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EFFECTS OF GROUP, INDIVIDUAL, AND NO CONTINGENCIES OF REINFORCEMENT ON THE ARITHMETIC PERFORMANCE OF NAVAJO AND HOPI STUDENTS

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Weekley, Alice Louise Wolfcale
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Effects of Group, Individual, and No Contingencies of Reinforcement on the Arithmetic Performance of Navajo and Hopi Students

Dissertation

Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Graduate School of the Ohio State University

By

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1980

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This dissertation is dedicated to my husband, Bob, who deserves to be awarded a Ph.D. in survival, diplomacy, and emotional support.
ACKNOWLEDGEMENTS

I wish to express my appreciation to Dr. Genshaft, Dr. Swassing, and Dr. Hill for serving on my dissertation committee and for their significant contributions to my professional growth. Accolades must go to Dr. Cooper, my advisor, for his valuable guidance, succinct directions, consistent support and prompt replies (via the U.S. Postal Service) to my numerous requests and inquiries.

A special word of thanks is due to math teacher, Mr. Joey Paul Chimerica, for working so diligently with these experiments in the classroom, and to the Tuba City Public School district for permitting this research.
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Exceptional Children: Culturally Different; Native Americans of the Southwest; History, Current Educational Issues and Policies.
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Chapter I

Introduction

American Indian education is primarily patterned after Anglo education. Methods that have been used with Anglo children are being implemented in reservation schools with the assumption that Indian children would learn successfully with Anglo methods. However, statements from the Education Division of the Navajo Tribal Council (Navajo Tribe, 1973, p. 36) insist that the educational programs currently administered for Navajos do not prepare Navajo youth with the basic skills and knowledge necessary for their future success. One reason given by the Tribe is that the program content does not support the growth and development of the Navajo culture.

The lack of cultural relevance in the classroom today can best be understood by looking at the educational history of the Navajo. The Bureau of Indian Affairs was established in 1824 within the United States War Department to deal with the Indian Problem. Later, when Indian tribes were placed on reservations, the Bureau's main responsibility was to work with the Indian tribes, administering the provisions of the 1868 treaty including the
education of Navajo children. The first boarding school, managed by missionaries, was established at Fort Defiance, Arizona, in 1882, followed by a second set up at Grand Junction, Colorado. These two schools served all of the Indians of the Southwest. Navajos were either uninterested or antagonistic toward this program that took the children away from their homes, educating and disciplining them in ways that were totally foreign to the Navajo way.

In 1887 the Bureau of Indian Affairs instituted compulsory school attendance. More schools were built and United States Civil Service employees became teachers in place of the missionaries. Very little interest was shown in education before 1930. Between 1950 and 1970 school enrollment more than tripled. During this period, Bureau of Indian Affairs schools, missionary schools, and public schools were staffed with Anglo teachers and administrators whose goal was to extinguish the Navajo language and culture. Students were punished for speaking their language or engaging in any cultural ceremonies. The 1969 Special Subcommittee on Indian Education stated: "...the typical school feels that it is its responsibility not to teach skills, but to impress the 'alien' Indian with values of the dominant culture..." (Navajo Tribe, 1973, p. 22).

In the past few years, programs such as Head Start, High Challenge, and Early Childhood were used with American Indian children. The underlying belief was that Indian
children were disadvantaged culturally and environmentally, that their parents and elders were not sufficient models for the main American culture, and that they were being deprived of proper educational opportunity. The idea was to fill the child with more information prior to formal education (Cooley, 1977).

With this historical background, the Navajo Division of Education is calling for an educational system which is "congruent with their basic philosophy". (Navajo Tribe, 1973, p. 36). This publication states that the Navajo are seeking a method for insuring that a "sufficient number of the educational requirements placed upon their children directly relate to the maintenance and upgrading of the Navajo culture, including the teaching of values, history and tradition, language, arts and all other important aspects of Navajo life."

The implication of this mandate is that students should not only be taught about their culture but that the methods of teaching, evaluating, rewarding, and relating to the students should be culturally appropriate. Snow (1976) believes that the American Indian wishes to retain his unique identity and culture but is "cognizant of the need to accommodate the dominant American contact society."

How to implement an educational program that is culturally appropriate, while at the same time equipping the students with skills needed to be successful in the society in
which the majority will find their employment, is the challenge for today's American Indian educator.

At the heart of this challenge lies the necessity for understanding the factors that are motivating and reinforcing within the culture. Bryde (1968) saw the problems in offering the "American educational system with its culturally determined system of rewards and punishments" to the American Indians. He stressed that reinforcers in one culture are not necessarily reinforcers in another culture. And Cooley (1977) has reminded educators that each culture has its own styles, values, and traditions developed over time for the purpose of making that social system work, and that each culture develops its "own models, forms of modeling, and methods of reinforcement."

Anthropologist Louise Lamphere (1977) has recently published a lengthy study of the Navajo culture. The title of the book, *To Run After Them*, meaning "I'll help him" is a key to one of the prominent values of generosity. The study states that Navajos believe that helping is good and that it is a moral obligation to give aid when it is requested or appears to be needed. Help is given in an uncalculated way, not in the spirit of doing something so they'll get it back. (p. 36)

Three strong traditional components of the culture, according to Lamphere, are defined as cooperation, autonomy, and consensus. First is the moral obligation to help
someone in need. However, to protect each person's autonomy, a request is not made directly to an individual. Instead, the need is stated to a group. In this way, those who choose to help will volunteer and the autonomy of all will be preserved (p. 41). When action needs to be taken or group decisions made, a system of consensus is used rather than majority rule. There is, however, no bindingness. One may choose not to go along with the group decision (p. 41).

Lamphere's (1977) study also points out that for the Navajo it is not good to have more than your neighbors or members of your clan, and certainly not good to be wealthy. This is confirmed by Navajo Tribal Chairman Peter McDonald (1979) saying that to speak of a "wealthy Navajo is like saying 'dry rain'." According to Lamphere (1977) this follows the tribal rule, "One is not stingy." Logically, then, if one is not stingy, one does not have more than others.

A question that educators are faced with today is, do these values prevail and do they carry over into the educational setting? The 1969 Special Senate Subcommittee (Navajo Tribe, 1973, p. 24) states that "the Indian student is told at school that he must be competitive, when at home he is taught the value of cooperation. At school he is impressed with the importance of individual success, but at home the value of good interpersonal relations is
emphasized."

If these values do carry over into the classroom it might be expected that students would prefer to help each other rather than to outperform each other. If consensus is ingrained, but people aren't required to abide by the decision, we might expect students to choose not to abide by authoritarian rules. And if having more than someone else is a negative circumstance, there may be a tendency for students to prefer to look only as capable or intelligent as others in the class.

Although there appears to be ample evidence for the type of cultural value differences found by Lamphere, as educators planning programs for these children, we need to listen to another camp of anthropologists who resist the idea that culture is the determining factor in all cases. The objection to "cultural determinism" is that it makes no allowances for variability and individual differences. Kluckhohn and Strodtbeck (1961, p. 3) caution that when working with other cultures the dominant values are usually overstressed while the variant values are ignored.

In view of the cultural differences, and inability to weigh the strength of the differences, the educator is left with the dilemma of developing an appropriate educational system and effective means of motivating the students to achieve the educational goals. Determining those factors that are reinforcers for Indian students is a
necessary step in helping them to achieve in any educational endeavor. Since there is some evidence that both Navajo and Hopi Indians are historically more group than individually oriented (Cooley, 1977; Lamphere, 1977; MacDonald, 1979; Navajo Tribe, 1973; Waters, 1963) it seems reasonable to question the effectiveness of group contingencies of reinforcement versus individual contingencies of reinforcement as effective motivators on the educational scene.

**Purpose**

The purpose of this study was to compare the effects of group reinforcement, individual reinforcement, and no reinforcement on the arithmetic performance of Navajo and Hopi students.

**Research Questions**

Individual and group data were analyzed to answer the following questions:

1. Are there differences in the group performance of two seventh grade arithmetic classes in response to individual reinforcement, group reinforcement, or no reinforcement?

2. Will eight students, identified by the teacher as being low achievers in arithmetic, respond to the three contingencies of reinforcement by increasing, decreasing, or not changing their performance in arithmetic?
Chapter II

Review of Literature

Classrooms are typically managed via individual reinforcement procedures. Students receive grades and other feedback based upon their individual behavior. Since the discussion of Indian culture, in the previous chapter, promotes the possibility of Indian preference for working for the good of the group, this literature review will encompass studies of group contingencies of reinforcement, studies that compare group and individual contingencies of reinforcement, and research methods that lend themselves to the comparison of two or more techniques.

Group-Oriented Contingency Systems

Sloggett's (1971) work with 24 low achieving adolescent Hawaiian boys is of particular interest since they constitute a culturally different population who seemed also to be highly influenced by their "group". Disruptive behavior that precluded academic achievement was a major problem. The experimenter needed to create an environment
in which disruptive behavior decreased and academic behavior increased. To accomplish this the class was divided into four teams. The boys on each team worked for points, based on appropriate classroom behavior, which were accumulated by the team and traded for special activities in which the team could engage. Each team was competing against a known standard. It was possible for any or all teams to win. Pre and post semester achievement tests were conducted in mathematics which resulted in significant improvement in mean group scores for all of the subtests and the total score. The investigator reported that misconduct declined and attendance increased during this period. Conduct was not systematically measured but rather, was a subjective judgement made by the teacher.

Another study using team competition (The Good Behavior Game) was designed by Harris and Sherman (1973) for use in a fifth and sixth grade class. The investigators were attempting to answer three questions. The first question was whether disruptive behavior would be reduced with this procedure. The second was, if the procedure were effective, what were the variables that were responsible for the control. Third, what was the effect upon the academic performance of the children.

After baseline data was acquired the teachers explained the good behavior game to the classes. The children in each class were divided into two teams, each containing
approximately one half the children in the class. The team member's names were written on the blackboard. The teacher explained that the rules of the game were: (1) no talking without permission; (2) no leaving seats without permission; (3) no throwing objects in the classroom without permission. A rule violation resulted in a mark being placed on the blackboard for the offending team. Students were told that the team with the fewest number of marks at the end of the specified period would be the winner, but if neither team received more than five marks (or four marks for grade six) then both would win. Also, if there were a tie, both teams would win. Members of the winning team or teams were allowed to leave school 10 minutes early at the end of the day. The losing team members were required to remain in the classroom until regular dismissal time.

