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ABSTRACT

The purpose of this investigation was to evaluate a microcounseling technique, microtechnology, with regard to its effects on three measures of cooperation in young children. A 3x3x2 factorial analysis of covariance was carried out on two of the three measures, with three grade levels, three levels of teacher involvement with microtechnology, and two levels of student involvement with microtechnology. The third cooperation outcome was analyzed within a multiple time series design. Results indicated that microtechnology was effective under both student and teacher combinations, but that effects were short term. (Author)

The Effectiveness of Microtechnology in Teaching Cooperative Behavior to Elementary Children

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Abstract

The purpose of this investigation was to evaluate a microcounseling technique, microtechnology, with regard to its effects on three measures of cooperation in young children. A 3 x 3 x 2 factorial analysis of covariance was carried out on two of the three measures, with three grade levels, three levels of teacher involvement with microtechnology, and two levels of student involvement with microtechnology. The third cooperation outcome was analyzed within a multiple time series design. Results indicated that microtechnology was effective under both student and teacher combinations, but that effects were short term.

There has been considerable interest in investigating cooperation and cooperative behaviors, especially with regard to pre-school and elementary school children. The early research of Madsen and his colleagues (Kagan & Madsen, 1969; Madsen & Shapira 1970; Shapira & Madsen 1969) reported cross-cultural and subcultural differences of cooperative and competitive behaviors. The literature expanded as Johnson and Johnson (1974, 1975) defined classroom practices as having cooperative, competitive and individualistic goal structures. Research was conducted to determine what interpersonal and intrapersonal experiences occur within each context, and how these learning structures influence learning outcomes, attitude towards school and other variables. (French, Brownell, Graziano, & Hartup 1977; Johnson & Ahlgren 1976; Johnson, Johnson, Johnson & Anderson 1976; Slavin & Tanner 1979; Tjosvold & Johnson 1978). In an attempt to clarify the concept, studies have also explored the relationship of cooperation to self-concept (DeVoe 1977; Kagan & Knight 1979; Vance & Richmond 1975), cognitive styles (Lopez 1977) age (Green & Schneider 1974; Leimbach & Hartup 1981; Sgan & Pickert 1980; Vinackle & Gullickson 1964), locus of control (Henderson & Hennig 1979), and institutionalization (Bauer & Krivohlavy 1974).

Cooperation has also been the focus of another research thrust. How to teach this prosocial behavior, or how to increase its occurrence has been researched. The use of modeling has been effective in increasing cooperative behavior in the laboratory and in the natural environment (Siegel 1980), with boys (Naylor 1977; Petrimoulx 1977), preschool, kindergarten and elementary age children (Funk 1975; Robak 1977; Theroux 1975), and with retarded adults (Samaras & Ball 1975; Thompson 1978). Another successful technique has been the use of reinforcers or incentives. These reinforcers include tangible

reinforcers (Altman 1971; Andrews & Krantz 1982; Larsen, Andrews & Sturgill 1977; Nacson and praise (Serbin, Tonick & Sternglanz 1977; Slaby and Crowley 197 oe (1976) presented a model of teaching cooperation that incorporated sful modeling and reinforcement techniques with rehearsal. The use of this microtechnology, resulted in statistically significant increase in coopera. ve behavior in children. The purpose of this study is to replicate the DeVoe study.

Specifically, the purpose of this investigation was to evaluate a micro-counseling technique in terms of how effective it is in teaching cooperative behaviors to children. The technique, called microtechnology, was examined with respect to both students and teachers in third, fourth, and fifth grade classrooms. Microtechnology features: (1) the child watches a recorded demonstration, (2) the child views a model of cooperative behavior on videotape, (3) the child discusses the prosocial behavior, (4) the child reviews the initial demonstration, (5) the child discusses the initial demonstration in relation to the model demonstration and how to apply the behavior in other settings, and (6) the child demonstrates the behavior again. Three types of outcomes were assessed: (1) performance by pairs of children on the Cooperation-Competition Game (Kagan & Madsen 1971), (2) performance on the Cooperation-Triad Measure (DeVoe 1976), and (3) observations of incidents of cooperation within the classroom setting.

The question of teacher and student involvement in the microtechnology process was of primary interest: Is the extent to which children display cooperative behaviors a function of the degree of training in microtechnology procedures of teachers, of students, or both? While students may exhibit cooperative behavior as a result of being taught by their teachers through the application of microtechnology procedures, they may also demonstrate such behavior after observ-

ing their teachers engaging in cooperative behavior, especially if that behavior leads to a desired reinforcement. Furthermore, students trained in microtechnology techniques may benefit from the opportunity for self-directed learning and assume greater responsibility for acquiring the skills of working harmoniously to achieve some goal. Therefore, teacher involvement was conceptualized in two different ways: (1) teachers using microtechnology in an instructional sense to teach children cooperative behaviors, and (2) teachers modeling cooperative behaviors to be imitated by the children. Student involvement was conceptualized as students using microtechnology procedures under their own initiation and direction.

Microtechnology is a set of techniques designed to teach children prosocial behaviors. Is is derived from Ivey's (1971) microcounseling model. The microcounseling approach is characterized by the use of videotape models, self-confrontation, written models, and systematic reinforcement of responses in the training of teachers and counselors. Although microcounseling has been shown to be effective in a variety of settings, among them paraprofessional training (Haase, Dimattia, & Guttman 1970), school counselor training (Higgins, Ivey, & Uhlemann 1970), and training eighth graders in attending behavior (Aldridge 1971) only two studies have been identified that adapt this set of procedures for application to young children (DeVoe 1976; DeVoe and Sherman 1974). DeVoe reported that this approach was effective in teaching groups of third grade students cooperative behavior outside the classroom setting.

