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ABSTRACT

The report presented findings of an educational program utilizing systematically scheduled tangible reinforcement to improve the academic performance of underachieving American Indian children from extremely deprived backgrounds. Participants were 7th and 8th grade students in an all-Indian private school, St. Mary's Mission (Catholic), on the Colville Indian Reservation in Washington State. Data were collected from November 1969--May 1970. The 54 students were from economically deprived homes in which a majority of parents were separated by unemployment, emotional problems, serious drinking problems, divorce, or death. The results generally provided significant support for the effects of contingent tangible reinforcement on all the dependent variables. In addition, it was discovered that termination of the reinforcement after 14 weeks led to only minor reductions in academic performance and slight increases in classroom disturbances during the final post-experimental baseline period. Several possible interpretations for this resistance to extinction were offered. Finally, several findings on the relation of selected attitudes to performance variables were presented in tables. (FF)

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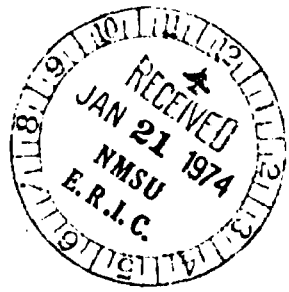

by

Bruce A. Chadwick and Robert C. Day

Introduction

The Problem

On every available education, economic and social index American Indians, as a group, experience greater deprivation and suffering than any other minority, including Mexican-American migrant workers and rural Blacks in the South (Johnson, 1969; Wahrhaftig, 1968; Sorkin, 1969; Steiner, 1968; Mindell, 1968; Striner, 1968; Morse, 1968; Lupe, 1968; Wilson, 1969; Payne, 1969). For many individual Indians the process of alienation emerges initially in the school situation. Measures of the relative performance and social adjustment of Indian students in elementary and secondary school settings provide clear indicators of the growing magnitude and pervasiveness of the problem as it emerges in the earliest years of contact with white institutions. In a large-national study of educational facilities and performance, James S. Coleman and associates (1966) discovered that Indian elementary and high school students' scores on tests of verbal skill, reading, general information and mathematics were substantially below those for whites at each grade level. A comparison of Indian and white children from the metropolitan Northeastern United States showed that in verbal ability, Indian children were 1.7 grades behind at the 6th grade level, 2.1 grades at the 9th grade, and 3.5 grades at the

12th grade (Coleman, et al., 1966, p. 274). The same pattern exists for other academic skills. At grade 12 the average Indian student is 3.2 grades behind in reading comprehension and 3.9 grade levels behind in mathematical performance (Coleman, et al., 1966, p. 275). Under-enrollment, (i.e., the proportion of school-aged persons not enrolled in school) is 10 percent higher among Indians than among whites, and the school dropout rate for Indians averages 50 percent, nationally, or double the rate for white students (Coleman, et al., 1966, p. 450). More recent data from a survey of schools in 12 western states came up with an overall dropout rate of 42 percent, compared to the national average for non-Indians of 26 percent (Selinger, 1968). There were significant differences among states, varying from 29 percent in Oregon, to 39 percent in Washington, to a high of 58 percent in South Dakota (Sellinger, 1968, p. 137). Finally, testimony before a senate subcommittee in 1968 reveals that for some of the tribes in western Washington the dropout rate approaches 100 percent (Lupe, 1968).

Numerous factors contributing to low educational performance of Indians have been suggested, ranging from the quality of physical school facilities, curricula, teacher training and salaries, to the wider environmental, and social factors operating in the peer group, family and community institutions. Psychological factors such as feelings of inadequacy and alienation, negative attitudes toward white controlled schools, and white teachers, basic language skills,

internalized norms and values concerning competition and achievement and negative self-conceptions have also been tested.

The broader community factors contributing to the problem are varied and complex. The whole reservation system and the related operation of the Bureau of Indian Affairs until recent years, has been designed and operated to maintain Indian dependency on federal agencies and its job-holders, thus preventing the growth of self-sustained, Indian-controlled educational institutions. Without going into the long history of reservation living conditions it is relevant to specify some of the consequences for Indians that often persist today. Unemployment and poor housing contributes to absenteeism due to lack of food, clothing, warmth and sanitation in the home, and resultant high disease rates. Children after a long bus trip to the school often are teased about their clothes and other differences, and then fall asleep at their desks due to lack of sleep and inadequate nourishment. White teachers often have little awareness of the distinctive attitudes or values operating in Indian homes relative to individual striving and competitiveness, future vocational aspirations, religious expressions and past experiences with whites. As a result the teacher may embarrass the child with regard to his achievement, stress inappropriate vocational goals and success models and strain the child's identification with his tribal group and parents through prejudiced, biased historical accounts of Indian relations with white settlers. Disapproval and insults from prejudiced

white students, teachers and principals in school, combined with similar treatment in stores, gas stations, police stations and by employers in the community, soon completes the picture of disapproval and rejection from white society and the youth drops out, not just from school but from many other institutional settings where past rejection has discouraged further participation. In the long run such a person tends to raise a family with similar coping patterns, leading to the same level of economic and social deprivation of the prior generation and the cycle continues.

Martin Deutsch (1967), Bereiter and Engelmann (1966), Weikart et al., (1964), Gray and Klaus (1965), Riessman (1962), Minuchin, et al., (1967), Allen (1970) and others have researched and summarized the work on the consequences of deprived home environments. Anxieties about simply surviving places demands on all the children in the family to aid in getting food, fuel and clothes. Close, crowded quarters and continual distractions combine with these survival demands to prevent any serious, stable involvement of children in the student role. Doing homework in the family environs is usually impossible. Such survival-oriented families tend to stress narrow values of traditionalism, pragmatism and even anti-intellectualism leading to negative attitudes toward school activities and subsequently limited development in verbal skills, self-expression, independence training and achievement motivation. Children living in such family environments, whether they are Indian, Mexican-Americans, blacks or whites, fail to acquire the appropriate motivation and the necessary behavioral repertoire to achieve the rewards in existing school systems and

the resultant success image (Webster, 1966). Additional problems arise for the children of Indian parents even if they overcome the above barriers and remain in the school room. Subtle teacher prejudice and discrimination may occur, but even more problematic in the classroom is the inadequacy of currently used reinforcers (i.e., teacher approval, marks on paper, grade slips, privileges, etc.) and the way they are scheduled. Traditional educational systems utilize a restricted range of reinforcers and schedule them ineffectively so that performance is far below potential.

The most frequently used reinforcers, teacher approval and grades, can produce substantial increases in learning activity if the child is attracted and adjusted to the teacher and education in general. But all too frequently the classes are too large or discipline problems arise to prevent such teacher reinforcers from being delivered in the systematic fashion required. Thus, as stated above, reinforcement for the correct response is applied in a way that minimizes or negates its effect. Often the delay between the reinforcer and the appropriate behavior is of sufficient length to radically diminish the influence of the reinforcement.

The problem of motivation is especially acute for the children of economically deprived Indian families whose previous experiences in the home and community has not prepared them to compete for reinforcement in a normal classroom situation. These children have not acquired the repertoire of social and behavioral skills needed to successfully achieve in school. Their attempts at relating to

white children and responding to teacher questions are frequently treated aversively, i.e., subtly ridiculed, rejected, teased, ignored, avoided, etc. This exposure to aversive stimuli from white students and nonsensitive teachers may result in the conditioning of generally negative feelings toward school and education. These negative feelings are then likely to increase "escape behavior" as manifest in increasing rates of truancy, daydreaming, inattention, and disruptive tactics. In other words, the frustrations experienced and the lack of general failure of effective reinforcement for appropriate academic activities leads the student to become motivated to spend his time and energy in nonscholastic activities that are more rewarding for him, such as skipping school, disrupting the class or psychologically withdrawing from participation in classroom activities. Generally, frustrations in classroom competition, combined with teacher insensitivities and aversive interaction with white peers, serve to develop negative attitudes toward education and alienation from the educational system, and result in poor classroom attendance and performance.

This report presents findings from an educational program utilizing systematically scheduled tangible reinforcement, to improve the academic performance of underachieving Indian children from extremely deprived backgrounds. Seventh and eighth grade students in an all-Indian private school, St. Mary's Mission (Catholic), on the Colville Indian Reservation in a rural section of the State of Washington, near the town of Omak, were participants. Data were collected from November, 1969 through May, 1970. All of the 54 students participating in the study

were from economically deprived homes in which a majority of parents were separated by the stresses of unemployment, emotional problems, serious drinking problems, divorce or death. Many were wards of the local court who preferred living in Mission dormitories to dwelling in white foster homes and attending Omak public schools.

Objectives of the Study.

The general objectives of the study were as follows:

1. To test the effects of programmed tangible reinforcement on the academic classroom performance of 54 underachieving seventh and eighth grade Indian children from economically deprived backgrounds. The following measures of academic performance were taken under baseline and experimental conditions: a) Work time (i.e., the percent of total class time actually spent working on six types of assignments); b) Rate of work completion (i.e., the number of workbook problems and exercises completed per hour); c) Accuracy of completed work (i.e., the percent of problems attempted that were done correctly).
2. To test the effectiveness of systematic tangible reinforcement for reducing and controlling the rate of disturbances in the classroom such as purposefully making noise and talking or gesturing to peers or the teacher in a disruptive way.
3. To assess the change in student attitudes toward the self, the school, the teacher and various academic activities as a consequence of participation in the programmed reinforcement system.