Evaluation of effectiveness of the procedures was determined by recording baseline data of disruptive behavior followed by systematic introduction and removal of the procedures from one or more of the observation periods within each classroom.

To evaluate which components of the good behavior game were responsible for controlling disruptive behavior, several manipulations of the variables occurred in the sixth grade class. In one case the consequence for winning the game was eliminated. At another time the maximum number of marks needed for winning was changed from four
to eight and back to four again. A third manipulation involved eliminating the marks from the blackboard and placing them on a piece of paper on the teacher's desk, out of the children's sight. A fourth change was treating the class as a whole rather than in teams.

To evaluate the effect of the procedure on academic performance, the good behavior game was used during the afternoon math period for five consecutive days and then transferred to the morning math period for five consecutive days.

Results of using the good behavior game with the consequence of 10 minutes early dismissal for winners was a marked decrease in disruptive behavior in those periods when the game was being played. The game was left in effect for three to four hours of the school day for 100 days. Additionally, both teams won the game on 121 days out of 133 days that the game conditions were in effect.

Removing the consequence of early dismissal resulted in a decline in disruptive behavior over baseline conditions but to a lesser degree than the previous condition when early dismissal was used as a consequence.

When the procedure was manipulated so that marks were made on a paper at the teacher's desk rather than on the board, all other variables remaining constant, there were no observable differences in disruptive behavior. That is, disruptive behavior maintained the same low rate whether
the students would see the marks they were getting or not.

Calculating the mean daily percentage rate of correct and incorrect math problems for children in the fifth grade, this study showed that when the game was in effect, disruptive behavior decreased and the percentage of correct math problems increased.

Considering the question of whether the group performed at a more acceptable level when divided into teams than when treated as one unit, in this study the use of teams appeared to prevent a rapid increase in disruptive behavior when introduced after the class had been operating as one group. The authors note that, in this design, a team could win, even though they had more than the criterion number of marks, if the other team surpassed them. However, when working as a unit, exceeding the criterion number of marks meant instant defeat and concomitant rise in disruptive behavior.

Evaluating the effect of varying the number of marks allowed to win the game provided interesting results. When the number of marks needed varied between four and eight, the behavior also varied. When required to have no more than four marks, the student's disruptive behavior was lower than when required to have no more than eight marks. This piece of information seems to indicate that the group as a whole worked to achieve the criterion, but no more than the stated criterion, in order to reach the desired
The overall study shows the effectiveness of using a significant reward and an appropriately determined criterion level of student performance in order to control student behavior in a classroom.

Several investigators have used free time as a reinforcer for group-oriented contingencies, attempting to increase academic performance. In one such study, Wilson and Williams (1973) designed a behavior management strategy for decreasing disruptive behavior and increasing academic productivity. The students were 100 first graders in an open classroom with four teachers. They were divided into four groups according to ability. The reinforcement procedure was introduced into the language arts program. The task was copying from the board a group of sentences which changed daily. The task was differentiated according to ability level.

After baseline data were gathered, students were instructed that if they completed the work on the board with no more than six errors in 20 minutes the whole group would get five minutes of free time. Further, if no one misbehaved (rules of behavior were specifically stated) the group would get an additional five minutes. For each misbehavior, one minute would be lost. If the group misbehaved or didn't finish on time no free time was given and they would go on to the next task.
The design included two weeks each for treatment, reversal, and treatment phases. Four students were designated as having the worst behavior problems. They were selected to be observed systematically in order to determine the effectiveness of the program.

Results showed that appropriate behavior increased during both treatment phases and decreased below baseline during reversal. Work completion data showed an increase of 24% during the first treatment phase over baseline, a decrease of 17% during reversal and an increase of 37% (over baseline) in the second treatment stage.

Although no specific data was gathered for the entire group, the teachers reported that most of the groups were earning eight to ten minutes of free time every morning. They felt that the free time activities were the variable that changed the behavior. Consequently, when the study was concluded the teachers arranged the entire morning activities around the group contingency system.

Andrews (1971) used free time as a reinforcer with nine junior high school students attending summer school for remedial mathematics. They were told that they could earn free time by maintaining specifically listed on-task behavior. When an unacceptable behavior was emitted, (these were also specifically stated), a buzzer would sound and the clock recording earned free time was stopped. The experimenter was primarily interested in discovering the
percentage of time students were engaged in task relevant activities. His secondary interest was in the relative amount of academic production completed while the students were emitting task relevant behavior, and the reactions of the students to appropriate or inappropriate behavior emitted by peers.

Although free time was the major reinforcer, teacher attention to appropriate behavior was used during designated periods. She was instructed, during specific periods to ignore, or ignore and praise, certain types of behavior.

Because of the variety of remediation activities available daily, individual, academic performance was difficult to evaluate. The teacher made a daily subjective judgement of the percentage of group quantitative output. A mean academic output for the group was established during baseline. There were five phases in the experimental design: (1) baseline, (2) introduction of group contingencies, (3) group and teacher reward contingencies, (4) withdrawal of group contingencies maintaining teacher reward, and (5) withdrawal of teacher reward and reintroduction of group contingencies.

Analysis of group data showed a mean increase in task relevant behavior of 23% over baseline when group contingent free time was introduced, and a mean decrease in non-task relevant behaviors of 63%. Addition of teacher attention appeared to have little effect. When free time was
withdrawn and teacher attention was maintained, task relevant behavior increased substantially. Reintroduction of group contingent free time and withdrawal of teacher attention resulted in a noticeable increase in task relevant behavior and decrease in the non task relevant category.

Analysis of academic performance from the teacher's quantitative estimates showed no difference between baseline and introduction of the two phases of contingencies of reinforcement. However, withdrawal of contingent free time was met with a substantial decrease in academic production and reinstatement of this contingency was followed by a higher level of productivity than during any other phase of the experiment.

Task relevant behavior, analyzed statistically, gave indications that contingent free time was the variable responsible for increasing this behavior.

From this study more inferences can be made about the positive effect of the use of free time upon task relevant behaviors for a group than upon academic achievement. Although there is some evidence for a relationship between the withdrawal/reinstatement of free time and decrease/increase in academic productivity.

The usefulness of group oriented contingencies for improving academic performance was recently explored by Baer and Richards (1980). Subjects were ten students of average intelligence. Five of the students were not
performing up to the teacher's expectations in reading and math, and were designated as target students. They ranged in age from 11 to 15 years, grades fifth through eighth. Nine out of ten of the students and all five target students chose additional recess time as a preferred reward for doing better work. The academic tasks chosen for monitoring were arithmetic, English, spelling and vocabulary.

After baseline data was gathered, the students were provided with a contract specifying that one minute of extra recess time would be awarded to everyone for each one point improvement of the weekly class mean over the baseline period. For example, if the class improved four points during the first week of intervention, they received four minutes of extra recess time per day for the next week. Below baseline performance did not result in any loss of recess time. Individual grades were posted on the blackboard without names and a weekly progress chart was maintained.

The experiment consisted of six weeks of baseline, four weeks of intervention, seven weeks of return to baseline, and a final four weeks of intervention. During the second intervention phase, extra recess time was awarded on a daily, rather than a weekly basis, so that rewards would be more immediate.
Analysis of the data for the individual students reveals that all ten students performed better in arithmetic during intervention than baseline conditions. In English, all five target students performed better during the first intervention and four out of five improved over baseline during the second intervention. Although non-target students had a high level of performance before the experiment was undertaken, some improvement in their English performance was noted in three out of the five cases.

These five studies examine the use of reinforcement applied to groups as a whole for the purpose of changing behavior. They sample a wide range of ages, ability levels, and social behaviors. Results of all of the studies indicate that despite the differences in populations, applying consequences to a group in each case cited, effectively increased the target behaviors. In all of these studies the consequence was some form of free time activity.

Since individual reinforcement procedures are generally used, and it appears that group reinforcement can be effectively used, the question arises if either individual or group reinforcement is more effective for changing behavior.
Comparison of Individual and Group-Oriented Contingencies of Reinforcement

Both individual and group reinforcement procedures were used by Lovitt, Guppy and Blatner (1969) in an attempt to demonstrate that a single classroom teacher can administer a contingency system with groups of children. The purpose was to increase academic performance in spelling. Thirty two fourth grade students of average or above average intelligence participated in this experiment. The children were from middle or upper middle class homes. The investigation was carried out in three phases. During phase one (11 weeks) a spelling lesson was introduced each Monday, using the regular textbook, requiring the students to read a story, then to say and write the new words. On Wednesday a trial test was given, on Thursday another lesson over the words was given and on Friday the final test was given. Grades were recorded in terms of percentage correct for Friday's scores.

During the second phase of the experiment, (10 weeks), the procedures were the same on Monday, followed by the children being assigned the lessons for the remainder of the week, with no specific time allotted for completion of the work. Final tests were given Tuesday, Wednesday, Thursday, and Friday and the children were told that when
they received 100% there was no requirement to take the test the following day; the time could be spent reading a library book or some other school related activity.

Those students who didn't receive a perfect score on Tuesday had their corrected papers returned to them 15 minutes before Wednesday's test.

Phase three consisted of the same conditions as phase two with the addition that a group contingency was added. During this three week period, and any day that the entire class received 100%, the total class was allowed to listen to the radio for 15 minutes.

As a result of applying the experimental conditions in phase two, achievement increased significantly. Additionally, there was a significant increase in the third phase over the second, even though the criterion was never met and the radio listening reward was never given.

The study illustrates that both individual and group reinforcement were effective. Although the group reinforcer made the most significant gains, the two conditions can't be compared for effectiveness because of extraneous variables such as difference in time between phases and the relative weight of the reinforcers.

A comparison of the relative effects of group versus individual contingent free time on disruptive behavior was undertaken by Long and Williams (1973). Their investigation was carried out with eight black students in a seventh
grade classroom in an inner city junior high school. The target students were selected because of their disruptive behavior. Further, the students in this class were grouped together because of poor achievement.

The experimental procedures called for elements of both reversal and multiple baseline designs. Data were recorded in math and geography classes for seven and eight phases respectively. Each phase lasted ten days.

Phase one consisted of accumulating baseline data from both classes. Following this period, structured lessons were introduced in math, and baseline was continued in geography for phase two. At the beginning of structuring the lesson, expected classroom conduct was defined.

Phase three added group contingent free time to the structured math lessons, while structured lessons were introduced in geography. Math students were told that obeying the rules would result in earning 18 minutes of free time at the end of each day. It was explained that each time a rule was violated, signified by flipping down one of 18 cards in rotary file on the desk, the class would have one less minute of free time.

