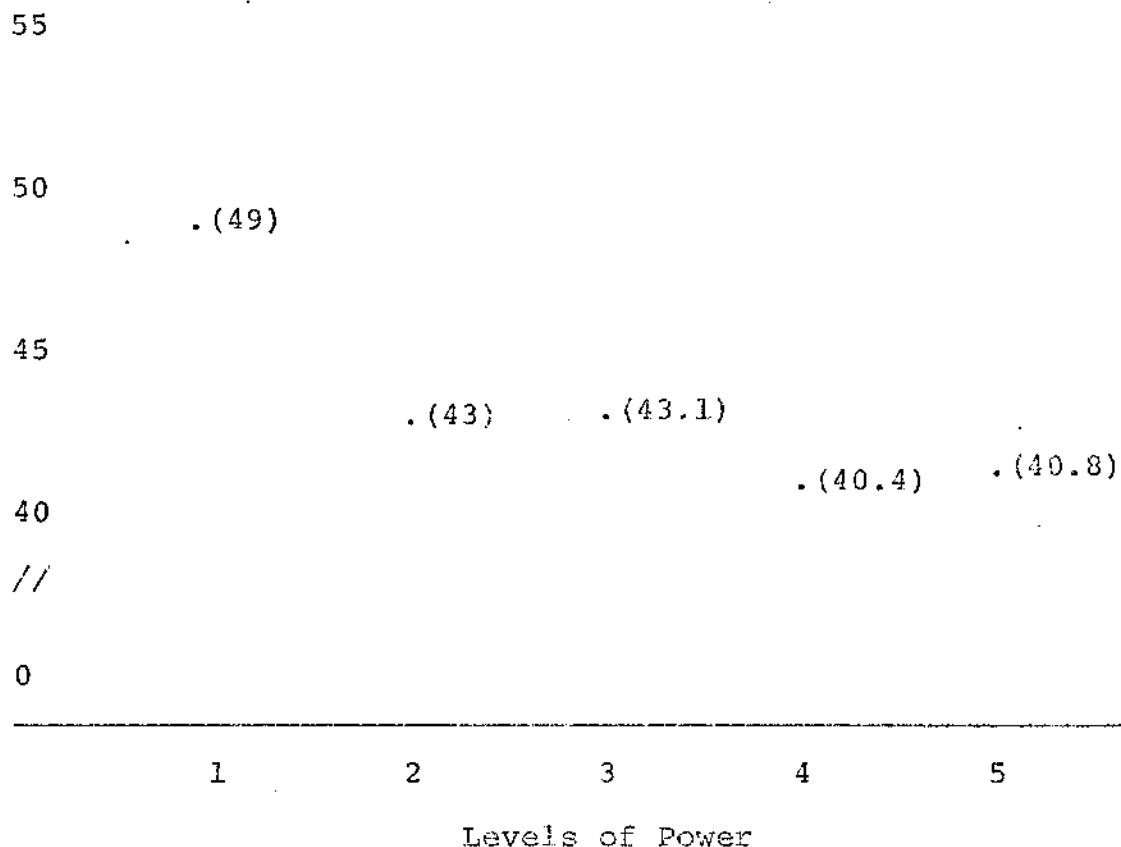


Fig. 2--Group Means on a Psychology Department's Departmental Examination for Graduate Studies as Plotted Against the 5 Levels of Power. There are 16 subjects per Level of Power with a Total N of 80.

	Early	Scheduled
Experimental Group	34	46
Control Group	32	34

Fig. 3--The Experimental Design of the Administration of the Comprehensive Final Examination and A Psychology Department's Departmental Examination for Graduate Studies. There was a Total of 146 Subjects with 80 Subjects in the Experimental Group and 66 Subjects in the Control Group.