A REVIEW OF RELEVANT LITERATURE

The experimental analysis of human behavior using various forms of programmed reinforcement, initially concentrated on the responses of individual subjects in artificial laboratory settings (Flanagan, Goldiamond, and Azrin, 1958; Terrell, 1958, 1959; Bijou and Sturger, 1959; Kerr, Nyerson and Michael, 1965; Staats and Staats, 1963; Wolf, Risley and Mees, 1964). Within the last few years, however, token reinforcement systems have been utilized with increasing frequency on groups of individuals in "naturalistic" institutional settings. Useful, adaptive behaviors have been developed and maintained among chronic adult mental patients (Ayllon and Michael, 1959; Ayllon and Azrin, 1964; Ayllon and Azrin, 1965), disturbed children (Zimmerman and Zimmerman, 1962; Quay, Werry, McQueen, and Sprague, 1966; Lovaas, 1966; O'Leary and Becker, 1967; Kuypers, Becker, and O'Leary, 1968; Lovitt and Curtiss, 1969), school dropouts (Clark, Lachowicz and Wolf, 1968), and institutionalized juvenile delinquents (Meichenbaum, Bowers, and Ross, 1968; Tyler and Brown, 1968). Finally, tangible and social reinforcers have been applied on normal subjects, individually and in classroom groups of varied size, to mold and accelerate academic responses while lowering and controlling disruptive behaviors. Staats and Butterfield (1965) used tangible reinforcers in an after-school program to alter the working behavior of a 14-year-old Mexican-American male from an economically deprived background so that he passed all his courses for the first time while substantially reducing

his misbehavior in the regular classroom. Tangibles likewise were used by Whitlock and Bushell (1967) to more than double the reading responses of a six-year-old girl working alone outside the classroom.

Moving into the complexities of actual classrooms and shifting to social reinforcement, a number of studies have demonstrated the practical advantages of the behavior modification approach (Allen, Hart, Buell, Harris, and Wolf, 1964; Barrish, Saunders, and Wolf, 1969; Becker, Madsen, Arnold, and Thomas, 1967; Brown and Elliot, 1965; Bushell, Wrobel and Michaelis, 1968; Hall, Lund, and Jackson, 1968; Hall, Panyan, Rabon, and Broden, 1968; Harris, Johnston, Kelley, and Wolf, 1964; Harris, Wolf, and Baer, 1964; Madsen, Becker, and Thomas, 1968; Scott, Burton, and Yarrow, 1967; Sibley, Abbott, and Cooper, 1969; Thomas, Becker, and Armstrong, 1968; Ward and Baker, 1968; Wasik, Senn, Welch, and Cooper, 1969). Wasik, et al., (1969) substantially raised the arithmetic and reading performance of two black second-grade girls in a class of 20 students while reducing their misbehavior by systematic use of attention and social approval. Ward and Baker (1968) manipulated teacher attention to significantly drop the disruptive behaviors of four black first-grade boys, in a class of 12 students, from 74 percent disruptions to 57 percent ($p < .03$). Madsen, et al., (1968) tested the relative strength of rules, ignoring disruptions, and praise on two second-grade white students in a class of 29 students. They discovered that enforcement of rules and ignoring behavior had little effect while praise achieved significant control. Finally, Thomas, et al., (1968) studied the

effects of teacher disapproval as well as approving responses, on 10 well-behaved seven-year-old, middle-class children in a class of 28. Tripling disapproval while withdrawing approval produced significant increases in various types of disruptive behavior.

Another group of studies is of interest because they deal with groups of older, very aggressive or withdrawn problem children (Chadwick and Day, 1971; Clement and Milne, 1967; Hall, Panyan, Rabon, and Broden, 1968; Martin, Burkholder, Rosenthal, Tharp and Thorne, 1968; O'Leary, Becker, Evans, and Saudargas, 1969; Wolf, Giles, and Hall, 1968). Martin and his associates (1968) tested the differential effects of simple versus complex types of token reinforcement systems on highly aggressive, underachieving adolescents ranging in age from 13 to 18 years. They found that older aggressive subjects made a great deal more progress toward complex target behaviors when detailed step by step "shaping" and "modelling" was used to achieve the final effect. Clement and Milne (1967) compared the effects on social behavior of tangible and social reinforcers applied by a therapist on eight highly withdrawn, introverted third-grade boys. For these subjects tangible reinforcers were significantly more powerful than social rewards. O'Leary's group (1969) tested the relative power of rules, task structuring, social reinforcement and tangible reinforcement in controlling disruptive behaviors of seven lower middle-class, white second graders in a class of 21 students. Rules, structuring and social rewards, acting individually, had little effect on this sample of children but tangibles used as backup reinforcers for tokens achieved significant results ($p < .02$ to $p < .05$).

This review of past research reveals three prior studies that can be directly compared to the work reported here in terms of the experimental situation and research design (i.e., large groups of underachieving minority students from economically deprived backgrounds all placed on reward contingencies simultaneously). Hall and his associates (1968) manipulated the teachers' use of social reinforcers (attention, praise, and approval) to effect an increase in the time spent in actual school work and decrease disruptions among three whole classes of from 24 to 30 white and black children in grades one, six and seven. There were no students labelled as problem children in the study. Systematic social reinforcers applied by teachers increased average work time in the classrooms between 28 and 34 percent. Significance tests were not calculated. The second study by Wolf and associates (1968) compared 15 experimental 6th grade students from an urban poverty area to a matched control group on academic gains achieved during a year of systematic social and tangible reinforcement. These students were underachieving in reading on an average of two years below the norm for their grade. In contrast to the controls, students in the experimental group made significant gains in both the Stanford Achievement Test ($p < .01$) and report card grades ($p < .005$) as well as in their reading performance.

Chadwick and Day more recently report on a study in which systematic tangible and social reinforcers were combined to effect significant reductions in the disturbing behaviors of 25 minority group students as well as powerful, positive effects in their rate and

accuracy in academic work (Chadwick and Day, 1972). Although the students in the study were chosen by prior teachers as difficult cases, they achieved a significant average increase in grade placement as measured by the California Achievement Test during experimental treatment.

The study described in this report differs from the above research in several important respects. First, the participants were selected from a minority group (American Indians) with cultural values and norms differing extensively from those of middle-class whites, migrant Mexican-Americans and urban blacks. Specifically, the Indian students in the study seemed to differ from whites and blacks of the same age in their attitudes toward the following things: competition and individual achievement in the presence of peers and friends, the value of material rewards, the degree to which "earned" material rewards should be shared with peers and family members, the degree of acceptance and resistance to innovative programs, availability and visibility of adult "models" successfully achieving material rewards in the white economic system and acceptable forms of classroom disturbance when bored, etc.

Secondly, the administrators had become sensitized to some of the relevant cultural differences of the group and had shaped the rules and procedures accordingly. There were no middle class white students who could form implicit coalitions with white teachers and administrators and thus be thrust into modelling roles. Thirdly, alienated Indian students seem to act out their frustrations in very different ways

than white, black or Mexican-American youth and may in turn respond differently to the usual forms of programmed reinforcement. The Indian students in this study who became disturbing influences in the classroom, used much less aggressive tactics to resolve their frustrations with teachers and administrators. They tended to a greater degree to simply withdraw from doing assigned tasks or entered into talking quietly but excessively to neighbors rather than becoming noisy or eliciting arguments and fights with others.

METHODS

Sample: The 54 Indian students participating in the project consisted of the entire seventh and eighth grades at St. Mary's Mission School (Catholic) near Omak, Washington. Two-thirds of the students lived in dormitories on Mission grounds while the rest travelled by bus each day from the Indian residential section of Omak, six miles away. Two Jesuit priests administer and coordinate the volunteer staff of certified teachers for the 180 children attending grades one through eight. The Mission, founded in 1886, is on the western edge of the Colville Indian Reservation, the largest area of tribally owned land in the state of Washington (1.4 million acres). Almost all of the 54 students in the study were from homes broken by marital conflict or death due to sickness, alcoholism, accidents, etc. Data was collected on 25 seventh graders (12 girls and 13 boys), ranging in age from 13 to 15 years, and 29 eighth graders (17 girls and 12 boys), ranging in age from 14 to 16 years.

The average achievement level as measured by the Iowa Test of Basic Skills is presented in Table 1. The results in Table 1 are consistent with previous findings that Indian students score significantly below the national norm on standard achievement tests. This finding was evident for each of the sub-tests as well as for the total test. Overall the 7th grade students were one and a half years behind while the 8th grade was a full two years behind the national norms. If this trend is projected to completion of the twelfth grade, those students who graduate will have the equivalence of an 8th grade education as measured by achievement tests. The underachievement of the Indian students in this study is even more serious when age is controlled for, as both grades averaged a year older than expected (13.2 for 7th grade and 14.3 for 8th grade).

Because of the overlap in age and ability of the seventh and eighth grade students they were mixed together in their classes rather extensively. Each mixed group of students experienced several different teachers during the day as they changed for different academic subjects. As a result the performance of seventh and eighth grade students under experimental conditions was not analyzed separately.