During phase four the math class returned to structured lessons and contingent free time was added to the structured lessons in geography.
Phase five withdrew the group consequences from the geography class and introduced individually contingent free time to the math class. During this condition free time was earned by a point system in which students had to earn 12 of 16 points in order to receive free time. The number of points earned for each behavior was explained to the students. As in the group contingent setting, students under individual reinforcement conditions lost points for inappropriate behavior.

During phase six, individually contingent free time was implemented in the geography class while the math class was returned to structured class activities.

Phase seven returned the math class to the point system, with no contingent free time, and the geography class to the structured lessons. Phase eight introduced the point system without free time to the geography class.

The outcome of the study disclosed a substantial increase in appropriate behavior during both individual and group contingent free time when compared to baseline. Withdrawal of contingent free time consistently saw a return to baseline performance. When points were given without free time, behavior was improved over baseline but to a lesser degree than when free time was used as a reinforcer.

Comparing the group with the individual procedure indicates that the differences were minimal with the group approach maintaining slightly higher levels of appropriate
behavior. The authors feel that a definite advantage of the group over individual was that fewer demands were made on the teacher's time. They also point out that the differences between group and individual contingencies may have been a function of variation in procedures (p. 471).

Contingent free time is again demonstrated to be a valuable reinforcer. However, it would be erroneous to conclude from this study that either the group or the individual reinforcement procedure is more effective than the other.

McNamara (1971) compared the use of no reinforcement, group reinforcement and individual reinforcement on the time required by students to pick up their folders after they entered the classroom.

The study was conducted in three different class periods a day with boys who were attending a school for junior high school boys with behavior problems. The students were functioning several grade levels below age expectation. Mean intelligence test scores for the group were approximately 88. The class was functioning on a reward system in which students earned points for appropriate behavior and exchanged them for certain privileges.

The experiment was undertaken in an attempt to increase the percentage of students in each class who obtained their folders within three minutes of a verbal prompt by the teacher.
Baseline data was recorded to determine the percentage of students who were retrieving their folders within three minutes of the teacher's verbal prompt. Student behavior during baseline was very inconsistent.

For the first phase all three classes were told that they should get their folders within a certain time period. The time remaining was mentioned every minute until the three minutes were up, whereupon the teacher gave the folders to those who had not received them.

During the next phase, the first period class continued as in the previous phase. The second period class received the same instructions and additionally, everyone received three extra points if the entire class had their folders within the three minute time period. Period three received the same instructions except that those persons who obtained their folders in three minutes received three bonus points, others did not.

This phase was followed by a return to baseline.

Results indicated that all three experimental conditions increased the desired behavior, with no substantial differences between them. Also, a return to baseline conditions did not result in a decrease in the behavior.

One study that does find differences between the two types of contingencies was designed by Ulman and Sulzer-Azaroff (1975). Using six retarded adults in a special education classroom, the investigators alternated the three
experimental conditions daily. Under the individual reinforcement condition the students earned money based on the number of arithmetic problems they answered correctly. Under the group contingency procedure the students earned money in the same manner, but the earnings were pooled and evenly divided among the students. When the no reinforcement condition was applied, the academic assignment was the same, but no money was earned.

The results of the study appear to be clear cut with the greatest number of problems correctly completed occurring under individual reinforcement conditions, and the fewest number when no reinforcement was given.

Kazdin and Geesey (1977) found the opposite to be true when investigating working for self versus working for peers. The subjects for their study were two boys, ages nine and seven, in a class of educable mentally retarded children. The students were offered tokens to be exchanged for back up reinforcers. Some days the tokens could be exchanged for reinforcers for the subject and some days they could be exchanged for reinforcers that the entire class could share. The two methods of dispensing reinforcers were alternated on a daily basis after a baseline was established. Return to baseline followed the intervention. The authors refer to this design as a simultaneous treatment design. The resultant increase in attentive behavior for both boys when they worked for tokens
for the class rather than for themselves, is clear. However, both treatments increased attentive behavior significantly over baseline conditions.

These studies, comparing group with individual reinforcers, encompass a wide range of ages, intelligence levels and research designs. The first three studies cited do not define differences between the results of group and individual reinforcement procedures, but indicate that both treatments are equally effective.

In the last two studies, whether group or individual contingencies were applied did make a difference in the degree of behavior change, with Ulman-Sulzer Azaroff (1975) finding the individual reinforcement clearly the most effective in their experimental setting and Kazdin and Geesey (1977) finding that working for the group was most effective.

The implication of these studies appears to be that there are many variables that determine whether one type of reinforcement procedure is superior to the other. The existing research points to the necessity for investigating the specific population and problems of interest to determine their unique relationship to group or individual contingencies of reinforcement.
Barlow and Hays (1979) discuss a design that has been used to compare two different experimental conditions. The "basic feature of the design...is the first alternation of treatments or conditions, each associated with a distinct and discriminative stimulus" (p. 200).

Leitenberg (1973) suggests that this design is "based on discrimination learning principles, that is, if the same behavior is treated differently in the presence of different physical or social stimuli, it will exhibit different characteristics in the presence of these stimuli" (p. 93).

An example of alternating experimental conditions is found in the Ulman and Sulzer-Azaroff (1975) study, discussed in the last section. The investigators alternated daily between group, individual, and no reinforcement procedures. The no reinforcement condition acted as a baseline. Since it was interspersed with the other experimental conditions, no extended period of baseline or reversal was required and the experiment was completed in 27 days.

Kazdin and Geesey (1977), also discussed in the previous section, employed a similar design with the rapid alternation of two treatments, earning tokens for the group. A baseline phase of eight and nine days was implemented for each subject respectively. Treatments
were alternated for eight days. One child was exposed to an eight day reversal phase. In all, the experiment required 26 days to complete.

McCullough, Cornell, McDaniel and Mueller (1974) alternated treatments between morning and afternoon. One experimental condition (A) paired social reinforcement with specific behaviors categorized as "cooperative", ignoring uncooperative behavior. The alternate condition (B) paired social reinforcement with cooperative behavior but administered time out for uncooperative behavior. There was a baseline period of five days followed by two days of Treatment A, delivered in the morning, and Treatment B, delivered in the afternoon. For the next two days, Treatment B was switched to morning, and Treatment A, to afternoon. Within a nine day period the investigators were able to determine that Treatment B was significantly more effective than Treatment A. The teacher had a reasonable basis for continuing the more effective treatment.

Kazdin (1977) followed a similar procedure to compare two different schedules for administering praise on the attentive behavior of an eight year old, educable mentally retarded boy. During an eight day baseline period, attentive behavior, and praise for attentive behavior when preceded by inattention, were instituted for 19 days. The two experimental conditions were administered daily by two
reinforcing agents across two time periods. Each treatment was administered across each time period, and across each reinforcing agent, approximately an equal number of times. This phase was followed by implementation of the schedule that was found to be most effective, praise for attentive behavior when preceded by attentive behavior.

The use of this design permitted Kazdin to determine that the behavior immediately preceding a reinforced response influenced the extent of behavior change in that situation.

Another example of alternating treatment conditions is seen in Experiment III of O'Brian, Azrin and Henson (1969). The authors were attempting to determine the importance of the consistency with which suggestions of patients in a mental hospital were followed, relative to the number of suggestions made. Two administrative leaders were chosen to meet with the patients on alternative days for eight days. Leader A followed all suggestions made by the patients during his four days, while leader B followed none of the suggestions during his four days. This was followed by a second eight day period in which their roles were reversed. During a third eight day period, leader A followed 25% of the suggestions; and leader B followed 75%. During the final eight days a third administrator led the eight meetings but the original leaders made the decisions as in their first roles.
Although the conditions changed every eight days, each condition was alternated daily. By alternating the treatment it is possible to discern that the eight out of nine patients responded with suggestions in direct proportion to the percentage of suggestions accepted. That is, as the percentage accepted increased, the number of patient suggestions increased. Conversely, as the percentage accepted decreased, the number of patient responses decreased.

Doke and Risley (1972) used a rapid alternation of conditions to determine if preschool children participated differentially based upon the requirement to remain in an activity until the group was finished versus the ability to move individually to a new activity as each was completed. The two conditions were alternated daily, resulting in a substantial increase in participation on those days when individuals were permitted to move to a new task as the previous one was completed. The examples of research designs cited in this section demonstrate rapid alternation of treatments for the purpose of comparing their relative effectiveness. They illustrate success in identifying which, of several experimental conditions, produced the desired behaviors. In all but one of the studies baseline data was collected as the first experimental phase. However, Ulman and Sulzer-Azaroff incorporated baseline reversal procedures
into the treatment phase by alternating a no reinforcement condition with the treatments investigated.

Summary

This literature review focused on studies that utilize group contingencies of reinforcement, studies that compare the results of applying group and individual reinforcement techniques, and research designs that are appropriate for comparing two or more experimental conditions.

This investigation of group contingencies of reinforcement, with free time used as the reinforcer, produced evidence that the researchers were able to bring the target behavior under control. There was a wide range of differences between the subjects in the studies. For instance group contingent free time was used with first graders, fourth, fifth and sixth graders, and over age junior high school students. Some of the students were average to above average in ability and achievement, while others were low achievers. The one common element in the studies was that desirable behavior increased using group contingent reinforcement.

The literature available for comparing the results of applying group and individual reinforcement procedures provides no evidence that one method is preferred over
another. Rather, it points to the probability that there are so many variables involved in each situation, that dissimilar situations need to be investigated separately.

The literature regarding research methods that effectively compare two or more treatments is in agreement on the basic design. Rapid alternation of experimental conditions is the major component, with variations on the length of the study and the use of baseline and reversal features. In general the studies take less time to complete. In all of the studies examined, the researchers were able to determine differences between the treatments they were comparing.
Chapter III

Methods and Procedures

The method chosen to compare the effects of group reinforcement, individual reinforcement and no reinforcement on arithmetic performance of Navajo and Hopi students is similar to the multielement baseline design of Ulman and Sulzer-Azaroff (1975). The literature review indicated that this strategy of rapid alternation of treatments is effective in achieving results and efficient in use of time.

Two experiments were performed. They differ in the subjects involved, the timing of the reinforcement and the type of reinforcer used. The second experiment was implemented three weeks after the first to determine if placing the consequence closer in time to student response would alter the results of the experiment.
Subjects

Subjects were 22 students in a seventh grade math class at Tuba City Junior High School, in Tuba City, Arizona. The age range was from 12 to 14 years and the class was comprised of 13 Navajo, 5 Hopi, 1 Apache, 2 Anglo and 1 youngster of Anglo and Hopi parents. There were 5 girls and 17 boys in the class. The class met second period each day.