TABLE V

THE OUTCOME OF THE TWO-WAY ANALYSIS OF VARIANCE
OF EARLY VERSUS SCHEDULED ADMINISTRATION
OF THE COMPREHENSIVE FINAL EXAMINATION

Source	Sum of Squares	Degrees of Freedom	Mean Square	F Level	P
Row	25.0301	1.	25.0301	0.1457	0.705
Column	458.2265	1.	458.2265	2.6676	0.101
Interaction	480.8906	1.	480.8906	2.7995	0.093
Within	24391.9836	142.	171.7745		

The computed F levels are not statistically significant. This means that there were no statistical differences between those students taking the examination early when compared to those students taking the examination at the scheduled time.

A two-way analysis of variance was computed between students taking the instrument early versus scheduled administration of a Psychology Department's departmental examination for graduate studies. These data are presented in Table VI. The computed F levels in Table VI are not statistically significant. This means that there were no statistical differences between those students taking the instrument early when compared to those students taking the instrument at the scheduled time.

TABLE VI

THE OUTCOME OF THE TWO-WAY ANALYSIS OF VARIANCE
OF EARLY VERSUS SCHEDULED ADMINISTRATION OF
A PSYCHOLOGY DEPARTMENT'S DEPARTMENTAL
EXAMINATION FOR GRADUATE STUDIES

Source	Sum of Squares	Degrees of Freedom	Mean Square	F Level	P
Row	1.3981	1.	1.3981	0.0257	0.065
Column	183.7613	1.	183.7613	3.3765	
Interaction	40.2520	1.	40.2520	0.7396	
Within	7728.1347	142.	54.4235		

During the scheduled final examination periods for both the experimental and control groups, a questionnaire to determine student attitudes toward the course, the psychology department, the university, and academia was administered. Those items where the mean difference between the two groups was greater than zero were statistically treated through the use of t -tests. The experimental group tended to be more favorable in their attitude toward the course on Item number 13 ($t=2.67$, $p \leq .05$), toward the psychology department on Item number 20 ($t=2.13$, $p \leq .05$), toward the university on Item number 26 ($t=3.58$, $p \leq .01$), and toward academia on Item number 12 ($t=3.67$, $p \leq .01$). Many items on the questionnaire failed to discriminate any differences among the groups.

While Hypotheses One and Two were not statistically accepted and the two instruments did not differentiate between the two groups on academic performance, there are other factors which lend merit to this particular approach. The attrition rate is of prime importance since much time and effort are wasted on both the student's part and that of the instructor when the materials are not satisfactorily learned. This system tends to eliminate this shortcoming by providing almost daily attendance to the materials. Even if the student had not read and prepared the materials he is attempting, the tests forced him to learn something. This was demonstrated through the power component of the system (Hypotheses Three and Four). Those subjects in the fourth and fifth groups would have been the failures in a traditional approach. They did not prepare the material, but through repeated testing learned enough to pass the final examinations. While they may not be realizing their full potential, they have at least made a start which, hopefully, will generalize to the other areas of academic study they are engaged in.

Another point, which is probably the most important one aside from student academic progress, is the fact that the experimental group tended to favor the mode of instruction they had been exposed to. This was evidenced through their response to the attitude questionnaire. This in itself was justification enough to continue experimentation with this

and other similar types of systems. If student achievement is not inferior to traditional techniques, then the next major concern should be what the student wants in a course. If a student receives the type of instruction which he desires, then the probability of his not completing the course is much lower than normal. This would be of concern to the entire university staff since drops are costly both to the student and to the administration.

Chapter IV has presented the statistical analysis of the hypotheses. Hypotheses One and Two were not upheld, and the null hypothesis of no difference was retained in each case. Hypotheses Three and Four were accepted at the .001 and .011 levels respectively, and the null hypothesis of no difference was rejected.

In order to determine if early administration of either instrument resulted in significant differences from scores obtained by subjects taking the instruments at the scheduled times, a two-way analysis of variance was computed in each case. The null hypothesis of no difference was retained in each analysis.

An attitude questionnaire was administered to the subjects at the conclusion of the courses with the contingency management subjects responding more favorably toward the course, the psychology department, the university, and academia than the lecture approach students.