Setting: The experimental program was conducted in two spacious classrooms adjoining each other in a newly constructed building. Observers watched through one-way mirrors set in booths constructed for the study in each room. Several microphones were located on the ceiling of the classroom so that observers could hear the verbal behavior of the students and teachers, including whispered responses. Classes were conducted from 9 a.m. to 3 p.m., five days per week and included

20-minute morning and afternoon recesses as well as one hour for lunch.

Experimental Design: The study lasted for 28 weeks which were divided into three periods: an eight-week baseline, a fourteen-week experimental period, and finally, a six-week post-experimental period.

Baseline: During the initial eight-week period the classroom was conducted in a conventional manner by one certified male teacher in each of the two classrooms. They used persuasion, minor privileges, scolding, and mild threats to maintain control as normally practiced in conventional classrooms. The rates of various teacher behavior were observed and recorded. The children were given clothes, candy, toys, etc. from the school "store" at a rate comparable to what could be earned eventually during the experimental phase. This period permitted the determination of a baseline rate of academic performance and disturbing behavior to be compared with the experimental and post-experimental periods.

Experimental Period: During this fourteen-week period the reinforcement system utilizing tangible rewards was instituted. Each child was given a booklet containing 20 pages each having 50 squares per page. Points, recorded as marked squares, were earned by students for performing two classes of behaviors:

A) Accurate completion of units of academic work.

B) Performance of appropriate social behavior such as remaining in their chairs, raising the hand for the teacher's attention and not disturbing peers.

When an assignment was completed it was collected and graded by staff who assigned points for correct answers. This procedure permitted rapid feedback to the student. Points were passed out to students for appropriate social behavior as it occurred in the classroom. If a student repeatedly misbehaved the teacher eventually began issuing a set of 3 verbal warnings. If further offenses occurred and this happened only a few times, a standard number of points were taken out of the student's point book for each misbehavior.

At the conclusion of the school day the students' names were randomly drawn from a box and in this order went to the school "store" to redeem their points with tangible back-up reinforcers such as gum, candy bars, clothes, jewelry, cosmetics, records and valued athletic equipment etc.

Finally, the teachers were trained during the experimental period to apply social reinforcement in the form of support and praise for working effectively and criticism and threats for inattention and disturbances at the same rates that occurred "Naturally" during the baseline period. In addition the teachers were guided into distributing positive social reinforcers more evenly among the children by directing them to students receiving lower rates during the day. Teacher behavior thus was counted and monitored by an observer to maintain relatively constant rates of positive reinforcement during the experimental and post-experimental periods.

The dependent variables, percent of time spent in academic activities, units of work completed per hour, accuracy of the work and the number of disturbing behaviors, were measured and the resultant rates were compared to those obtained during baseline to determine the effects of the experimental program.

Post-experimental Baseline Period: To assess the effectiveness and permanence of the experimental reinforcement system on academic performance and disturbing behavior, the point system was terminated during the final six weeks of the program. The children received candy, toys, clothes, etc. without contingencies, as in the initial baseline period.

Measurement of variables:

1. Work time: Two electric clocks, controlled by switches mounted on a panel, were assigned to each student. When the teacher gave a particular student an assignment, his "total-time" clock was turned on and remained on until the student completed the assignment or the teacher asked for it. When the student was actually engaged in working on the task his "work-time" clock was turned on. Any interruptions in work such as talking to peers, shouting, running or throwing pencils, etc., resulted in the work clock being turned off while the "total-time" remained in motion. Observers were trained and periodically checked for reliability. The most difficult timing decision was when the student stopped working to stare out of the window as if he were thinking about the task. A one-minute period was allowed for

the child to return to the task before the clock was stopped. If it became obvious during this one-minute period that the student was responding to outside stimuli, and not working on the task, then the work clock was turned off. Four observers were assigned to the clocking task. It should be stressed that continuous observations rather than sampling procedures were applied to assess student and teacher behaviors. These timing procedures permitted computation of the percent of time that the student actually worked on any given assignment (actual time at work/total time).

2. Rate of Work Output: The number of workbook exercises, math problems, words spelled, etc. were carefully counted, timed and recorded each day. The total number of exercises or units of work completed of each type (i.e., reading comprehension, spelling, social studies, and mathematics), divided by the total number of minutes available for the exercise, provided the measure for the rate of work output. The problems of exercises done correctly were thus combined with those done incorrectly in calculating this measure.

3. Accuracy of Work: The percentage of exercises of each type that were completed correctly were also counted and recorded each day (i.e., the number done correctly divided by the total attempted), as the third measure of academic performance.

4. Behavior: Four observers were each assigned eight or nine students to watch. A modified version of the Becker observational system (1967) was used to count and record disruptive behaviors of the class. The first two categories concerned generally disruptive behavior which was not targetted on peers or teachers:

A. Gross motor behaviors: Standing up, leaving the desk without permission, walking rapidly and noisily across the room, flailing arms and rocking back and forth noisily in chairs.

B. Disruptive noise-making: Observers recorded only those noises in which the noise-making action was actually perceived by the observers. Tapping feet on desks, clapping hands, repeatedly banging desks, slamming books on desks, kicking or tipping over chairs or desks were recorded.

The next three categories of disruptive behavior involved interaction with peers.

A. Verbalization: Talking to peers without permission, singing, loud laughter, etc. were recorded. Quiet whispering behavior was not counted unless obviously not task-related.

B. Aggressive behavior: Hitting, kicking or striking another child with an object such as a pencil, ruler or book. Pinching, slapping and knocking others' books off the desk were counted.

C. Symbolic behavior: Gestures which aroused either anger or laughter in the peers who witnessed the gesture. This category contained responses such as mimicking the teacher or peers, eliciting laughter and sending various hand signals engendering smiles or laughter.

The remaining three categories involved student interaction with teachers:

A. Verbalization: Calling loudly to the teacher or acting smart, etc.

B. Symbolic behavior: Facial or hand gestures directed against the teacher which are judged by Indian group standards to have derogatory intent.

C. Aggressive behavior: Hitting or pushing the teacher, and overt rejection of his requests or demands for compliance to a rule.

The first two weeks on the project were devoted to training and practice with the clocking and observational categories to develop observer reliability. The data collected during his training period was not included in the analysis of results for the study. Periodically an extra observer was assigned a sample of children to code independently for comparisons with the regular observers. The regular observers were not permitted to know which children were being checked. The reliability averaged 84 percent with the clocking of student work and 89 percent in observations of student disruptive behaviors. On those days when reliability was low, the observers and other staff reviewed and discussed the differences in an effort to resolve them.

Attitude Inventories:

A battery of attitude scales were administered in questionnaire form to the Indian students during the 3rd and 4th weeks of school and then readministered during the two weeks preceding the end of the

school year. The scales included in the instrument pertained to: self concept; achievement motivation; attitudes towards teacher approval and disapproval, acceptance of teacher's authority, classroom misbehavior, fighting with peers, and the value of three academic subjects (arithmetic, science and reading). The scale items are presented in Appendix A. Most of the scales incorporated a typical six point Likert scale format: Strongly Agree (6); Agree (5); Mildly Agree (4); Mildly Disagree (3); Disagree (2); Strongly Disagree (1).

An attempt was made to obtain an Indian-white comparison on these attitudes by locating and surveying a matched control group of white 7th and 8th grade students. It was not possible to obtain a perfect match on parental education and family income as Indian students at the Mission tend to come from severely deprived families economically speaking. A junior high school located in a working class neighborhood in the town of Clarkston, Washington, provided as close an appoximation as was possible. Nevertheless, the Indian students' father's education averaged over five years less than for the white sample (7.1 years versus 12.7 years) and nearly four years less for mother's education (8.3 years versus 12.1 years). Data on family income revealed that the white families had nearly twice as much income ($8,500 compared to $4,500). Caution is indicated in evaluating the students' perceptions of parental education and family income as it is questionable how much Indian or white 7th and 8th graders know about family finances

or even parents' educational achievement. Many children left these three questions blank or checked "don't know". Also the white sample's average income of $8,500 is somewhat high for the occupations reported. Keeping these potential sources of bias in mind several relevant comparisons between Indian and white students' attitudes can be made with the data gathered.

RESULTS

Academic Performance

Worktime. The initial indicator of student performance assessed in this study is the percent of available time that students actually worked on the exercises and workbooks assigned by the teacher (i.e., their "worktime"). Table 2 presents comparisons between baseline and experimental periods on the percent of total assigned time and students worked. An unexpected finding in Table 2 is that the students were observed in the initial baseline to be engaged in actual work nearly 80 percent of the assigned time. It is doubtful that even highly achieving middle-class students work much more diligently than this. Secondly, it is clear from the data that in spite of their initially high baseline performances the experimental reinforcement program had a significant, powerful effect on the average time spent

Table 2 about here

at work by the 54 Indian students. The increase from 79.6 percent to 86 percent average worktime was significant at the .001 level and explained 37 percent of the variance.[1] It is equally clear from

Table 2 that termination of the reinforcement system (i.e., the point system and backup reinforcers) during the post-experimental baseline period did not produce a return to the original baseline rate of time spent at work. The reduction in work time from an average of 86 percent during the experimental period to 84.9 percent during the second baseline was not statistically significant. Apparently the fourteen-week reinforcement program, as applied in this classroom and school environment, sufficiently strengthened academic working behaviors to the point where they resisted extinction for a period of six weeks. The persistance of the high rate of work time during the post-experimental baseline period occurred at the end of the school year where distractions were somewhat heightened, particularly for the 8th grade students who were to graduate in June from St. Mary's Mission. The level of significance obtained when the two baselines are compared, simply verifies these findings. The results in Table 2 thus provide strong support for the hypothesized effect of systematic tangible reinforcement on the rate of time spent at work by this sample of underachieving American Indian junior high school students and indicate also that the positive effect tends to persist for a meaningful period of time after the reinforcement program itself has been terminated.