This group of students demonstrated a wide range of abilities and behaviors. During one class observation by the researcher the teacher taught a method of adding fractions. All students watched the teacher at the board. When the class was expected to answer questions in unison, one male spoke very loudly so that his voice was heard above the others, four males watched but said nothing, and the remainder of the students varied in the loudness and number of responses. When the students were given problems to do at their seats, one student finished in 10 minutes, three students required 25 minutes and the remainder finished between 10 and 25 minutes. All answers were correct on all papers except for the first student
finished, who missed one out of ten and one of the last three students who missed eight out of ten.

The teacher reported that the class was generally inconsistent, some days finishing their assignment and other days not finishing. In addition he pinpointed seven students with specific difficulties.

In the following description of the students, the grades referred to are for the grading period preceding the experiment and the days missed refer to the eight weeks preceding the experiment. The grading system uses numbers 1 to 4, with 1 denoting excellence and 4 denoting failure. Plusses and minuses indicate that the student is performing slightly above or slightly below the number assigned.

Student A is a Navajo male, 13 years, 3 months of age. His grade in the class was 4. He was absent 11 days. Two weeks prior to the experiment the student was suspended for a week for breaking a window out of a teacher's van.

Student B is a Navajo male, 14 years, 7 months of age. He has used crutches to walk until the last nine months and now sways from side to side as he walks. The teacher reported that he became angry and quit working when the teacher pointed out mistakes to him. His grade in the class was 3-. He missed one day of school.
Student C is a Hopi/Anglo male, 13 years, 9 months of age. The teacher reported that he talked to whomever sat near and "played around" after the assignment had been handed out. His grade was 3. He missed two days of school.

Student D is a Navajo male 13 years, 8 months of age. The teacher found that this student did not comprehend on the first explanation and needed individual help to complete his work. His grade was 3-. He missed two days of school.

Student E is a Navajo male, 12 years, 0 months of age, who missed school one or two times every week. His grade was 4. He missed ten days of school.

Student F is a Navajo male, 12 years, 7 months of age. He did not return homework assignments. His grade was 3-. He missed one day of school.

Student G is a Hopi male, 12 years, 8 months of age. The teacher felt that this student seemed to try but had trouble comprehending. His grade was 4-. He missed two days of school.
Setting

The research took place in one math classroom housed at the end of the hall in a temporary unit that has two other math classrooms, a nurses office and a girl's restroom to the left of the hall, and two special education resource rooms, a career education room and a boy's restroom to the right. The facility is a part of the Tuba City Junior High School in Tuba City, Arizona on the western edge of the Navajo reservation, 119.1 Km north of Flagstaff, Arizona. Students range in age from 11 to 16 and are seventh and eighth graders. They are transported from distances as far as 88.5 Km, requiring an hour bus ride, with the first pickup at 6:30 A.M. and the last drop off between 4:45 and 5 P.M.

The classroom used for research was 9.8m long and 8.99m wide. Students began class at 9:35 A.M. and were dismissed at 10:20 A.M. The students came into the classroom and were seated in assigned places facing a blackboard on the west side of the room. The teacher's desk was on the south side and the aide's desk was behind the students, on the east side of the room. Figure 1 is a line drawing of this classroom.
Instruction was given by the teacher at the blackboard. When the written assignment was given to the students the teacher walked around the classroom giving individual help as requested or as he felt it was needed. The teacher was a Hopi male, chairman of the math department and has been teaching math at the Tuba City Junior High School for seven years.

The teacher had an aide for three months prior to the experiment. The aide was dismissed a week before the experiment began.

**Definition of Behavior and Measurement Procedure**

The behavior studied was the mean number of math problems correctly completed each day by the class and the number correctly completed by the individually targeted students. There were ten math problems in each daily assignment. The first two weeks involved problems of addition, subtraction, multiplication and division of fractions. Figure 2 is an example of one day's math problems in addition of fractions.

During the last three weeks the students were given beginning geometry problems. Figures 3 and 4 are an example of one daily assignment in geometry.
Figure 1. Floor Plan of Experimental Setting, Math Classroom.
**ADDITION OF LIKE FRACTIONS**

**EXPRESS THE SUM IN LOWEST TERMS.**

a. \( \frac{2}{5} + \frac{1}{5} = \)

b. \( \frac{4}{9} + \frac{6}{9} = \)

c. \( \frac{3}{10} + \frac{9}{10} = \)

d. \( \frac{1}{7} + \frac{7}{7} = \)

e. \( \frac{4}{9} + \frac{2}{9} = \)

f. \( \frac{2}{15} + \frac{4}{15} = \)

g. \( \frac{6}{10} + \frac{6}{10} = \)

h. \( \frac{3}{9} + \frac{6}{9} = \)

i. \( \frac{7}{5} + \frac{4}{5} = \)

j. \( \frac{7}{8} + \frac{2}{8} = \)

Figure 2. Sample Problems of a Daily Arithmetic Assignment in Fractions
MEASURE THE ANGLES USING A PROTRACTOR.

1. 

2. 

3. 

4. 

5. 

Figure 3. A First Page of Sample Problems in a Daily Geometry Assignment.
Bisecting an Angle

Bisect each of the given angles. Be neat!

6. FIGURE 4 - A Second Page of Sample Problems in a Daily Geometry Assignment.
Measurement for individuals was by the total number of correct responses per day. Measurement for the class required summing the class scores and calculating the mean class score for each class, each day.

The measurement procedure consisted of grading papers, recording the number of correct responses in the teacher's grade book, summing the class total, computing the mean class score each day, and plotting on graphs the correct scores for the eight targeted students and the mean class scores.

The teacher graded the papers and recorded the scores across from the student's name under the appropriate date. The teacher added the scores for the day and placed the total two lines below the last student's name and in the appropriate date column. He then computed the mean class score for the day and entered it two lines below the total score. The mean class score was the sum of all student scores divided by the number of students present that day. Daily, the researcher plotted the correct scores on graphs prepared for each of the targeted students. On a separate graph, the researcher plotted the mean class score each day.

These procedures are discussed in more detail in the section: "Interobserver Agreement".
Materials

The blackboard and chalk were the materials used for presenting the lesson. The assignments handed to students included ten teacher-prepared problems similar to those used in the original instruction. Figure 2 is an example of a daily assignment sheet. Signs used in the classroom were made of poster board, 71cm by 56cm. On one sign was printed: "WORK FOR YOUR OWN POINTS TODAY", a second sign read: "WORK FOR THE GROUP'S POINTS TODAY", and the third read: "NO POINTS TODAY." Lettering was 7.62cm high.

Games available were: one set each of chess and checkers, Sorry (Parker Brothers), Stay Alive (Milton Bradley), Electronic Baseball (Entex Electronics), Merlin, The Electrical Wizard (Parker Brothers), a softball and bat, puzzle cube, and a puzzle.

Procedure

The treatment was applied in four session increments; one 40 minute period comprised a session. There were a total of 17 sessions. The experiment was planned through the last six weeks of school. However, there was a break the third week when all students were engaged in standardized testing rather than regular classroom activities.
A contingency of reinforcement was applied each day, Monday through Thursday. Friday was reserved for "reward day". Three different contingencies of reinforcement were randomly assigned by drawing the names from a hat. A complete explanation of this process follows in the section entitled "Random Selection of Contingencies of Reinforcement". The contingency of reinforcement for the day was announced by lettering on a white sheet of poster board standing on the chalk tray on the left side of the black board. White poster board, rather than colored, was used because colors have special meanings in the Navajo and Hopi cultures so that the use of varied colored signs might have added an unwanted variable.

**Individual Contingency of Reinforcement.** During this period, students received one point for each problem they correctly completed of the ten problems assigned each day. The criterion for achieving the reward was eight correct out of each set of ten problems. In other words, for the four day period, 80% accuracy in math computation was required to receive the reward. The poster board read: "WORK FOR YOUR OWN POINTS TODAY."

**Group Contingency of Reinforcement.** When group reinforcement was in operation, each student earned one point for each problem correctly computed. The total points for the individuals were added together, resulting in a total group score. The group score was divided by
the number of individuals participating that day to achieve an average group score. The average group score was the number of points earned by each student for that day and counted toward the 80% accuracy required to receive the reward. The poster board announcing this contingency read:
"WORK FOR POINTS FOR THE CLASS TODAY."

No Contingency of Reinforcement. During those sessions in which no reinforcers were given, students received a score for the number of problems computed accurately, but they received no points to be used toward the reward. The poster announcing this condition read: "NO POINTS TODAY."

Random Selection of Contingencies of Reinforcement. Prior to initiation of the experiment, a sequential schedule for presentation of the reinforcers was randomly determined. For this purpose the name of each reinforcement was written on a slip of paper and placed in a hat. The first name drawn was the reinforcer that would be presented twice during that increment, (there were three contingencies of reinforcement for four sessions). The name drawn was returned to the hat, along with its duplicate, so that there were then four slips of paper to draw from the hat. A 12.7cm X 17.78cm card was used to register the sequence of the drawing, i.e., the card had the days, Monday through Thursday written on it. The first name drawn was placed beside "Monday", the second name drawn was placed beside "Tuesday", etc. This method of
drawing names from a hat and assigning them to days on a card occurred seven times. The seven cards were then placed in a hat and drawn one at a time. On the first card drawn was written "week 1", on the second card drawn, "week 2", and so forth until the seven cards had the number of the week in which that card's sequence was to be used. The weekly scheduling information on the cards was transferred to a standard size 20.32cm X 27.94cm paper, in sequence from week one to week seven, and duplicated with a copy for the teacher and the experimenter. The teacher was instructed to keep his copies out of sight so that students would not know the schedule in advance.