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CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The problem of this study was to compare the effect of a contingency management approach with that of a lecture approach in an introductory psychology course. The purposes of the study were: (1) to compare the achievement of students enrolled in an Introductory Psychology course when taught by a lecture method, as opposed to a contingency management approach to instruction; (2) to compare the results of instruction as measured through the administration of the relevant parts of a Psychology Department's departmental examination for graduate studies; (3) to analyze the relevance of the power component, as measured by the Mycom electronic learning computer, on the achievement level of the contingency management approach students.

To determine if attitudes toward the course, the Psychology Department, the university, and academia differed significantly between the two groups, an attitude questionnaire was constructed. This instrument was administered anonymously upon completion of the course.

In this study a total of 146 students from four Introductory Psychology classes were used as subjects. The

experimental group was made up of 80 subjects, and the control group consisted of 66 subjects.

Hypothesis One predicted that there would be a significant difference between the mean scores of the contingency management approach students and the lecture approach students as measured by a comprehensive final examination constructed by the faculty of the Psychology Department. A test of significant difference by using analysis of variance revealed no statistical difference ($p \leq .05$). The hypothesis was rejected.

Hypothesis Two predicted that there would be a significant difference between the mean scores of the contingency management approach students and the lecture approach students as measured by the relevant parts of a Psychology Department's departmental examination for graduate studies. A test of significant difference by using analysis of variance indicated no statistical difference existed ($p \leq .05$). The hypothesis was rejected.

Hypothesis Three predicted that the power component of the Mycom electronic learning computer would be of value for predicting the final examination scores of the contingency management approach students. When subjected to a test of significant difference by using analysis of variance, an F ratio that was highly significant ($p \leq .001$) was found. The hypothesis was accepted.

Hypothesis Four predicted that the power component of the Mycom electronic learning computer would be of value for

predicting performance on a Psychology Department's departmental examination for graduate studies for the contingency management approach students. When subjected to a test of significant difference by using analysis of variance, an F ratio that was highly significant ($p \leq .011$) was found. The hypothesis was accepted.

To determine if early administration of either instrument resulted in significant differences from scores obtained by subjects taking the instruments at the scheduled times, a two-way analysis of variance was computed in each case. The null hypothesis of no difference ($p \leq .05$) was retained in each analysis.

During the scheduled final examination periods for both the experimental and control groups an attitude questionnaire was administered. Four basic attitudes were to be measured by the questionnaire with significant differences (t -test) existing on the following items: item number 13 ($p \leq .05$) the experimental group responded more favorably toward the course; number 20 ($p \leq .05$) the experimental group responded more favorably toward the Psychology Department; item number 26 ($p \leq .01$) the experimental group responded more favorably toward the university; number 12 ($p \leq .01$) the experimental group responded more favorably toward academia.

Conclusions

The following conclusions were formulated upon the basis of the findings in this study:

1. No difference in results between the experimental and control groups was found; hence, the two methods of treatment do not differ, at least in terms of the criterion measures used in this study.

2. The power component of the Mycom electronic learning computer is of value in determining achievement levels on the two instruments used for the experimental subjects.

3. Early administration of the examinations did not differ from scheduled administration for either the experimental or control group.

4. Experimental subjects tend to respond more favorably than the control subjects on the attitude questionnaire toward the course, the Psychology Department, the university, and the academia.

In addition to the findings and conclusions presented above, another point needs to be clarified. The experimental and control subjects did not differ significantly in their performance on the comprehensive final examination, but both groups were significantly higher than the mean score on the instrument the semester before. It could be that the control group did not reflect an "average" level of instruction, but was somehow biased. Unfortunately, no additional subjects could be used in the comparison as a different final examination was used for the students in all the other Introductory Psychology classes.

Recommendations

Based upon the research findings and conclusions of this study in conjunction with the literature and theory associated with a contingency management approach to instruction, the following recommendations are made:

1. There should be a more random assignment of the method of instruction to be used by the instructor. This would alleviate the complaint that one instructor might perform better teaching with a method he liked and chose.
2. There should be a more thorough look at the method of assessing students. The number of times required to pass each chapter might also be a reliable index of ability.
3. An effort should be made to find a way to reward superior students who pass the material the first time since they demonstrated a greater grasp of the materials.
4. The sampling tests should be lengthened to increase their reliability.
5. Additional research is needed to find more effective and efficient modes of instruction to handle the rapidly increasing number of students.