Figure 1 graphically presents the trends through time of the average percentage of time spent at work by the group. This figure reveals that in all three periods steady states of behavior were obtained relatively quickly with only minor fluctuations.

Rate of Work Output. The second measure of academic performance included in the study is the rate of work output (i.e., problems or exercises completed per unit of time). The goal here was to find out not only whether Indian students would work longer under systematic reinforcement, but whether they actually would complete more problems and exercises per minute as well. Accuracy is not a factor with this index. The number of activity units (problems, exercises, assignments, etc.) were recorded for each student for each day. The nature of the unit of activity varied considerably from simple math problems mimeographed by the teacher or contained in the math workbook, to reading a paragraph and answering questions about the reading, to spelling exercises. The important point is that the unit for each activity remained constant during the entire program. Also, the complexity and level of difficulty of the activities were gradually increased to control for an increase in performance due to practice effects and to maximize the learning progress of each student. Once the number of units of a given activity were observed and recorded, this figure was then divided by the number of minutes the student worked on the activity that day to yield the measure of work output.

The results in Table 3 indicate that in three areas of academic

Table 3 about here

activity, English, spelling and social studies the rate of problem completion increased significantly during the reinforcement period. The range of percentage increases varies from 23 to 35 percent while

the degree of variance in completion rate accounted for by the reinforcement program varied from 38 to 54 percent. For one area of the curriculum, the SRA Reading Laboratory, the experimental increase in productivity was not significant while in the case of mathematics there was a significant decrease in output. An examination of the daily math output suggests a possible explanation for this result. The first six weeks of the eight week baseline were spent reviewing relatively simple arithmetic exercises. No new concepts or principles were introduced. During the remainder of the year, new principles such as fractions, reciprocal numbers, how to solve algebraically for unknown, etc., were taught which resulted in a significant reduction in the speed with which the students could solve a given set of problems. When the students eventually increased their performance again to the baseline level, new, more difficult material would be introduced, etc. This circumstance was not avoidable in the given situation but such changes in the types of math problems presented to students tend to suggest that the whole experimental test on mathematic activity was invalid.

Despite the reduction in math productivity, the overall rate of problems completed per unit of time as shown in Table 3 for the five curriculum areas combined, showed a significant and relatively powerful increase. This result is illustrated graphically in Figure 2. The increase from 1.86 to 2.30 problems per minute reflects an increase in work output of nearly 25 percent by a group of generally underachieving reservation Indian students (Trend Analysis).

The data in the second and third sections of Table 3 covering the effects of the post-experimental baseline indicates that terminating the tangible reinforcement system had a rather mixed effect on the differing types of classroom activity. The rate of work completed in English and spelling continued to increase, as in the experimental period, while the rates in social studies and the SRA Reading Laboratory dropped off to levels below the initial baseline performance. The rate of output in mathematics remained at the same level during the treatment and post-experimental baseline periods. It is difficult to provide an explanation for these differences but the authors suspect that the intrinsic interest of the social studies and SRA materials may have dropped off toward the end of the year due to their inadequate cultural relevancy for reservation-dwelling Indian students. Nevertheless Table 3 indicates that generally, the overall increase in rate of work achieved with the reinforcement system as summarized in the combined means, persisted into the final baseline without alteration even though the system was terminated.

Examination of Figure 2 reveals an upward trend in the rate of work output achieved during the experimental treatment, particularly during the last half of the period. Trend analysis indicates that the increase in output is significant ($F = 8.59$, $p < .001$). This means that not only was the average rate of output achieved in the experimental period significantly greater than the baseline rate, but it was also significantly increasing during the period itself. It is unfortunate that the overall design of the study necessitated termination of the treatment period before the rate of productivity achieved a steady state at some maximum level.

Generally, then, combining the results in Tables 2 and 3, we are led to conclude that the reinforcement program utilizing tangible reinforcers, not only extended the length of time underachieving Indian students applied themselves to academic tasks, especially the language arts, but also tended to accelerate the output per unit of time, in spite of a long past history of classroom inattention and apathy. Likewise the results suggest that with the language arts, fourteen weeks in such a program sufficiently strengthened both the duration and rate of academic activity so that they tended to resist extinction, at least for six weeks.

Accuracy of Work. The third measure of performance, accuracy of problem-solving is a necessary addition to the above two indicators. The substantial increases in problems completed during the reinforcement period reported in Table 3 would be meaningless if most of the additional work was done inaccurately. Several students tested the nature of the contingencies as soon as the point system was instituted to see if rewards could be obtained by racing through a workbook or assignment, making random guesses at correct answers. In reality the contingencies were weighted so that 67 percent of the points earned were based on accuracy while 33 percent were contingent on completion rate. The "racers" soon learned that few points were earned with this tactic and returned to an emphasis on high accuracy with speed. The levels of accuracy observed in the two baselines and the experimental period for each type of exercise are reported in Table 4.

Table 4 about here

As manifest in Table 4, the experimental reinforcement system significantly increased the level of accuracy for three of the five activities. For the SRA Reading Laboratory, English and spelling, the increase in accuracy was significant at the .001 level and the levels of explained variance obtained were 80,64 and 30 percent, respectively. For the remaining two activities, mathematics and social studies, there was no difference between the level of accuracy in the baseline and experimental periods. When the results for the five types of classroom activity are combined, as illustrated in Figure 3, the overall improvement in accuracy of work is impressive. The Indian students increased the proportion of exercises and problems completed correctly by 13 percent during the experimental period, which is significant at the .001 level. Thus over 80 percent of the variation in accuracy is controlled by the reinforcement contingencies.

When the tangible reinforcement system was terminated, the level of accuracy dropped for all five curriculum activities and four out of the five changes were statistically significant. The combined results revealed a decrease from 81.1 to 77.2 percent, which is significant at the .001 level and accounts for 35 percent of the variance in accuracy. Nevertheless, the results in Table 3 indicate that even though extinction occurred during the second baseline, it occurred at a relatively moderate pace during those last six weeks of the project.

When all three sections of Table 3 are examined, along with Figure 3, it is apparent that the experimental period witnessed a significant increase in accuracy of academic work. Once the tangible reinforcer system was terminated, however, the level of accuracy declined to a

point nearly midway between the initial baseline and the experimental period rates. Thus the effects of the experimental period persisted moderately well during the final six week baseline.

The results with the three indicators of academic performance (i.e., work time, rate of output and accuracy) together provide very strong support for the predicted effect on classroom achievement of using systematic reinforcers on male and female Indian students from exceptionally deprived backgrounds. They worked longer, faster, and more accurately under the reinforcement system as designed for this study, than they did under "normal" classroom conditions.

Disruptive Behavior. The overall effect of the reinforcement system on the rate of disruptive behavior during the experimental and baseline periods, is presented in Table 5 and Figure 4. It is evident from the totals presented at the top of each section of Table 5, that the average number of disturbing acts for each student shifted downward significantly with systematic tangible reinforcement from the baseline rate of 12.23 to 7.40 per hour, yielding 43 percent explained variance. Termination of the contingencies in the post-experimental baseline had the effect of significantly raising ($p < .01$) the rate of disturbing acts per child per hour to 8.27. Generally, these summary results indicate that the positive effect of reduced classroom disturbances under reinforcement, tended to resist extinction moderately well during the final six week baseline. Figure 4 clearly portrays this trend in graphic form.

The initial baseline rate of 12.2 disturbing acts per hour for each child translates into approximately one act every five minutes, or an average of 300 acts per hour in a classs of 25 students. While this is a considerable amount of disruptive behavior, interfering fairly often with the academic process, it does not even approach the levels of disruption attained by hyperactive children. To the inexperienced observer, in fact, the classroom looked substantially quieter and more orderly than it was in actuality due to the fact that many of these acts (3.6 out of 12.2) consisted of quiet, unobtrusive whispering to a neighboring peer, disturbing the work of only one or two persons. The teachers' urging for a return to work were usually obeyed for a few minutes until another opportunity for whispering emerged so that an image of docility and compliance with controls was the dominant impression gained. The actual rate of disturbances, however, both in quantity and quality, was relatively mild compared to the rates observed in other studies. The above figure of 12.2 acts per child per hour, for example, is only one third the rate observed in another study by the authors of more aggressive children (Day and Chadwick, 1972).