Pre-Experimental Instructions. The first reinforcement was presented on a Monday. On the Wednesday directly preceding that Monday, the teacher received instructions from the researcher. This instructional period was scheduled at the teacher's convenience, during the regularly scheduled "prep" period. Time allotted was 45 minutes. At this time the researcher read the script that would be used by the teacher, demonstrating the position of the posters. She also gave a copy of the schedule of reinforcement to the teacher and read to him the section of the proposed experiment entitled, "Interobserver Agreement". This instructional period was in addition to informal meetings between the teacher and researcher in which this experiment was discussed.
At the beginning of the class period on Thursday and Friday of that week the teacher read the following script to the class:

Beginning Monday of next week you will be doing something a little different in class. You will have the same type of assignments, but you will be allowed to work for points some days. Those who get enough points will be permitted to spend Friday's math class playing one of the games on the bottom shelf, or going outside for a game of softball, weather permitting. If you do not earn enough points, you will work with me in the classroom to complete an additional work sheet of problems that are similar to those presented during the week. Here's how you can earn points. Every day except Friday, when you come in to the class you'll see a sign propped up against the board like this (teacher places a blank white sheet of poster board against the far left side of the black board). This sign will be different on different days so be sure you read it. Some days it will say: "work for your own points today" (teacher places individual reinforcement sign against the board). On those days you will receive the same number of points as problems you get right, so, if you get
seven problems right you'll receive seven points. You will get your points as soon as you come to class the following day. They will be written at the top of your paper and your paper will be on my desk.

On other days you'll find a sign that reads: "work for the group's points today" (teacher places group reinforcement sign against the blackboard). This means that the number of problems you get right will be added to everyone else's and divided by the total number of students present that day. This will give an average class score. It will be circled at the top of your paper. Beside it will be your individual score. The group score for that day will be the number of points that each person gets. Obviously, if some people don't do anything, or make many mistakes, the points for the group will be lower than if everyone scores high.

Some days you'll find an even different sign: "no points today" (the teacher places the no reinforcement sign against the chalkboard). This means that you will do your work as usual but there will be no points earned.

Each day, after you have seen your previous day's score, you will return that paper to the
teacher. When you come into class on Friday the number of points needed to qualify for "game time" will be written on the board. On your paper your total score for the week will be in a box in the upper right hand corner, like this: (teacher shows a sample class paper with a number in a box). If your total score is the same as, or higher than the one on the board, then you know that you have qualified for "game time". Those who do not qualify will meet with me in the row of seats in the front of the room.

If any one does not want to be a part of this program please give me your name before Monday. It is not a requirement but an opportunity to gain a reward for your work. Your grades will in no way be affected by your decision to participate or not to participate.

This script was used on Thursday and Friday to increase the student's understanding of the reinforcement program and to reach those that were absent at the first reading.

Appendix I is a copy of a script which was translated into Navajo and read at the regular chapter meeting by the school-community liason person. These persons go to all of the communities which are served by the Tuba City Public Schools to explain their children's educational
programs.

**Rewards.** The games listed in the materials section were selected as rewards because they were available to the school. The outside activity of playing softball was included so that the range of rewards might appeal to all students.

The criterion for achieving the reward was an average point count of eight of ten correct per day. Therefore, if working for points was assigned two days a week, the total number of points required was sixteen (of a possible twenty). If a reinforcement was presented three times, the total points required was twenty four (of a possible thirty two).

**Experiment II**

**Subjects**

Subjects for the second experiment were 15 students in a seventh grade math class at Tuba City Junior High School. This class met fifth period every day with the same teacher and in the same room as students in the first experiment. The age range of the students was from 12 to 14 years and included 12 Navajo, 1 Anglo, and 2 Hopi students. Nine of the students were male and six were female.
Setting

The research took place in the same room as the first experiment. There were no changes in the configuration of the room. Students began class at 12:55 P.M. and were dismissed at 1:40 P.M.

The teacher conducted the class in the same manner as the first experiment.

Definition of Behavior and Measurement Procedure

The behavior studies was the mean number of math problems correctly completed each day by the class. The problems were identical to the geometry problems in the first experiment, exemplified in Figures 3 and 4. The calculation of the class mean each day was also the same.

Materials

As in experiment number one, the blackboard and chalk were the materials used for presenting the lesson. There were ten teacher prepared problems in each assignment. Figures 3 and 4 are examples of a daily assignment sheet.

The signs used in the first experiment were also used in the second experiment.
Individually wrapped pieces of sugarless candy were used as rewards. They were multiflavored, multicolored hard candies.

**Procedure**

Experiment II was initiated three weeks after the first experiment. The treatment was applied in three session increments for a total of twelve sessions. A contingency of reinforcement was applied each day of the week. The three different contingencies were randomly assigned by drawing the names from a hat. This is further explained in the section entitled: "Random Selection of Contingencies of Reinforcement".

The contingency of reinforcement for the day was announced by lettering on a white sheet of poster board placed on the chalk tray on the left side of the blackboard.

**Individual Contingency of Reinforcement.** During this period each student received one point for each problem correctly completed of the ten problems assigned each day. For every two points earned the student received one piece of sugarless candy at the beginning of the class period the following day. The candy was placed in a sandwich bag and stapled to the scored arithmetic paper.
Group Contingency of Reinforcement. When group reinforcement was operational each student earned one point for each problem correctly computed. The total individual scores were divided by the number of students present to find the daily average for the class. One piece of sugarless candy was awarded to every student for every two points earned by the class. If the class average was eight problems correct, all students received four pieces of candy stapled to their paper the following day.

No Contingency of Reinforcement. During the sessions in which no reinforcers were given, students received scores on their papers, papers were returned the following day, but there was no candy.

Random Selection of Contingencies of Reinforcement. A sequential schedule for presentation of the reinforcers was prepared for the second experiment in the following manner: the name of each reinforcer was written on a slip of paper and placed in a hat. The names were drawn one at a time and placed in the order they were drawn, on a 12.7cm X 17.78cm card. The four cards were then drawn from the hat. The information on the cards, in the sequence drawn, was transferred to a standard size paper and duplicated, with a copy for the teacher and the experimenter. The teacher was again instructed to keep his copies out of sight so that students wouldn't know the schedule in advance.
Pre-Experimental Instruction. On Wednesday of the week preceding the introduction of the second experiment the experimenter met with the teacher to read through the script to be used with the class. On Thursday and Friday the teacher read the following script.

Beginning Monday of next week you will be doing something a little different in class. You will have the same type of assignments but you will be able to work for points on some days. There will be ten problems every day and on some days you will receive a point for every problem you correctly complete. For every two points earned you will find a piece of candy attached to your paper. Here's how it will work. Every day, when you come in to the class, you will see a sign propped up against the board like this (teacher places a blank white sheet of poster board against the far left side of the blackboard). This sign will be different on different days so be sure you read it. Some days it will say: "work for your own points today", (teacher places individual reinforcement sign against the board). On those days you will receive one point for each problem you get right and for every two points you will receive one piece of candy. For example, if you get eight problems correct you'll get eight
points and four pieces of candy. If you get seven problems right you'll get seven points and three pieces of candy.

On other days you'll find a sign that reads: "work for the group's points today" (teacher places group reinforcement sign against the blackboard). This means that the number of problems you get right will be added to everyone else's and divided by the total number of students present that day. This will give an average class score. On these days everyone in the class will receive the same amount of candy, based on the number of points the class as a whole earned. So, you may get ten problems correct but if the average class score is only six correct then everyone, including the person with ten correct, will receive six points and three pieces of candy.

Some days you'll find an even different sign: "no points today" (teacher places the no reinforcement sign against the chalk board). This means that you will do your work as usual but there will be no points earned.

Every day when you come to class you'll find the paper that you completed the day before on my desk. The number of points earned,
either by you or by the class, will be written on the paper. The candy will be attached to your paper.

If anyone does not want to take part in this program you can tell me at any time. Your grade in this class will not be affected by whether or not you participate in this program.

**Interobserver Agreement**

Interobserver agreement checks were provided for both the dependent and the independent variable in both experiments.

**Dependent Variable.** To insure that the student's papers were graded correctly the following procedure took place: the teacher graded the paper, during the day, using a teacher made key. The teacher transferred the grades to the grade book and computed the mean class score for the day. The researcher collected the papers after school and regraded them, using the teacher's key. She then compared her grade with that recorded in the grade book. When there was agreement, she recorded the number right and the number of points at the top center of the paper. When there was disagreement the paper was discussed the next morning with the teacher and regraded by each. When agreement was reached, the number right and the number of
points was written at the top center of the page. One hundred percent accuracy was necessary because of the small numbers used.

In the case of those students receiving candy, the candy was attached to the papers after one hundred percent agreement was reached.

Each day when one hundred percent accuracy was confirmed, the data points were plotted on the appropriate graphs. For experiment number one, Thursday's papers were graded and regraded as explained and, in addition, the teacher totaled the number of points for the week, placing this total in the upper right hand corner of each paper. He also totaled the number of group points for the week. If the group totals agreed with that taken from the group graph, and the individual totals agreed with the researcher's data from the individual graphs, she put a box around the number at the upper right hand corner of each page. If there was disagreement, she and the teacher checked the papers turned back to the teacher against the score in the grade book and the data point plotted (if any) to determine the accurate figure. In this manner, one hundred percent accuracy was maintained for total week point count for the groups and individuals.

Independent Variable. The independent variable involves the system of specifying the contingencies of reinforcement and delivering the reward.
As mentioned previously, a copy of the schedule for presenting the contingencies of reinforcement was held by the teacher and the researcher. It was suggested that each day the teacher look at his schedule to check that the proper sign was placed on the chalk board that day. The researcher checked in the classroom one day before each increment, before the tardy bell, to verify that the reinforcement appearing on her schedule was indeed being presented. The day of the week was chosen randomly by drawing the name of a week day, Monday through Thursday, from a hat, for the first experiment and drawing one day out of every three for the second experiment.

While checking the reinforcement schedule the researcher remained in the room to ascertain that students were receiving their papers with the previous day's points, and candy, in the case of the fifth period class, at the beginning of the period. In addition, for the second period class, the first Friday that rewards were given, and one Friday randomly selected from every succeeding four, the researcher entered the room at the beginning of the period to ascertain that the qualifying number of points was correctly written on the board and that the rewards were given as explained under the section that explains procedures.
Two approaches were used to analyze the results of this study. First, mean group data from the first and second experiments, and individual data from the targeted students, were plotted for each contingency of reinforcement. Second, the data were subjected to regression analysis. Regression lines were drawn to illustrate the trends in the behavior under the three different contingencies of reinforcement.

To establish regression lines data pairs were entered into the computer for $x$, the session number, and $y$, the session score. The number for the slope and for the $y$ intercept, provided by the regression analysis program, were then used in the equation for a straight line, $y = mx + b$, where $m$ is the slope and $b$ is the $y$ intercept. The second point for each line was located by solving the equation $y = mx + b$, substituting a value of 10 for $x$.