APPENDIX A

TESTING PROCEDURE

1. The green light above the door indicates a booth is open for testing. S^D for student to enter testing room.
2. Red light above door--all boothes are in use. S^A for entering testing room.
3. Upon entering testing room all books, papers, etc. must be placed in bookcase.
4. The student fills out the testing sheet indicating the date, section, instructor, and source and chapter of the test he wishes to take.
5. There is absolutely no talking in the testing room. All information must be present on the form or the student will receive a fail for that particular test.
6. The testing form is given to the tester who selects the test the student wishes to take, directs the student to a booth, and clears the machine so it is ready for the student.
7. The student reads question one and then dials the letter of his answer and pushes the red button. (a) The machine indicates the correct answer by flashing a green light and also advancing one in the space designated "problems correct"; (b) an incorrect answer receives a flashing red light and the student must continue selecting

- alternatives until the student has identified the correct answer; (c) as the student answers the question correctly the space marked "problems completed" advances one number.
8. The student should not dial selections after he has completed eight questions.
 9. Upon completion of the test the student will turn the reflector, located above his desk, to red and the tester will come to the booth and record the number of correct responses, problems completed, etc. Criteria for passing is 7 of 8.
 10. Passing a test allows a student to immediately take another test.
 11. Failing a test prevents a student from taking tests for the next 20 minutes.
 12. A student kingdom room across from the testing room will be open during testing hours. This room will be used for studying while waiting to take tests. A tutor will be present in this room to answer any questions you may have regarding your reading. Coffee is also available in this room.
 13. If you have a complaint or question about a particular item on a test, you are instructed to (a) finish test (many of the same questions will appear on alternate forms of the test); (b) write out complaint on Test Item Analysis form which can be obtained from tester; (c) turn in completed Test Item Analysis form to tester, who will

fill in additional information; (d) take Test Item Analysis form to Monitor Room (PB301).

APPENDIX B

TESTER PROCEDURE

1. Punch time clock in testing room at 8:15 a.m.
2. Put up new Daily Test Data Sheet.
3. Make coffee in Student Kingdom.
4. Replenish stacks of testing data forms in testing room.
5. Get machine key from monitor.
6. Check instructor posting of dooms days. Make list of sections and persons by section blocked from testing room.
7. Count laminated question sheets. If any are missing, contact monitor.
8. Turn on power source above cubby holes.
9. 8:30. Set timer for 60 minutes, clear counter and read number, turn on green light.
10. When student hands tester completed Test Data form, tester inspects form, checks current Flunk Box, and removes test requested from file cabinet. Tester leads student to machine at farthest corner of room. If form is incomplete circle incomplete item and mark form "fail", add 20 minutes to current time, write this time on top of form and file in Flunk Box.
11. Tester will (1) set logic (2) clear machine (3) plug in adapter (4) hand student laminated question sheet.

12. Testing Data form is then placed on clip above student with print facing wall.
13. When student turns his reflector to red, indicating he has completed test, tester goes to student and unplugs adapter and fills in information requested on Test Data form.
14. The tester returns immediately to the main desk and records the total number of responses corresponding to machine number. The tester then resets response counter to zero. (a) If student failed test, tester adds 20 minutes to present time and writes this time on Test Data form. Place failed test in Current Flunk Box to be held until time has expired. When expired, test is filed in Fail Cubby until end of day. (b) If student passes test, he may return to bookcase, fill out another Test Data form and immediately take another test.
15. Question sheet is replaced in file cabinet at end of forms for that chapter in order to insure that forms will be alternated.
16. If student disagrees with an answer, he is instructed to (1) finish test (2) fill out test Item Analysis sheet (tester will fill in additional information required on this form and send student to see monitor in PB301). Place laminated questions containing disputed item and Test Data form in Hold Box until monitor reports.

arises, turn on red light and tell tutor in Student Kingdom to get monitor.