More specifically, it is evident in Table 5, that comparatively speaking, verbalization with peers in whispered conversations occurred more than twice as often during baseline as the next most frequent misbehavior, namely, the inappropriate verbal remarks directed at teachers (3.59 vs. 1.48). The next most frequent types of disturbances were non-targetted noise-making (i.e., slamming down books,

scraping chairs and desks on the floor, etc.) and aggression against peers (1.39 vs. 1.36), and were followed closely by another form of physical behavior, gross motor responses (1.25). There appears to be a pattern among these underachieving junior high school Indian students of employing relatively lower rates of disturbing responses (compared to other student groups from similar socio-economic backgrounds) and of relying more heavily on verbal as opposed to more physical forms of disturbing responses. This general pattern of classroom disturbance (i.e., the rank order of frequency of acts) among these American Indian students closely approximates that obtained for younger (3rd and 4th grade) black and Mexican-American students (Day and Chadwick, 1972).

It is clear in Table 5 that tangible reinforcers had their most powerful effect with regard to verbalizations against peers where the highest rate of disturbances occurred in the initial baseline period. It appears that this type of effect was highly resistant to extinction, judging from the results in the second section of Table 5. Non-targetted gross motor behavior, noise-making and symbolic behaviors against peers and teachers likewise responded well to the reinforcement contingencies and generally resisted extinction with the possible exception of the symbolic responses against teachers which increased during post-experimental baseline from .39 to .59 acts per hour for each child. The one type of behavior which failed to respond to the contingencies was aggressive acts against peers, an important category for several reasons. It appears that once interactive exchanges with a peer escalates to the point of physically aggressive acts, this

point system was not sufficient to effect a degree of control.

In a previous study a technique for controlling such behavior was developed which involved taking points away from the student for the first three violations in a work period, and if that failed, to remove the student from the classroom to a "time out" room. This procedure was very effective in reducing aggression against both the teacher and peers. In the present study the baseline level of aggressive behavior was not sufficiently high to warrant the use of these additional procedures. It is anticipated that similar procedures could have been employed to reduce such behavior with the populations of Indian students if the situation would have required it.

The students' reduced level of disturbing behavior during the fourteen-week experimental treatment permitted the teachers to shift their emphasis from control over inappropriate behavior, to teaching functions. This permitted considerably more material to be presented and discussed than was possible during the baseline period.

The results discussed above demonstrate quite dramatically that a program of systematic reinforcement significantly reduced the level of classroom disturbing behavior of underachieving American Indian junior high school students. The control over such behavior obtained during the experimental period permitted the teacher to devote considerably more time and energy to presenting academic material and also permitted the students to work in a quieter environment, more conducive to academic activity.

Academic Performance and Attitudes Towards School and Self

Self Concept. Two self concept scales were administered. The first scale (Self Concept) included thirty items ascertaining how the respondent evaluated himself. Example items are: "I am smart," "I am good enough to hang around the teacher like other kids do", and "I just can't do most things as well as most other kids do." The second scale (Generalized Other), focused on how the student thought others, particularly significant others, felt towards him. Examples are: "Most teachers think I will never be able to make good grades in school", "Most kids think I am afraid to try new things" and "My parents trust me." The initial responses to the two self concept scales indicate that these students have fairly weak self concepts. The mean responses are 3.87 for the Self Concept and 3.88 for the Generalized Other. Both means fall between the "Mildly Agree" and "Mildly Disagree" but on the positive side. This finding was anticipated from past research linking self concept to family disruption, boarding school placement, and academic underachievement. The two measures were strongly correlated ($r = .768$) which indicates consistency between how the students perceived themselves and how they perceived others evaluated them. The correlations between the two measures of self concept and the various measures of academic performance revealed very little relationship between self concept and initial rates of worktime; productivity; accuracy; or disruptive behavior. A few of these many correlations were statistically significant but the majority were not. These will be discussed later.

Achievement Motivation. A twelve item achievement orientation scale was included in the attitude questionnaire. Examples are: "Education and the job should come first", "A good steady job is very important" and "The most important qualities of a real man are determination and driving ambition".

The Indian students' mean response to these achievement motivation items was 2.16 as compared to 2.94 for the white students. Both means indicate a rejection of achievement values as they fall between "Mildly Disagree" and "Disagree". The difference is significant ($F = 11.88$, $p < .001$) indicating that this particular group of Indian students had fairly low educational and occupational aspirations. An interesting question for future research is the existence and direction of a causal relationship between low achievement motivation and academic underachievement as it is possible that a causal effect could go in either direction. All that can be inferred from the data collected in this study is that this sample of underachieving Indian students tended to reject achievement values significantly more than the white control sample. The relationship between achievement motivation and academic performance and disruptive behavior will be presented next.

Worktime and Attitudes Towards School and Self

Sixteen independent variables, including attitude towards self, academic subjects, teachers, and peers and achievement test scores for several academic subjects were included in multiple regression analysis to determine their relationship to initial baseline rate of worktime and increase in such time during the reinforcement period.

The results for the baseline are presented in Table 6 and correlates of change from baseline to experimental period in Table 7.

Only the students score on the reading section of the Achievement test was associated with the level of work time for the baseline period in the bivariate analysis. It would appear that a general ability to read was directly related to the percent of classroom time the student engaged in academic work. Once the effects of reading ability were controlled by partialling, vocabulary achievement entered the regression equation but surprisingly the relationship is inverse. The author can offer no explanation as to why the relationship between vocabulary and worktime is inverse. Two important variables, liking of teacher approval and achievement motivation entered after vocabulary achievement. The final significant variable to emerge was arithmetic achievement test scores. The basic picture to appear from this analysis is that students who are more capable of doing the work (as indicated by achievement tests), are motivated to achieve and finding it rewarding to be praised by the teacher work a greater percentage of the available time than do those without these characteristics. The one exception to this model is the unaccounted for inverse relationship between vocabulary achievement and worktime. These five variables acting together account for 53 percent of the variation in worktime. Again no statement of cause and effect can be made but these results do suggest these relationships be traced out.

The level of change from the Baseline to Treatment I in worktime was standardized to take into account the potential for change. If a student had a baseline rate of worktime of 20 percent as compared to one with 90 percent, the former had the potential to improve 80 percent while the latter only 10 percent. To standardize for this potential of improvement the change in time was divided by the potential possible thus arriving at the percent of the possible change accounted for by the actual change (amount of change/100 - baseline rate). The bivariate correlations between standardized time improvement and the independent variables provided only one significant relationship. Self Concept was inversely related to improvement in worktime. Three variables, self concept, arithmetic achievement test and attitude towards arithmetic appeared in multiple regression analysis. The latter two were positively related to the change. The three variables together accounted for 44 percent of the variation in the change in work time. It would appear that those students with the stronger self concepts were more resistant to change induced by the reinforcement systems. The nature of the relationship between a positive attitude toward and high achievement test score in arithmetic can only be speculation. One possible explanation is that a significant amount of the work day was spent in math classes and that it is in this subject that substantial improvement in work time occurred. If this were the case, one would anticipate a positive attitude that math is important and valuable, as well as math skills learned in the past being related to increased

time spent in work during math classes. Such analysis of the data is possible but because of the large expenditure of time to separate out the individual subjects required will be done at a later date. It is important to note though that those students with a weak self concept, liking of math and high scores on math achievement tests evidence the greatest response in work time to the systematic tangible reinforcement program.

Productivity and Attitudes Toward Self and School

The analysis, both bivariate and multivariate, concerning the rate of output, revealed no significant correlations between the independent variables and overall output. Analysis for each of the specific academic subjects produced significant results but very little consistency. Each academic subject produced differing correlates which is probably why nothing was significant for the overall rate. These divergent findings for each academic subject casts doubt on the validity of the results and make it difficult to infer ways of altering rates of work for underachieving Indian students. The analysis of change in productivity from the Baseline to the Treatment period reported in Table 8 revealed that achievement test-arithmetic and attitudes supporting orderly classroom behavior were directly related to increased productivity. The attitude concerning classroom behavior emerged in the multivariate analysis after the effects of achievement test-arithmetic was controlled by partialling. The two variables together in multivariate analysis were capable of accounting for 31 percent of the variance in change in productivity.

Accuracy and Attitudes Toward Self and School

The bivariate results for baseline rates of accuracy (Table 9) indicated that students who scored high on achievement tests had a relatively higher rate of accuracy. Again the multivariate analysis produced significant interaction effects, as after controlling for achievement test scores (the total test score dropped out as it overlapped with the two sub tests) three additional factors entered the regression equation. Positive attitudes toward reading, orderly classroom behavior and acceptance of teacher authority emerged as significant correlates of baseline accuracy. The five factors together accounted for 55 percent of the variation in baseline rate of accuracy.

Table 10 reveals that only one factor was related to change in accuracy from Baseline and the treatment period. Achievement motivation was directly related to increased accuracy. In the multivariate analysis, after controlling for achievement orientation, attitudes toward reading and achievement test-reading emerged as significant factors predicting change in accuracy. The three variables accounted for 42 percent of the variance in increased accuracy from the Baseline to the treatment period.