In Experiment I, Figures 5 through 12, a break of one week occurred between session seven and eight, shown as a double vertical line. Missing data points, on
the individual student graphs, signifies the student's absence during that session.

**Group Data: Experiment I**

The data points for the class, of the mean number of problems correctly completed, are shown in Figure 5. There is no clear indication that one treatment is superior to another, however, the number of problems correct for individual reinforcement increases and remains greater than the other two treatments. The mean performance of the group is also highest under the individual contingency condition ($\bar{X} = 7.49$). This corresponds to the slope of the regression line seen in Figure 6, showing an increasing trend in the data under the individual reinforcement contingency. Mean group performance for the group reinforcement contingency ($\bar{X} = 7.0$) and for no reinforcement contingency ($\bar{X} = 6.67$) indicates the no reinforcement contingency to be slightly less effective than group. However, trends in the data suggest only slight decline in the no reinforcement contingency with a marked decrease under the group reinforcement condition.
Figure 5. Mean group arithmetic scores for students in Experiment I.
Figure 6. Regression lines computed from mean group scores in Experiment I.
Individual Data: Experiment I

Student A. Data for Student A are displayed in Figures 7 and 8. Mean number of problems solved by this student is greatest under the no reinforcement condition ($\bar{X} = 8.2$), less under the group reinforcement condition ($\bar{X} = 7.4$), and lowest under the individual reinforcement condition ($\bar{X} = 6.2$). However, decreasing trends in the data (Figure 8) are shown for both the group and no reinforcement conditions while an increasing trend appears for the individual contingency of reinforcement.

The student was absent the second week of the experiment.

Student B. Figures 9 and 10 graph the data for this student. Decreasing trends, seen in Figure 10, for all contingencies of reinforcement are suggested by the data, with the greatest decrease in the group contingency of reinforcement and the least in the no reinforcement condition. Figure 9 shows that the student's mean performance is highest under the no reinforcement condition ($\bar{X} = 7.5$), while the means for the individual and group contingencies are similar to each other (individual $\bar{X} = 6.73$; group $\bar{X} = 6.76$).

Student C. The data in Figure 12 suggests increasing trends in performance of Student C for the group reinforcement condition, while both individual and no reinforcement
Figure 7. Daily arithmetic scores for Student A.
Figure 8. Regression lines computed from daily arithmetic scores for Student A.
<table>
<thead>
<tr>
<th>Problem Correct</th>
<th>Individual Contingency</th>
<th>Group Contingency</th>
<th>No Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>( \bar{X} = 6.75 )</td>
<td>( \bar{X} = 6.76 )</td>
<td>( \bar{X} = 7.50 )</td>
</tr>
<tr>
<td></td>
<td>S.D. = 1.9937</td>
<td>S.D. = 2.8635</td>
<td>S.D. = 1.7320</td>
</tr>
</tbody>
</table>

Figure 9. Daily arithmetic scores for Student B.
Figure 10. Regression lines computed from daily arithmetic scores for Student B.
Figure 11. Daily arithmetic scores for Student C.
Figure 12. Regression lines computed from daily arithmetic scores for Student C.
conditions indicate decreasing trends. The mean number of problems correct, (Figure 11), is greatest under the individual reinforcement condition ($\bar{X} = 8.17$). The mean for the no reinforcement contingency is closest ($\bar{X} = 7.8$) and the mean performance under the group reinforcement condition is the lowest ($\bar{X} = 7.0$).

**Student D.** Decreasing trends for group and no contingencies of reinforcement are displayed in Figure 14, with an increasing trend for the individual reinforcement condition. The decline for slopes for no reinforcement and individual reinforcement are markedly negative and positive, respectively.

Figure 13 shows that the mean number of problems correctly solved for the group and no reinforcement conditions are the same (group $\bar{X} = 4.0$; no $\bar{X} = 4.0$). Mean performance for individually contingent reinforcement is highest ($\bar{X} = 5.5$).

**Student E.** In Figure 16, increasing trends in the data for Student E are shown for both individual reinforcement and no reinforcement conditions. The trend remains constant for group reinforcement, indicating neither upward or downward directionality. The greatest increase is seen for the individual reinforcement condition. Figure 15 shows that the mean performance for this student is greater under the individual condition ($\bar{X} = 5.08$), while mean performance for both group and no contingent reinforcement is the same ($\bar{X} = 3.75$).
Figure 13. Daily arithmetic scores for Student D.
Figure 14. Regression lines computed from daily arithmetic scores for Student D.
Mean Number of Problems Correct

- Individual Contingency
  - $\bar{X} = 5.08$, S.D. = 3.8524
- Group Contingency
  - $\bar{X} = 3.75$, S.D. = 3.8622
- No Contingency
  - $\bar{X} = 3.75$, S.D. = 4.1129

Figure 15. Daily arithmetic scores for Student E.
Figure 16. Regression lines computed from daily arithmetic scores for Student E.
Figure 17. Daily arithmetic scores for Student F.
Figure 18. Regression lines computed from daily arithmetic scores for Student P.
Figure 19. Daily arithmetic scores for Student G.
Figure 20. Regression lines computed from daily arithmetic scores for Student G.


**Student F.** Data for Student F, recorded in Figure 18, suggests a slight increase in the trend of the individual and no contingencies of reinforcement with a decline in the data for the group reinforcement condition. Figure 17 shows the students' mean performance to be the same for the individual and group reinforcement conditions ($\bar{X} = 6.0$), and lower ($\bar{X} = 4.80$) for the no reinforcement contingency.

**Student G.** Increasing trends for all three contingencies of reinforcement are found in Figure 20. The greatest increase is seen in the regression for the no reinforcement condition. The individual reinforcement condition, displays a slightly smaller slope, and the no reinforcement condition has the smallest increase of the three. Figure 19 shows the mean performance of this student to be greatest for the no reinforcement condition ($\bar{X} = 5.6$). The individual condition resulted in a slightly lower mean number of problems correct ($\bar{X} = 5.2$). The group contingency of reinforcement yielded the lowest mean performance ($\bar{X} = 4.0$).

**Group Data: Experiment II**

Decreasing trends in the performance of the students for the no contingency and group contingency conditions are displayed in Figure 22. An increasing trend is seen in the individual reinforcement condition.
Figure 21. Mean group arithmetic scores for students in Experiment II.
Figure 22. Regression lines computed from mean group scores in Experiment II.
Figure 21 shows the mean number of problems correctly solved to be greatest under the no reinforcement contingency ($\bar{X} = 8.4$) and lowest under the group reinforcement contingency ($\bar{X} = 7.08$). The trends in the data suggested more consistent increasing performance with the individual contingency in effect.

**Regression Analysis**

Tables 1 and 2 show the increasing and decreasing trends found in the data. Table 1 displays the data for the seven targeted students in Experiment I. Table 2 refers to the data from the two classes for both experiments. Perusal of Table 1 suggests that for the seven students, preferences for the three contingencies of reinforcement are evenly distributed. Table 2 indicates a more clear-cut preference in both classes (based on group data) for the individual contingency of reinforcement over either group or no contingency of reinforcement.

Table 3 shows the mean number of problems correct under the three different contingent conditions for both experiments. An asterisk beside a number indicates that the mean related positively to the trend suggested by the regression analysis. In only seven out of 27 cases, the mean corresponds to the trend of the data.
Table 1
INCREASING (+) AND DECREASING (-) TRENDS IN STUDENT PERFORMANCE

<table>
<thead>
<tr>
<th>Targeted Students</th>
<th>Individually Contingent Reinforcement</th>
<th>Group Contingent Reinforcement</th>
<th>No Contingent Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>D</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>E</td>
<td>+</td>
<td>*</td>
<td>+</td>
</tr>
<tr>
<td>F</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>G</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Total Increasing Trends</strong></td>
<td>(+)5</td>
<td>(+)3</td>
<td>(+)3</td>
</tr>
<tr>
<td><strong>Total Decreasing Trends</strong></td>
<td>(-)2</td>
<td>(-)3</td>
<td>(-)4</td>
</tr>
</tbody>
</table>

* Slope = .0055
Table 2

INCREASING (+) AND DECREASING (-) TRENDS
IN CLASS PERFORMANCE FOR
EXPERIMENT I AND EXPERIMENT II

<table>
<thead>
<tr>
<th></th>
<th>Individually Contingent Reinforcement</th>
<th>Group Contingent Reinforcement</th>
<th>No Contingent Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class; Experiment I</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Class; Experiment II</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total Increasing Trends</td>
<td>(+)2</td>
<td>(+)0</td>
<td>(+)0</td>
</tr>
<tr>
<td>Total Decreasing Trends</td>
<td>(-)0</td>
<td>(-)2</td>
<td>(-)2</td>
</tr>
</tbody>
</table>
Table 3
MEAN NUMBER OF PROBLEMS CORRECT
UNDER VARYING CONTINGENT CONDITIONS

<table>
<thead>
<tr>
<th></th>
<th>Individually Contingent Reinforcement</th>
<th>Group Contingent Reinforcement</th>
<th>No Contingent Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experiment I;</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class Data:</td>
<td>7.49*</td>
<td>7.00</td>
<td>6.67</td>
</tr>
<tr>
<td>Student A:</td>
<td>6.20</td>
<td>7.40</td>
<td>8.20</td>
</tr>
<tr>
<td>Student B:</td>
<td>6.73</td>
<td>6.76</td>
<td>7.50</td>
</tr>
<tr>
<td>Student C:</td>
<td>8.71</td>
<td>7.00</td>
<td>7.80</td>
</tr>
<tr>
<td>Student D:</td>
<td>5.50*</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Student E:</td>
<td>5.08*</td>
<td>3.75</td>
<td>3.75</td>
</tr>
<tr>
<td>Student F:</td>
<td>6.00</td>
<td>6.00</td>
<td>4.80</td>
</tr>
<tr>
<td>Student G:</td>
<td>5.36*</td>
<td>4.00*</td>
<td>5.80*</td>
</tr>
<tr>
<td><strong>Experiment II;</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class Data:</td>
<td>7.75</td>
<td>7.07</td>
<td>8.40</td>
</tr>
</tbody>
</table>

* Those means that correspond to the trends suggested by the regression lines.
Interobserver Reliability

Dependent Variable. Tables 4 and 5 give the percentage of interobserver agreement, before and after correction of disagreements, for Experiment I and II respectively. The process for establishing interobserver reliability involved having the teacher and researcher grading all papers independently and comparing answers. The resultant percentage of agreement for each session is found in the first column. The second column indicates the number of agreements and the number of students present for each session. The third column gives the percentage of interobserver agreement after the questionable papers had been regraded. In Experiment I the mean percentage of agreement before papers were recorrected was 91.35%. For Experiment II, the mean percentage of agreement before the papers were recorrected was 92%. In both experiments 100% agreement was established before rewards were dispensed.