18. When timer goes off, tester completes Daily Test Data entry. Timer is reset.

APPENDIX C

MIDDAY PROCEDURE FOR TESTERS COMING IN AFTER 8:30

1. Punch time clock.
2. Get machine key from tester.
3. Count laminated sheets.
4. Perform numbers 10-17.

CLOSE OUT PROCEDURE

1. At 4:30 turn on red light, clear persons out, no additional tests are given.
2. Turn off power source on counters.
3. Count total number of failures. Enter this on Daily Test Data sheet.
4. Clean up testing room.
5. Check all adapters to see that they are on top of machine.
6. Straighten chairs, remove extra papers from tester's desk.
7. Punch time clock.

APPENDIX D

MONITOR GENERAL INFORMATION

1. Instructors must file Dooms Day reports by 9:00 a.m. of the following day: day listed is actual dooms day, date is when filed, \$1.00 fine for not filing on time.
2. Monitors will be fined \$5.00 for not showing for monitor duty.
3. Monitors will be fined for arriving late for duty. An initial 5 minute grace period will be allowed, followed by a \$1.00 fine up to 15 minutes. An additional \$1.00 fine will be charged for every 15 minutes thereafter. Late arrival fines will be the property of the previous monitor if he remains to collect it and replaces the late monitor until he arrives. This will provide incentive for monitors to arrive on time and also for the previous monitor to remain until he is replaced. If the previous monitor must leave, he should file a Monitor Not Present Form indicating when he left and who was supposed to relieve him. He will receive payment for the period of time he waited in excess of his duty. When the late monitor arrives, he should sign the filed form indicating the time he arrived and have it verified and initialed by a tester on duty. Otherwise, he will be

- charged for having missed his entire duty. These charges and payments should be automatic and a violating monitor should pay his fine without question unless some other arrangement is agreed upon by both monitors involved.
4. When a monitor arrives on duty and the previous monitor is not present and should still be on duty, he should file a Monitor Not Present Form. The absent monitor must present justification for absence at the staff meeting or fines will be charged at the usual rate.
 5. When a monitor cannot be located during his duty and the student with a complaint has made adequate effort to find him, the tester will file a Monitor Not Present Form and a charge of \$1.00 will be assessed if the monitor does not justify his absence from duty at the staff meeting.
 6. A monitor on duty must notify the primary or secondary person responsible on the same day which a complaint requiring form correction arises. If forms or complaints are found and the responsible person has not been notified, the monitor who ordered the change will be fined \$1.00. His responsibility for notifying the person in charge of correction does not end with his monitor duty.
 7. When forms are out for correction, the responsible person has 24 hours to make corrections. When removing forms, a Test Removal Form should be filled out so that nightly counts of laminated sheets will be accurate. A

\$1.00 fine will be charged per form per day for forms that are out longer than 24 hours.

APPENDIX E

MONITOR PROCEDURE

8:15

1. Get keys for machines and test cabinet from monitor room.
2. Punch time clock in testing room.
3. Check tester attendance and get replacement if necessary.
4. Give key to tester on duty.
5. Open test file.
6. Change pens at shelf.
7. Check Student Kingdom to see that coffee is made and furniture is orderly.

8:50

Go to Student Kingdom. Spend 10-15 minutes talking to students.

9:00-9:05

1. Count number of persons in Student Kingdom and record on Daily Test Data Sheet.
2. Return to testing room, watch tester to see that: (1) pressing counter when handing out laminated questions (2) alternating test forms (3) filing passed tests (4) unplugging adaptars. If discrepancy is detected, inform tester of errors.

3. Take time sample (using two stop watches) on: (1) Student time in room. Record time from student entry to student exit or until he fills out second form; (2) Total time to take test. Record time from point that tester hands student test questions until student turns his reflector to red. Record on Daily Test Data sheet.
4. Return to monitor office.

9:35

Do plotting of data from Daily Test Data sheet.