A couple of general trends emerged from the analysis of factors related to initial rates of output and accuracy. The first trend to note is the anticipated relationship between measures of academic ability and performance on academic assignments. Second, was the relationship between positive attitudes toward school activities, i.e., reading is a valuable skill, education is important, etc., and academic

performance. Finally, factors concerning classroom control emerged as significant. Those students who accepted the teacher's authority and felt that disruptive actions were inappropriate tended to produce high quality work, at a faster rate. Again the question is left unanswered as to whether there are causal relationships between such factors and performance and if there is a causal link, which direction does it flow. This remains a topic for future research.

The same general findings were apparent for changes in productivity and accuracy observed after the initiation of the reinforcement system. It is suggested that those students with greater academic skills were capable of reacting to the contingencies by increasing their rates of output and accuracy to a greater extent than those with less ability. It is speculated that those students with positive attitudes toward education and school work responded to the program to a greater extent because their values were consistent with it. Also it was discussed that ability and positive attitudes were highly correlated so that the correlation of either with actual changes in behavior may be spurious.

Disruptive Behavior and Attitudes Toward Self and School

The baseline rate of disruptive behavior (Table 11) was significantly related to three factors. The first, aggressive attitude toward peers, is no surprise as much of the disruptive behavior observed was directed against peers. It seems that students with aggressive attitudes act such tendencies out in the classroom, often disrupting the academic process. Achievement motivation was inversely related to

disruptive behavior suggesting that academically oriented students engage in relatively less disruption. Finally, a positive attitude toward science evidenced an inverse relation with classroom disruptions. It is suspected that this scale is tapping a general positive orientation toward academic activities which tends to prevent the student from misbehaving. An important omission from the significant results was acceptance of teacher authority. It was anticipated that this factor would be inversely related to disruptive behavior.

The multiple regression analysis revealed that controlling for aggressive tendencies toward peers permitted three new factors to emerge as important predictors of disruptive behavior. Achievement test-vocabulary entered the equation second, followed by self concept. Once the effects of aggressive tendencies and general academic ability (as indicated by achievement test-vocabulary) are partialled out attitudes about self entered the regression equation in an inverse relationship. Those students who tended to have a negative attitude toward themselves engaged in relatively more disruptive behavior. Finally, acceptance of teacher authority did appear in the equation. Those students who accepted the teacher as being responsible for the class tended not to engage in disruptive actions. The four variables together accounted for 61 percent of the variance in disruptive classroom behavior.

In analyzing the change in disruptive behavior, comparing the baseline rates to those observed in the experimental period, it was necessary to standardize for the initial rates. [1] Those students who

evidenced substantial baseline rates had greater potential for change than did those with lower baseline rates. Therefore, the level of change (Baseline minus Experimental Treatment) was divided by the Baseline rate to standardize for potential change. The analysis did not produce any significant correlates of change in classroom disruptions, although two factors did approach significance. Achievement motivation had a fairly strong direct relationship to change indicating that those students who did desire to achieve academically reduced their classroom disruptions relatively more than those lacking such motivations. Self concept produced a sizeable negative correlation which may be interpreted as support for the hypothesis that those students with strong self concepts were more resistant to change. This is similar to results obtained for change in work time. In the multivariate analysis, once achievement orientation is controlled for by partialling, (although it was not significant) self concept and acceptance of teacher's authority both enter the regression equation as significant correlates of change in disruptive behavior. Again self concept produced an inverse relationship, while acceptance of teacher's authority was directly related to change in classroom misbehaviors.

Summary

This report describes the major findings of a field experiment testing the effects of systematic tangible reinforcement on the educational performance and classroom disturbances of underachieving American Indian seventh and eighth grade students attending a small,

remote reservation school near Omak, Washington. Fifty-four students in two classrooms were treated to baseline (8 weeks), experimental (14 weeks) and post-experimental baseline periods (6 weeks) utilizing an A-B-A design. During the experimental period programmed tangible reinforcers were distributed, using a point system and back-up reinforcers such as candy, phonograph records, cosmetics, jewelry and inexpensive sports equipment and games. During the final baseline period of six weeks, at the end of the school year, the contingencies for tangible reinforcers were terminated to assess the persistence of their effect on academic performance and disturbing behaviors in the classroom such as noise-making and whispered conversations with peers etc. Social reinforcement (i.e., approval, pats, smiles etc.) from teachers to students was maintained at a relatively constant level throughout the baseline and treatment periods.

The dependent variables in the study were: 1) The percent of total time that students actually worked on assignments; 2) The rate of work output in terms of problems and exercises completed per unit of time; 3) Accuracy of work, the percent of problems completed correctly; and 4) The rate of disturbing behavior in the classroom. The effects of several attitudinal factors (self-concept, feelings about school, teachers etc.) on baseline performances, disturbances and changes in performance during the experimental period.

The results generally provide significant, relatively powerful support for the effects of contingent tangible reinforcement on all the dependent variables. The experimental treatment controlled 37 percent of the variance in time at work ($p < .001$), 49 percent of the variance in the rate of work output in all academic subjects combined ($p < .001$); 81 percent of the variance in the accuracy of work on all subjects combined ($p < .001$), and 43 percent of the variance in disturbing classroom behaviors ($p < .001$). In addition it was discovered that termination of the reinforcement contingencies after 14 weeks led to only minor reductions in academic performance and slight increases in classroom disturbances during the final 6 week post-experimental baseline period. Several possible interpretations for this resistance to extinction are offered. Finally, several interesting findings on the relation of selected attitudes to the performance variables are presented.

Table 1

SCORES ON THE IOWA TEST OF BASIC SKILLS FOR SEVENTH AND EIGHTH GRADE STUDENTS

Sub-Tests	Observed Scores 7th	Observed Scores 8th	Difference from Norm 7th	Difference from Norm 8th
Vocabulary	5.2	6.1	-1.8	-1.9
Reading	5.6	6.3	-1.4	-1.7
Spelling	6.1	5.9	-.9	-2.1
Arithmetic Concepts	6.1	5.8	-.9	-2.2
Arithmetic Problems	5.5	5.8	-1.5	-2.2
Total	5.6	6.0	-.14	-2.0

Table 2

PERCENT OF TIME AT WORK: COMPARISON OF MEANS, SIGNIFICANCE TESTS, AND EXPLAINED VARIATION FOR THE EXPERIMENTAL AND TWO BASELINE PERIODS

Comparison	Mean Percent Worktime			t	P	ω^2
	Baseline	Experimental	Baseline			
Baseline vs. Experimental	79.6	86.0		5.5	.001	.37
Experimental vs. Baseline		86.0	84.9	.5	NS	--
Baseline vs Baseline	79.6		84.9	4.0	.001	.27

Table 3

RATE OF WORK OUTPUT IN FIVE ACADEMIC SUBJECTS: COMPARISON OF MEANS, SIGNIFICANCE TESTS, AND EXPLAINED VARIATION FOR THE EXPERIMENTAL AND TWO BASELINE PERIODS

Baseline versus Experimental Period

Academic	Mean Prob. Attempted/Min. Baseline	Experimental	Percent Increase	t	P	ω^2
English	1.11	1.50	35	6.35	.001	.54
Spelling	2.20	2.90	32	6.86	.001	.50
Social Studies	.61	.75	23	3.33	.01	.38
SRA Reading Lab	2.21	2.33	5	1.01	NS	--
Math	1.94	1.60	-21	3.54	.001	.19
Combined Total (Mean)	1.86	2.30	24	7.31	.001	.49

Experimental Period versus Post-Experimental Baseline

Academic Activity	Experimental	Post-Experimental Baseline	Percent Increase	t	P	ω^2
English	1.50	1.81	21	5.3	.001	.44
Spelling	2.90	3.20	10	2.29	.05	.08
Social Studies	.75	.45	-67	6.01	.001	.69
SRA Reading Lab	2.33	2.11	-10	1.21	NS	--
Math	1.60	1.60	0	.07	NS	--
Combined Total (Mean)	2.30	2.30	0	.09	NS	--

Table 3 (cont.)

Initial Baseline versus Post-Experimental Baseline

Academic	Mean Prob. Attempted/Min. Baseline	Mean Prob. Attempted/Min. Post-Experimental Baseline	Percent Increase	t	P	ω^2
English	1.11	1.81	63	12.11	.001	.81
Spelling	2.20	3.20	45	6.02	.001	.43
Social Studies	.61	.45	-26	4.94	.001	.59
SRA Reading Lab	2.21	2.11	-5	.51	NS	--
Math	1.94	1.60	-21	2.97	.01	.14
Combined Total (Mean)	1.86	2.30	24	6.89	.001	.46

Table 4

ACCURACY OF WORK IN FIVE ACADEMIC SUBJECTS: COMPARISONS OF MEANS, SIGNIFICANCE TESTS, AND EXPLAINED VARIATION FOR THE EXPERIMENTAL AND TWO BASELINE PERIODS

Baseline versus Experimental Period

Academic Activity	Mean Percent: No. Correct/Total Baseline	Experimental	Percent Increase	t	P	ω^2
SRA Reading Lab	65.8	89.9	37	9.53	.001	.80
English	65.7	76.6	17	7.85	.001	.64
Spelling	77.4	83.6	9	5.14	.001	.30
Math	78.2	76.0	-3	1.53	NS	--
Social Studies	75.4	75.5	0	.02	NS	--
Combined Total (Mean)	72.0	81.1	13	15.1	.001	.81

Experimental Period versus Post-Experimental Baseline

Activity	Experimental	Post-Experimental Baseline	Percent Increase	t	P	ω^2
SRA Reading Lab	89.9	75.5	-19	5.01	.001	.52
English	76.6	78.5	2	2.04	.05	.09
Spelling	83.6	82.8	-1	.57	NS	--
Math	76.0	71.4	-6	1.97	.05	.06
Combined Total (Mean)	81.1	77.2	-5	5.40	.001	.35

Table 4 (cont.)