Independent Variable. It was necessary to determine if the specified contingencies were offered on the days scheduled, and if the students were receiving their points (or candy) at the beginning of the class period. The researcher visited the classes on a randomly selected schedule, one time per week for Experiment I and one session out of every three for Experiment II. The teacher consistently used the correct experimental condition and rewards
were consistently given at the correct time. This resulted in 100% agreement between the observers.
### Table 4

**INTEROBSERVER RELIABILITY SCORES**  
**EXPERIMENT I: DEPENDENT VARIABLE**

<table>
<thead>
<tr>
<th>Sessions</th>
<th>% Agreement of Scores</th>
<th>Raw Data</th>
<th>% Agreement After Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>84%</td>
<td>16/19</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>89%</td>
<td>16/18</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>94%</td>
<td>17/18</td>
<td>100%</td>
</tr>
<tr>
<td>4</td>
<td>94%</td>
<td>16/17</td>
<td>100%</td>
</tr>
<tr>
<td>5</td>
<td>89%</td>
<td>17/19</td>
<td>100%</td>
</tr>
<tr>
<td>6</td>
<td>94%</td>
<td>18/19</td>
<td>100%</td>
</tr>
<tr>
<td>7</td>
<td>80%</td>
<td>16/20</td>
<td>100%</td>
</tr>
<tr>
<td>8</td>
<td>95%</td>
<td>19/20</td>
<td>100%</td>
</tr>
<tr>
<td>9</td>
<td>95%</td>
<td>20/21</td>
<td>100%</td>
</tr>
<tr>
<td>10</td>
<td>70%</td>
<td>16/23</td>
<td>100%</td>
</tr>
<tr>
<td>11</td>
<td>100%</td>
<td>21/21</td>
<td>100%</td>
</tr>
<tr>
<td>12</td>
<td>100%</td>
<td>22/22</td>
<td>100%</td>
</tr>
<tr>
<td>13</td>
<td>100%</td>
<td>20/20</td>
<td>100%</td>
</tr>
<tr>
<td>14</td>
<td>89%</td>
<td>17/19</td>
<td>100%</td>
</tr>
<tr>
<td>15</td>
<td>100%</td>
<td>18/18</td>
<td>100%</td>
</tr>
<tr>
<td>16</td>
<td>95%</td>
<td>20/21</td>
<td>100%</td>
</tr>
<tr>
<td>17</td>
<td>85%</td>
<td>17/20</td>
<td>100%</td>
</tr>
</tbody>
</table>

Mean of total: 91.35%  18/19.7  100%
Table 5
INTEROBSERVER RELIABILITY SCORES
EXPERIMENT II: INDEPENDENT VARIABLE

<table>
<thead>
<tr>
<th>Sessions</th>
<th>% Agreement Of Scores</th>
<th>Raw Data</th>
<th>% Agreement After Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100%</td>
<td>9/9</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>100%</td>
<td>10/10</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>100%</td>
<td>9/9</td>
<td>100%</td>
</tr>
<tr>
<td>4</td>
<td>100%</td>
<td>8/8</td>
<td>100%</td>
</tr>
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<td>5</td>
<td>100%</td>
<td>6/6</td>
<td>100%</td>
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<td>100%</td>
<td>8/8</td>
<td>100%</td>
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<td>7</td>
<td>100%</td>
<td>10/10</td>
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<td>9</td>
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<td>10</td>
<td>78%</td>
<td>7/9</td>
<td>100%</td>
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<tr>
<td>11</td>
<td>71%</td>
<td>5/7</td>
<td>100%</td>
</tr>
<tr>
<td>12</td>
<td>100%</td>
<td>10/10</td>
<td>100%</td>
</tr>
</tbody>
</table>

Mean of Total: 92% 7.83/8.5 100%
Chapter V

Discussion

Some anthropologists, and others conversant with the ways of Native American peoples, suggest that the Navajo and Hopi are more group than individually oriented (Cooley, 1977; Lamphere, 1977; MacDonald, 1979; Navajo Tribe, 1973; Waters, 1963). Other anthropologists suggest that individual differences within a culture preclude the possibility of basing such a general assumption on dominant values (Kluckhohn & Strodtbeck, 1961).

The current study was undertaken in an attempt to discern whether group or individual reinforcers are effective motivators for present day Navajo and Hopi school children. The results will be discussed from several vantage points. The first section will deal with the relationship of the research findings to the research questions found in Chapter I. Discussion of limitations of the study will be found in the second section. The third section will focus on the implications of this study for the classroom teacher while section four will address the need for further research. The final section will summarize the study.
Research Questions

In answer to the first research question, "Are there differences in the group performance of two seventh grade math classes in response to individual reinforcement?" the trends seen in Figures 1 and 13 indicate that there are differences. The regression analysis showed an increasing trend, for each group's performance, when individual reinforcement conditions were presented, and a decreasing trend when no reinforcement and group reinforcement contingencies were in effect. These trends were not evident when the accumulated data was visually inspected nor were they substantiated by the mean number of problems that the students completed correctly under the alternating conditions (Table 3). Although summarizing trends in the data via regression lines does not constitute a statistical analysis in the strict sense, this procedure appears to satisfy the need for statistical analysis described by Kazdin (Herson & Barlow, 1977, pp. 270). He states that "...at the beginning of a research program, when the investigator is not familiar with the relative impact of different interventions, the statistical analysis will reveal reliable effects, although visual inspection is equivocal." He goes on to state that: "In cases where the results are ambiguous, statistical evaluation can assess whether the effects are reliable."

Regression analysis was chosen as the method for analyzing
the data since finding trends in the data was judged to be more valuable than products of other statistical measures.

The second question, "will seven students in one math class, identified by the teacher as low achievers, respond to the three contingencies of reinforcement by increasing, decreasing, or not changing their math performance?" was answered in a different manner. Individual regression lines for the seven students showed trends that differed from the group as a whole.

In the following discussion of individual students, there are references to a grading system where 1 denotes excellence and 4 denotes failure.

Student A is a Navajo male who was thirteen years three months when the investigation was initiated. He had a history of substance abuse and was suspended from school for breaking a window out of a teacher's van two weeks prior to the experiment. He was absent during the second week of the experiment due to a cousin's death and funeral. When he resumed the experiment, after a two week break, visual inspection shows that his performance improved under both group and individual reinforcement contingencies. In this case the regression analysis cannot be considered because of lack of data points for the no reinforcement condition during the first week, and the student's many absences over the entire experimental period. He was in attendance for only 10 of the 17
experimental sessions. This student never received the free time reward. Lack of attendance was a contributing factor. His grade in the class was 4, before and after the experiment.

Student B is a Navajo male, fourteen years, seven months of age at the onset of the investigation. He had previously used crutches to walk but due to hip surgery is now able to walk alone. However, he sways from side to side and occasionally falls on the playground. This student missed only two sessions while the experiment was in progress. Visual investigation suggests that the student performed much better during the first two weeks than during the last three. It is the opinion of the experimenter that Student B's generally poor motor control made it very difficult for him to succeed in using a protractor, a requirement for the last three weeks. Nevertheless, his grade preceding the experiment was a 4 and at the end of the experimental procedure his class grade was 3.

The regression analysis indicates there was decreasing performance under all experimental conditions. This is due to the poorer overall performance during the time that geometry was taught. However, the decrease was of a lesser magnitude when no reinforcement was offered, indicating that his performance was relatively better under the no contingency condition. The researcher, who was also the counselor at the school, had an opportunity to
get to know the student while the investigation was ongoing. One of the statements made by the student was that he had no friends. These feelings could account for a lack of motivation toward winning game time. Teacher attention may have been a more valuable reinforcer.

Student C is a Hopi/Anglo male, thirteen years, nine months of age when the experiment began. He was targeted for individual attention because the teacher felt that he was a capable student but more interested in playing around with other students. All of his teachers had referred him to the counselor because of consistent initiation of playful interactions with other students, constituting a disruption in the class.

Student C attended all of the experimental session. Furthermore, his grade was a 3- at the end of the grading period preceding the experiment and was raised to a 1 by the end of the experimental period. During the investigation the mean number of problems correctly completed was greatest under individual reinforcement conditions. Overall performance was not as high under group reinforcement, however, the regression analysis indicates a trend toward increasing performance during group reinforcement contingencies with a slight decrease in performance under no reinforcement conditions. Student C received game day every week that it was awarded.
Student D is a Navajo male, thirteen years, eight months of age at the onset of the experiment. His teacher felt that his low achievement was due to lack of comprehension. He missed two days of school during the grading period prior to the experiment and received a grade of 3-. He missed 3 days during the experimental period. At termination his grade was 3. He received the game day award two out of the five times that it was available. His mean performance was greatest under individual reinforcement. Group performance was substantially lower with a very slight decreasing trend. A prominent decreasing trend occurred under the no reinforcement condition.

Student E is a Navajo male, twelve years old when the experiment began. He missed ten days of school, during the six weeks preceding the experiment and had a grade of 4-. He missed four days during the six weeks in which the investigation was in progress and earned a grade of 4. The data suggests an increase in performance for both individual and no contingency of reinforcement during the segment in which geometry was studied. His teacher remarked that geometry appeared to be easier for him to comprehend. This may account for the increasing trend seen in two of the reinforcement conditions, but not for the static performance under group reinforcement conditions. The mean number of problems completed correctly was greater under individual reinforcement. The regression analysis also shows an
increasing trend for the individual reinforcement contingency.

Student F is a Navajo male, twelve years, seven months of age as the experiment began. He missed one day of school during the six weeks preceding the investigation and received a grade of 3-. During the six weeks in which the experiment occurred he missed one day of school and received a grade of 4. This student's results show evidence of a greater effect under individual reinforcement conditions than either group or no reinforcement contingencies. The mean number of problems correct was greatest for individual reinforcement and there is also an increase in the performance trend. Student F earned one game day out of the five possible.

Student G, a Hopi male, twelve years, eight months of age at the onset of the experiment, was targeted as a subject of investigation due to low achievement. His teacher felt that he was unable to comprehend the lessons. As in the case of Student E, the teacher believed that geometry was easier than fractions for this student. His performance improved when geometry was introduced. This accounts for the increasing trends indicated for all three contingencies of reinforcement. The greatest number of correct problems occurred during the no reinforcement condition, the greatest increase in the trend in performance is seen under the no reinforcement condition. Consequently,
it appears that the no reinforcement contingency was most effective for this student.