APPENDIX F

MONITOR CHECK OUT

1. Count laminated sheets while tester counts and processes failures.
2. Plot percent of tests passed daily.
3. Plot total number of tests given: (a) on cumulative graph; (b) on daily graph.
4. Plot average time spent taking tests.
5. Check to see adapters are all unplugged and on top of machines.
6. Check to see if power source is off.
7. Check to see if coffee is unplugged in Student Kingdom.
8. File daily data sheet in monitor's office.
9. File fail analysis in monitor's office.
10. Place time card and other communication and keys in monitor's office.
11. Lock monitor's office.

WEEKLY STAFFINGS

1. Instructor must have total number of tests required of each student that week times the number of students currently in course. This will be plotted as expected on daily and cumulative graph of total tests given.

2. Review fail analysis and item analysis sheets.
3. Ordering forms. Single instructor in charge.
4. Questions which have been directed about testing, rationale.
5. Weekly dooms day.

APPENDIX G

DOOMS DAY REPORT

(to be completed by instructor)

Day of Week _____

Date _____

Courses _____

Sections _____

Instructor _____

By course and section list students who are blocked from testing.

APPENDIX H

DAILY TEST DATA

Date

To be filled out by:

	<u>Testers</u> (# given per hour)	<u>Monitors</u> (2 students testing) 1 2 Avg.	<u>Monitors</u> (# of students in SK)
8:30- 9:30	_____	_____	_____
9:30-10:30	_____	_____	_____
10:30-11:30	_____	_____	_____
11:30-12:30	_____	_____	_____
12:30- 1:30	_____	_____	_____
1:30- 2:30	_____	_____	_____
2:30- 3:30	_____	_____	_____
3:30- 4:30	_____	_____	_____
Total for day _____ (minus) Total failures for day _____ Remainder _____		-----	=
		<u>Total Tests given</u>	<u>No. passed (to be plotted)</u>
Number of complaints daily _____			
Credit given _____			
No credit given _____			
Logic error _____			
Tester _____			

APPENDIX I

TEST DATA

NAME _____
COURSE _____
SECTION _____
INSTRUCTOR _____
DATE _____
BOOK _____

CIRCLE CHAPTER NUMBER

1	6	11	16	21
2	7	12	17	22
3	8	13	18	23
4	9	14	19	24
5	10	15	20	25

NOT FOR STUDENT USE

Problems completed _____
Problems correct _____
Total responses _____
(Circle one) PASS FAIL
Tester _____
Machine Number _____

APPENDIX J

COMPLAINT PROCEDURE

1. Student will come to the tester and complain about a question/answer.
 - A. Tester asks student to complete test if he has not already done so. Tester keeps Test Data form and laminated questions in Hold Box.
 - B. Tester gives student Test Item Analysis form and asks student to fill it out. Tester adds requested information.
 - C. Tester asks student to take completed Test Item Analysis form to Monitor Office.
2. Student enters Monitor Office with Test Item Analysis form.
 - A. Monitor reads Test Item Analysis form thoroughly. If it is incomplete, hands it back to student and have him fill it out.
 - B. If possibility exists that student made a dialing error (for example, dialed "c", and thought he had dialed "d", and assumed answer was wrong) monitor accompanies student back to testing room and watches while student runs through test again.
 - C. Monitor makes decision regarding validity of complaint. Criteria for acceptance or rejection of question/answer is statement in book which is being tested.

This should be communicated to student.

D. If student was in error and failed test, monitor notifies tester and regular procedure of 20 minute time out is in effect.

E. If question/answer item is judged to be inadequate or in error:

(1) Monitor will accompany student to testing room and notify tester that student receives credit for that item and his Test Data form is marked accordingly.

(2) Tester notes on acetate bulletin board that appropriate chapter will be closed at end of day.

(3) Monitor contacts Responsible Monitor for that chapter and indicates he has done so on Test Item Analysis form.

(4) Responsible Monitor then must make appropriate changes on questions/answers on all test forms before authorizing tester to reopen testing on that chapter.