Initial Baseline versus Post-Experimental Baseline

Academic Activity	Mean Percent No Correct/Total Initial Baseline	Post-Experimental Baseline	Percent Increase	t	p	r^2
SRA Reading Lab	65.8	75.5	15	3.34	.01	.32
English	65.7	78.5	19	9.57	.001	.73
Spelling	77.4	82.8	6	3.24	.001	.14
Math	78.2	71.4	-9	2.42	.01	.10
Combined Total (Mean)	72.0	77.2	7	6.84	.001	.47

Table 5

RATES OF DISTURBING BEHAVIOR WITHIN SPECIFIC CATEGORIES: COMPARISON OF MEANS, SIGNIFICANCE TESTS, AND EXPLAINED VARIATION FOR THE EXPERIMENTAL AND TWO BASELINE PERIODS

Baseline versus Experimental Period						
Behaviors	Mean No. of Acts Per Child Per Hour Baseline	Experimental	Percent Decrease	t	P	r^2
Total	12.23	7.40	39	8.67	.001	.43
Non-targetted:						
Gross Motor	1.25	.84	33	6.61	.001	.46
Disruptive Noise	1.39	.88	37	4.10	.001	.23
Against Peers:						
Verbalization	3.59	1.87	48	9.22	.001	.62
Symbolic	1.29	.72	44	5.19	.001	.33
Aggressive	1.36	1.18	13	00	NS	--
Against Teacher:						
Verbalization	1.48	.99	33	2.57	.01	.10
Symbolic	.99	.31	69	4.97	.001	.32
Aggressive	.88	.61	31	2.44	.01	.09

Table 5 (cont.)

Experimental Period versus Post-Experimental Baseline

Behaviors	Mean No. of Acts Per Child Per Hour Experimental	Post-Experimental Baseline	Percent Decrease	t	P	ω^2
Total	7.40	8.27	11	2.80	.01	.09
Non-Targetted:						
Gross Motor	.84	.90	02	1.79	NS	--
Disruptive Noise	.88	.75	22	4.64	.001	.28
Against Peers:						
Verbalization	1.87	1.94	01	1.56	NS	--
Symbolic	.72	.73	01	.98	NS	--
Aggressive	1.18	1.36	-07	.83	NS	--
Against Teacher:						
Verbalization	.99	1.13	-05	.32	NS	--
Symbolic	.31	.59	-34	1.24	NS	--
Aggressive	.61	.80	-14	.00	NS	--

Initial Baseline versus Post-Experimental Baseline

	Initial Baseline	Post-Experimental Baseline				
Total	12.23	8.27	32	7.45	.001	.42
Non-Targetted:						
Gross Motor	1.25	.90	28	10.04	.001	.67
Disruptive Noise	1.39	.75	46	5.17	.001	.33
Against Peers:						
Verbalization	3.59	1.94	47	9.31	.001	.62
Symbolic	1.29	.79	39	6.24	.001	.43
Aggressive	1.38	1.36	02	.96	NS	--
Against Teacher:						
Verbalization	1.48	1.13	24	2.07	.05	.06
Symbolic	.99	.59	40	3.83	.001	.21
Aggressive	.84	.80	09	2.13	.05	.06

Table 6

Significant Bivariate and Multivariate Correlations
Between Initial Baseline Worktime and Sixteen Independent Variables

Bivariate Results

Variable	r	r^2	P
Achievement Test-Reading	.414	.171	.05

Multiple Regression Results

Step	Variable	Partial	R	R^2	Increase in R^2	F	P
1	Achievement Test - Reading		.414	.171	-	4.97	.05
2	Achievement Test - Vocabulary	-.414	.560	.314	.142	4.77	
3	Teacher Approval	.358	.631	.402	.088	3.24	
4	Achievement Motivation	.469	.730	.533	.131	5.91	
5	Achievement Test - Arithmetic	.393	.778	.605	.072	3.65	
	Corrected* R = .728	and R^2 = .530					

*McNemar, P. 184.

Table 7

Significant Bivariate and Multivariate Correlations Between Standardized Change in Worktime (from Baseline to the Experimental Period) and Sixteen Independent Variables

Bivariate Results

Variable	r	r^2	P
Self Concept	-.503	.253	.01

Multiple Regression Analysis

Step	Variable	Partial	R	R^2	Increase in R^2	F	P
1	Self Concept		.503	.253	-	8.12	.001
2	Achievement Test-Arithmetic	-.468	.645	.416	.163	6.44	.001
3	Attitude toward Arithmetic	.334	.694	.481	.065	2.75	.05
	Corrected R = .662 and R^2 = .438						

Table 8

Significant Bivariate and Multivariate Correlations Between Change in Level of Productivity (from Baseline to the Experimental Period) and 16 Independent Variables

Bivariate Results

Variable	r	r^2	P
Achievement Test-Arithmetic	.489	.239	.01

Multiple Regression Analysis

Step	Variable	Partial	R	R^2	Increase in R^2	F	P
1	Achievement Test-Arithmetic		.489	.240	-	7.56	.001
2	Classroom Behavior	.363	.583	.340	.100	3.49	.01
	Corrected R = .559 and R^2 = .313						

Table 9

Significant Bivariate and Multivariate Correlations Between Baseline Accuracy and 16 Independent Variables

Bivariate Results			
Variable	r	r^2	P
Achievement Test - Arithmetic	.478	.228	.01
Achievement Test - Reading	.428	.183	.05
Achievement Test - Total	.422	.178	.05

Multiple Regression Analysis							
Step	Variable	Partial	R	R^2	Increase in R^2	F	P
1	Achievement Test-Arithmetic	-	.478	.228	-	7.09	.01
2	Achievement Test-Reading	.318	.553	.306	.078	3.01	.05
3	Attitude-Reading	.352	.626	.391	.086	3.11	.05
4	Attitude-Classroom Behavior	.519	.746	.556	.164	7.74	.001
5	Teacher Authority	.379	.787	.620	.064	3.36	.01
	Corrected R = .740 and R^2 = .548						

Table 10

Significant Bivariate and Multivariate Correlations Between Change in Accuracy (from Baseline to the Experimental Period) and 16 Independent Variables

Bivariate Results			
Variable	r	r^2	P
Achievement Motivation	.384	.147	.05

Multiple Regression Analysis							
Step	Variable	Partial	R	R^2	Increase in R^2	F	P
1	Achievement Motivation		.384	.147	-	4.15	.01
2	Attitude Toward Reading	-.420	.546	.298	.151	4.93	.001
3	Achievement Test-Reading	-.491	.684	.464	.170	7.01	.001
	Corrected R = .646 and R^2 = .417						

Table 11

Significant Bivariate and Multivariate Correlations Between the Baseline Rate of Disruptive Behavior and 16 Independent Variables

Bivariate			
Variable	r	r^2	P
Attitude Towards Peers	.458	.210	.05
Achievement Motivation	-.434	.188	.05
Attitude Towards Science	-.390	.152	.05

Multiple Regression Analysis							
Step	Variable	Partial	R	R^2	Increase in R^2	F	P
1	Attitude Towards Peers		.458	.210	-	6.39	.01
2	Achievement Test-Vocabulary	-.458	.629	.396	.186	7.06	.001
3	Self Concept	-.573	.771	.594	.199	10.78	.001
4	Authority of Teacher	-.389	.810	.656	.061	3.74	.01
	Corrected R = .780 and R^2 = .609						

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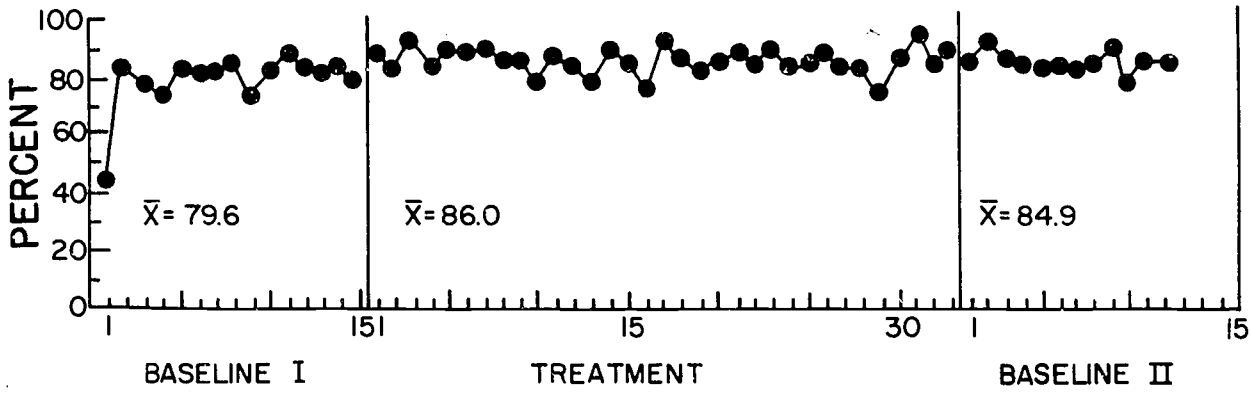

Fig. 1. Percent of time at work: The number of minutes spent actually working on assignments divided by the total time assigned to the task.