Student G missed two days of school during the preceding six weeks with a grade of 4-. He missed no days during experimental sessions and received a final grade of 4-.

The results of the data are clearly different for the two research questions. The group data indicates that individual reinforcement is more effective than group or no reinforcement for increasing math performance. However, when the performance of low achieving students was measured, individual differences were found in the data. The results of none of the seven individual studies conformed to the group data. Consequently, it may be concluded that for these seventh grade math classes, individual contingencies of reinforcement will more effectively increase math performance than will group reinforcement or no reinforcement. However, it will also be expected that individual differences among the students will result in a lack of effectiveness of any or all reinforcement techniques for certain persons in the group. That is to say there will always be those students who need to be studied individually, to determine appropriate reinforcers, because they do not fit the pattern of their group.

The overall data appears to refute the theory that cooperation is of a higher value than individual gain, at least for these seventh grade math students in Tuba City
Junior High School. It does, however, lend substance to the theory of Kluckhohn and Strodtbeck (1961), who contend that dominant cultural values are usually overstressed and the variant values ignored (p. 3).

Limitations

An apparent limitation of this study is lack of immediate reinforcement. Students in the first experiment waited until the end of each week to receive game day. The daily points awarded acted as more immediate rewards, however, the results may have been more decisive had it been possible to apply the more effective reinforcer each day.

In an attempt to place the consequence as close in time to completion of the assignment as possible, Experiment II was initiated. Instead of waiting until the end of the week for their reward, these students received candy the day following completion of their assignment. This may have caused a more difficult problem, discussed at length under the title of "contrast effects" (Ullman & Sulzer-Azaroff, 1975, pp. 388-389; Reynolds, 1968, pp. 45-46; Barlow & Hays, 1979, pp 204-205). Contrast refers to a condition in which the behavior changes in the opposite direction of that expected due to changes in the consequences of that behavior under different experimental conditions. The teacher provided some insight into the
situations as he observed the students in Experiment II.

The first contingency offered was group reinforcement. Therefore, on the second day of the experiment each student received a number of pieces of candy based on the previous days group performance. Several students voiced their displeasure that one student, who had no problems correct, received the same amount of candy as the other students. According to the teacher, the students were disgruntled. They were then told that they would work for individual points that day and the performance for that day decreased. The third day of the experiment, when students entered the class they each received a number of pieces of candy determined by their individual scores. The teacher reported that there was no negative feeling expressed about that procedure. Immediately after receiving the reward they were told that they would be working for no points that day, whereupon the class performance increased over the other two days. A similar pattern occurred for the following three sessions. During the next six sessions there was an abrupt change. Group performance increased under individual reinforcement and decreased under group and no reinforcement conditions. This pattern raises an interesting possibility: with the previous days reward occurring immediately before an assignment in which a different reinforcement condition was operational, the students may have been reacting to the
present reward instead of the prospective reward for which they were working. The change in performance after six sessions may signify a difference in their understanding of the cause and effect of the sequence of events.

A second limitation to the first experiment was the interruption of the study for one week between sessions seven and eight. The problem is one of lost data rather than a change in data due to a break in the study. A definite advantage to this design is that because all of the treatments were experienced each week, the data for each increment, in this case each four days, is capable of standing by itself, (Ulman & Sulzer-Azaroff, 1975, pp. 383).

A third limitation may be in the nature of the rewards. Game time appeared to be an appropriate reward. The teacher stated that students verbalized their enthusiasm for this activity. However, as discussed in the previous section, game time may not have been reinforcing for Student B, and perhaps there were others that went unnoticed, for whom game day was not an effective reinforcer.

Candy is a more questionable reinforcer for this age student. The teacher reported that the students in Experiment II showed no enthusiasm when the program was explained to them. Three girls, a Navajo, a Hopi and an Anglo, chose not to participate, saying that they did not like candy. Free time or game time may have been
of more value to this group.

**Implication for Teachers**

The major implication of this study for teachers of Navajo and Hopi junior high school students is that rewarding students individually for academic performance, with either free time or sugarless candy, does not oppose a culturally held value of these students. In fact, results of this study show that for the class as a unit, rewarding individual performance may be a more effective means of increasing academic behavior than rewarding group performance.

A second implication of this study is that while the group as a whole may increase academic performance under individual reinforcement conditions, there will probably be individual students for whom this is not effective. Consequently, if the teacher's goal is to increase the performance of specific students it would be necessary to first determine reinforcers and/or contingencies of reinforcement that work for them. This could be accomplished by comparing reinforcers or contingencies of reinforcement in an alternating treatment design for the class as a whole, measuring the performance of the students in question, until the desired trend in behavior is discerned. The effective program could then be applied consistently
to the class.

Although the study indicates that an increase in academic performance may accompany certain individual reinforcement conditions used in this experiment, it in no way approaches the question of using individual praise as a reinforcer.

**Future Research**

The results of this study indicated group trends toward increased math performance under individual contingencies of reinforcement and decreasing trends with group and no reinforcement conditions. The trends were established by regression analysis with no corroboration from visual inspection of the data. The study needs to be expanded in order to provide conclusive results. Previous discussion of limitations of the study suggest that further research should include circumstances in which the consequence will be applied immediately. This may be most easily accomplished in an elementary setting with self contained classrooms.

A second topic for research deals with the question of whether singling out students for praise is a reinforcer or a punisher. There are actually three questions here. Is praise a reinforcer when given privately, with no other persons around? Is praise a reinforcer when given
quietly, at a student's desk, with other children in the classroom? Is praise a reinforcer for a student if he/she is singled out in front of the class?

This investigator has worked with students in a counseling setting and finds that they respond to praise openly, with smiles, in this one on one situation. However, the same praise given in front of peers in a chance meeting in the corridor has caused students to turn their heads away. In one case a young Navajo male walked away as if he had not heard. There is a possibility that praise itself is a reinforcer but that the social situation in which it is given can nullify its effects. There is also the possibility that the student's reaction, dictated by shyness or social custom, makes it appear that praise is ineffective as a reinforcer, when in fact a positive reaction is occurring at an inner level which cannot be evaluated by the usual verbal or non verbal behavioral signs.

Answers to these questions will aide the educator in his/her ability to use appropriate reinforcers in educational setting.
Summary

The current study was undertaken because of the lack of information regarding conditions that are reinforcing for Native American school children. Most available studies are anthropological in nature and implicitly raise questions about the Anglo engineered educational setting and its appropriateness for Native American students. With the bulk of evidence indicating that Native Americans prefer to work for the group rather than themselves, this study was designed to investigate whether young people in school were more highly motivated when working for group goals or individual goals.

Subjects for the study were students in two seventh grade math classes in Tuba City Junior High School, Tuba City, Arizona. There were 22 students in the first class, ranging in age from 12 to 14 years. The class was comprised of 13 Navajo, 5 Hopi, 1 Apache, 1 Anglo/Hopi, and 2 Anglo students. There were 5 girls and 17 boys. From this class seven students were identified as underachievers. Group data was collected for the class and individual data was collected for the seven students.

The second class contained 15 students, ranging in age from 12 to 14 years, with 12 Navajo, 1 Anglo, and 2 Hopi students. Nine of the students were male and six were female. Group data was collected for the class.
A separate experiment was developed for each class to compare the effects of individual reinforcement, group reinforcement and no reinforcement on math performance of the subjects. The three reinforcement contingencies were alternated daily in a random sequence for both experiments. Students earned points for the number of problems correctly completed. Under individual reinforcement conditions each person earned one point for every problem correct. Under group reinforcement, the number of problems correct for the class was averaged. Each student received a number of points equal to the average correct problems for the group. Under the no reinforcement condition, students received no points.

In the first experiment the students collected their daily points for the first four days of the week. Those who received 80% or more of the possible points for the four day period were permitted to use Friday's math class for game day. Those who did not meet the criterion were given review lessons for that week's math assignments.

In the second experiment students received sugarless candy when their papers were returned to them. They received one piece of candy for each two problems correct under individual reinforcement conditions. When group reinforcement was in effect the number of problems correct for the class was averaged. Each student received one piece of candy for each two problems correct of the
class average. Under no contingency of reinforcement, no candy was received.

Individual and group data were subjected to regression analysis as well as visual inspection. The latter provided no indication of greater effectiveness for any one of the contingencies of reinforcement, for group or individual data.

The individual data for the seven targeted low achieving students showed no conformity with each other or with the group. Their performances varied so extensively that inferences could only be made on an individual basis.

Group data in both experiments suggested increasing performance trends under individual reinforcement procedures and decreasing performance trends under group and no contingencies of reinforcement.

The results suggest that while it may be true that Navajo and Hopi people value working for group goals above individual goals, two classes of seventh grade math students, attending public school on the western edge of the Navajo reservation, appear to be generally more highly motivated when working for individual rewards.


Kazdin, A.E. & Geesey, S. Simultaneous treatment design comparisons of the effects of earning reinforcers for one's peers versus for oneself. *Behavior Therapy,* 1977, 8, 682-693.


MacDonald, P. *Dine' (The people).* Arizona Highways, 1979, Aug, 2.


Appendix

Script For A School-Community Liaison Worker To Read In Navajo At The Chapter House Parent Education Meetings.
This script is to be translated into Navajo and read at all regular parent education chapter meetings, by the school-community liaison person.

The counselor at the junior high school wants to find out if there are ways to help your children to study and learn more. She is doing an experiment with one math class to see if students will work harder if rewarded for the work. She also wants to know if they will work harder for a personal reward or for a reward given to the whole group. She has arranged for them to receive points for the number of problems they do correctly. Some days they will be working for individual points, some days points for the whole class will be combined and there will be a group score, and some days they won't get any points. On Friday, those students who get a certain amount correct for the week will be able to have time for playing a game arranged by their math teacher, Mr. Chimerica. Their reward will be the time to play the game. In this program, the math problems aren't different than before. The only difference is that the students now have the possibility of
a reward.

After many weeks we will know if they get more math problems done correctly when they get a reward and if they do better when the whole group is being rewarded or when they are being awarded individually. The counselor hopes that this information will help other teachers to find a good way to encourage the students to do their best in their school work.

If you want to ask questions about this program, or voice your opinion, Mrs. Weekley will be glad to talk to you about it. Stop in her office the next time you are in town or call her at 4211.