F. If student is judged to be in error by monitor and shown statement in book, but still wishes to appeal, he may: (1) fill out a duplicate Test Item Analysis form, (2) receive name of Responsible Monitor for that chapter so that he may make an appointment to meet him in Monitor Office to reconsider matter. Further appeal will be directed to the Program Director.

C. All Test Item Analysis forms will be filed in Monitor Office which will be checked daily by the Program Director.

APPENDIX K

TEST ITEM ANALYSIS

NAME _____
COURSE _____
SECTION _____
INSTRUCTOR _____
DATE _____
BOOK _____
CHAPTER _____
YOUR ANSWER _____
MACHINE CORRECT ANSWER _____
PAGE NUMBER IN BOOK WITH
SUPPORT FOR YOUR ANSWER _____
COPY COMPLETE QUESTION WITH
ALL OPTIONS: _____

NOT FOR STUDENT USE

Tester's name _____
Machine number _____
Monitor's name _____

Decision:
Logic error _____
Bad question _____
Student mistake in
dialing _____

Action required:
Credit given _____
Responsible person _____
Notification time _____

- | <u>SA</u> | <u>A</u> | <u>DK</u> | <u>D</u> | <u>SD</u> | |
|-----------|----------|-----------|----------|-----------|---|
| --- | --- | --- | --- | --- | 7. My parents are wasting their money on my education. |
| --- | --- | --- | --- | --- | 8. If most professors in this university were forced to choose between teaching better and getting paid more, there is no question that they would choose more pay. |
| --- | --- | --- | --- | --- | 9. A college professor is a perfect example of the statement, "Those who can't do, teach." |
| --- | --- | --- | --- | --- | 10. If a professor were to give all A's for several semesters, the administration would soon fail to renew his contract. |
| --- | --- | --- | --- | --- | 11. Psychology as a science is dead. |
| --- | --- | --- | --- | --- | 12. My attitude has improved toward studying this semester. |
| --- | --- | --- | --- | --- | 13. This course has helped me to understand the principles of psychology and how to apply them. |
| --- | --- | --- | --- | --- | 14. The facilities available in the psychology department at this university leave much to be desired. |
| --- | --- | --- | --- | --- | 15. The concept of this course could be condensed to allow more study time for more relevant studies. |

- | <u>SA</u> | <u>A</u> | <u>DK</u> | <u>D</u> | <u>SD</u> | |
|-----------|----------|-----------|----------|-----------|---|
| --- | --- | --- | --- | --- | 16. Our administration is more concerned with the political status of this university than with student needs. |
| --- | --- | --- | --- | --- | 17. I like this course better than other courses I've had. |
| --- | --- | --- | --- | --- | 18. It's fortunate my psychology instructor is preparing for a career in psychology because he would not make it in any other area. |
| --- | --- | --- | --- | --- | 19. This university is far behind in the area of student rights. |
| --- | --- | --- | --- | --- | 20. The psychology department is one of the most progressive on campus. |
| --- | --- | --- | --- | --- | 21. I have enjoyed attending lectures for this course. |
| --- | --- | --- | --- | --- | 22. My attitude toward psychology has improved this semester. |
| --- | --- | --- | --- | --- | 23. I switched my major to psychology during this semester. |
| --- | --- | --- | --- | --- | 24. This course was conducted always to the best academic interest. |
| --- | --- | --- | --- | --- | 25. This course should influence a significant number of students to change their major to psychology. |

SA A DK D SD

- ___ ___ ___ ___ ___ 26. This university considers the students learning of knowledge to be far above any other function.
- ___ ___ ___ ___ ___ 27. I consider this university to be a detriment to my happiness.
- ___ ___ ___ ___ ___ 28. Few professors on campus find time to know students intimately.
- ___ ___ ___ ___ ___ 29. This university spends too much money in areas less important than supplying a competent instructor staff.
- ___ ___ ___ ___ ___ 30. If I had my choice, I would not attend this university again.

I have studied in the Student Kingdom

OFTEN

SOMETIME

NEVER

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