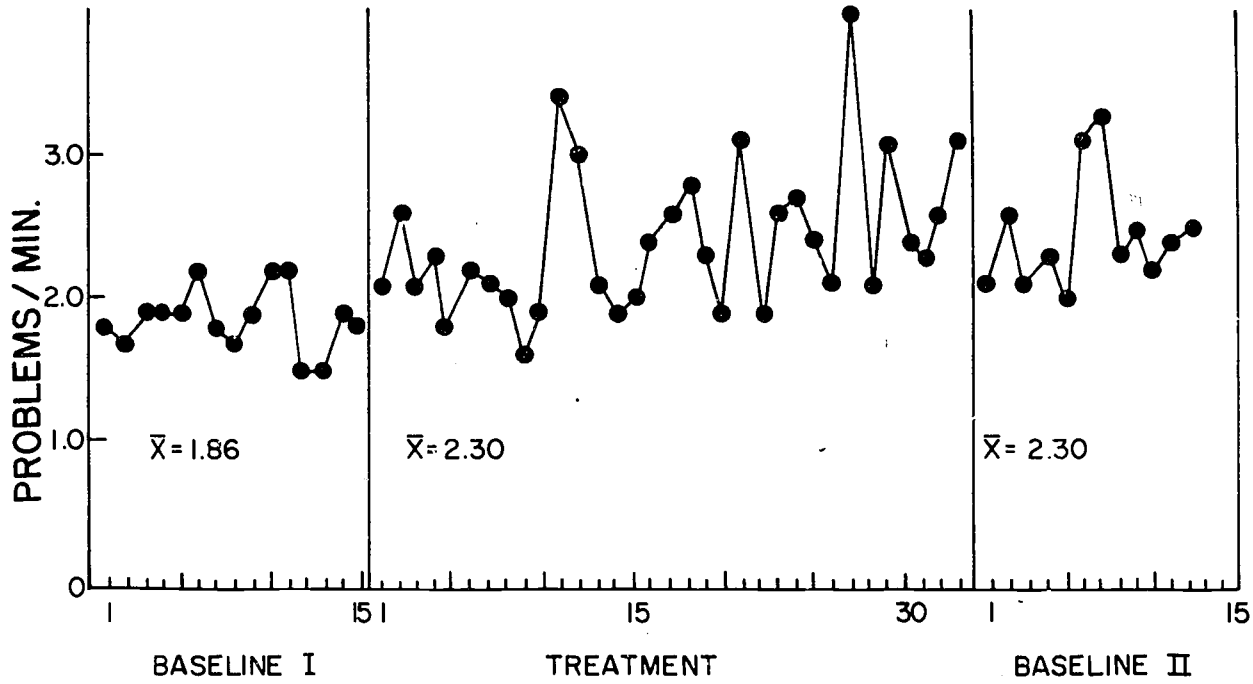

Fig. 2. Rate of work output: The number of exercises and problems completed divided by the number of minutes.

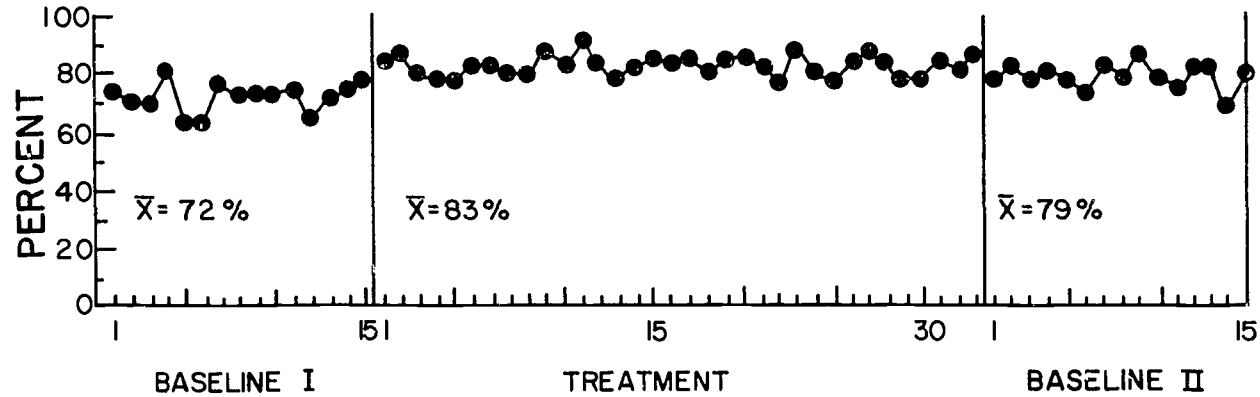

Fig. 3. Accuracy of output: The number of problems and exercises completed correctly divided by the total attempted.

OBSERVATION DAYS
(Every Other Day is Plotted)

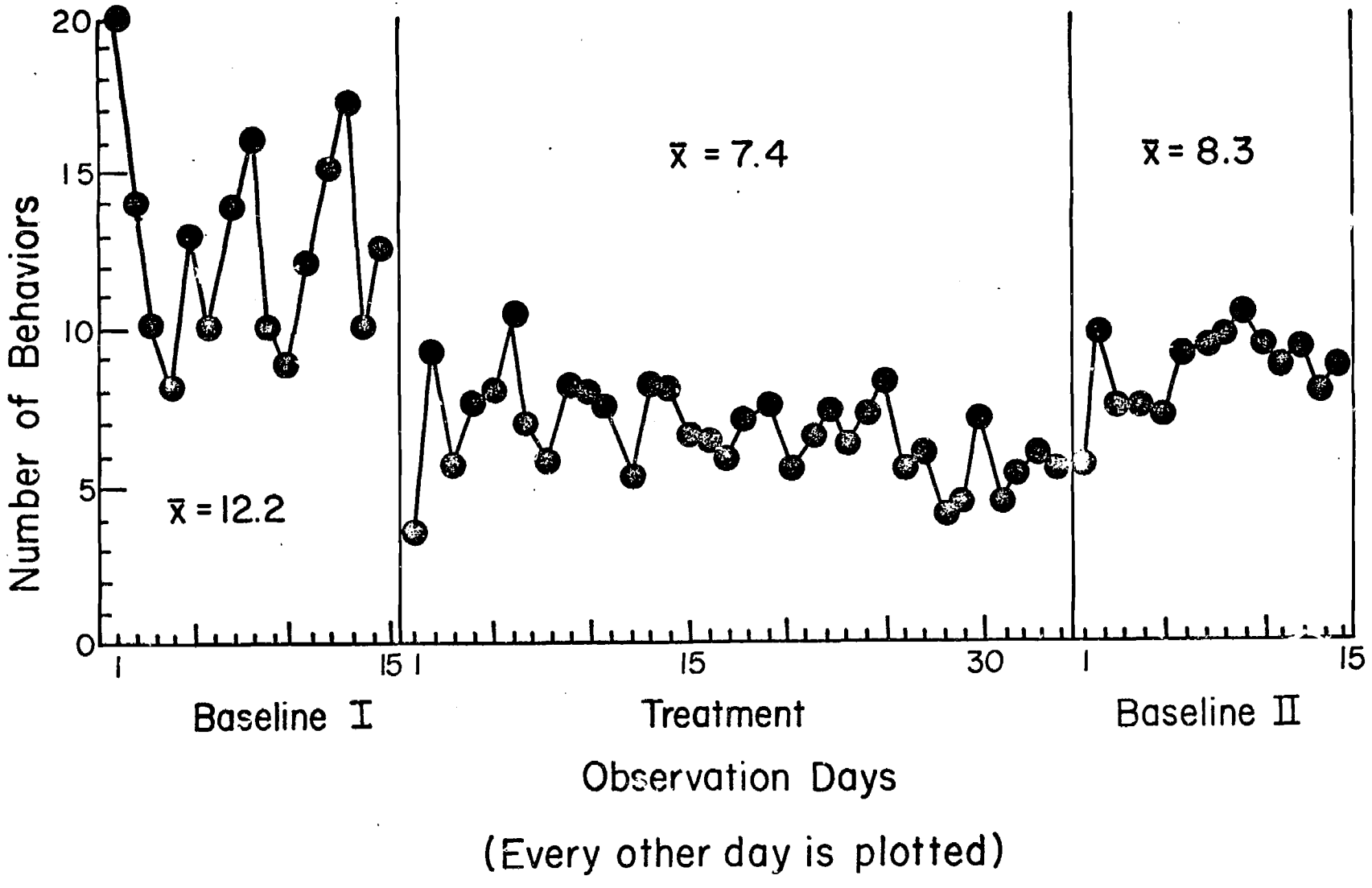

Figure 4. Disruptive Behavior: The Average Number of Disruptive Acts Per Hour For Each Student.