Recent reviews of the literature on cooperative learning (Sharan 1980; Slavin 1980) have revealed no studies evaluating the microtechnology techniques in relation to cooperation among students in schools.

The following hypotheses provided the focus for the investigation: (1) students taught by teachers using microtechnology techniques will display more

cooperative behavior in terms of helping each other achieve some common goal than students whose teachers do not employ microtechnology; (2) students taught by teachers modeling cooperative behavior will display more cooperative behavior than students of teachers who do not model cooperative behavior; (3) students applying microtechnology techniques among themselves will demonstrate more cooperative behavior than students not using microtechnology procedures.

Method

Subjects

Students and teachers in two third, two fourth, and two fifth grade classrooms in each of three public schools were identified. These public schools were located in a middle class suburban community in the northeast.

Design

The following treatment conditions were randomly assigned to six classrooms at each grade level:

(a) teacher involvement

(1) teacher applying microtechnology,

(2) teachers modeling cooperation, and

(3) control (teachers using neither microtechnology nor modeling in an intentional or deliberate sense);

(b) student involvement

(1) students using microtechnology, and

(2) control (students not using microtechnology intentionally).

Thus, a 3 x 3 x 2 factorial design, with three grade levels, three levels of teacher involvement, and two levels of student involvement, was used to

analyze the data obtained from the two measures of cooperative behavior. An analysis of covariance was carried out on scores from each of the dependent variables, the Cooperation-Competition Game and the Cooperation-Triad measure, with the pretest serving as a covariate in each analysis. To appraise the naturalistic manifestations of cooperation within the classroom milieu, a multiple time series design was employed. Each experimental group was observed for ten days before and ten days following the application of the treatment conditions.

Procedures

The teachers were randomly assigned to treatments, either microtechnology, modeling, or no treatment. Then each class was randomly assigned to treatments, either microtechnology or no microtechnology.

Teachers received one of the following treatments.

Microcounseling

The teachers were randomly grouped into triads and participated in the following:

Step 1: The triad was told, "I will give you these six objects, and you will have 10 minutes to make something as a group."

Step 2: After the 10 minutes had elapsed, the triad was told, "I would like you to watch another group in a similar situation." The group viewed a videotape showing three 9-year-old children working on a house together after they had been given the task of building shelter from the six objects given to them. The group was seen sharing ideas, agreeing on what to construct, treating materials as belonging to the group, and building the shelter together. The students listened to one another, allowed

others to use their own materials and commented when group members did a good job.

Step 3: The triad was then asked, "Could you tell me what happened in the videotape you just saw?" The triad discussed how and why the videotape group cooperated.

Step 4: The triad was then asked to look at their completed task and describe it.

Step 5: The triad compared their own activity to the activity of the group in the videotape. The group discussed other possible situations in the classroom where they might cooperate.

Step 6. The triad was then instructed to make something as a group from six objects. After 10 minutes had elapsed, the triad discussed their second project.

Modeling

The teachers participated in a training session that included (1) definition of modeling, (2) definition of cooperation, (3) rehearsal of cooperating actions in the classroom.

They then were instructed to include these cooperating actions in their repertoire of classroom behaviors.

Control

The teachers in this group did not receive any treatment. They were associated with the investigation as the counselor works with each individual classroom with the microtechnology process.

The students, randomly assigned to both experimental (microtechnology) and control groups, had the following experiences.

Experimental

The counselor randomly divided the classroom into triads.

Step 1: The triad was told, "I will give you these six objects, and you have 10 minutes to make something as a group."

Step 2: After the 10 minutes had elapsed, the triad was told, "I would like you to watch another group in a similar situation." The group viewed a videotape showing three 9-year-old children working on a house together after they had been given the task of building shelter from the six objects given to them. The group was seen sharing ideas, agreeing on what to construct, treating materials as belonging to the group, and building the shelter together. The children listened to one another, allowed others to use their own material and commented when group members did a good job.

Step 3: The triad was then asked, "Could you tell me what happened in the videotape you just saw?" The triad discussed how and why the videotape group cooperated.

Step 4: The triad was then asked to look at their completed task and describe it.

Step 5: The triad compared their own activity to the activity of the group in the videotape. The group discussed other possible situations in the classroom where they might cooperate.

Step 6: The triad was then instructed to make something as a group from six objects. After 10 minutes had elapsed, the triad discussed their second project.

The day after treatment, the students in the classroom played the Competitive-Cooperative Game.

Control

The classrooms in this group did not receive the microtechnology process. The students in the classroom were randomly assigned to triads and played games with the counselors for 30 minutes. The day after treatment the students were randomly paired with a non-subject peer and participated in the Cooperative-Competition Game.

During the two week period after treatment, the students were observed and their cooperative behavior recorded. The observers viewed the students once each day, 30 minutes a day and recorded the behavior once a minute. Time sampling was utilized. The observation measures were taken at different times during the school day in order to achieve a more representative measure of cooperating behavior.

Instruments

Cooperation-Competition Game. The purpose of the Cooperation-Competition Game is to provide a controlled situation in which pairs of children can exhibit cooperative and/or competitive behavior. The game is a circle matrix board designed by Kagan and Madsen (1971) to study cooperation and competition among three subcultures. Each child of a pair takes turns moving a marker to adjacent circles, where the fewer the moves indicates cooperation between children in reaching a predetermined goal. Each pair plays four times, and each trial terminates after a goal is reached or when all twenty allotted moves are made. Children were assigned to pairs at random. The score represents each pair's performance.

Cooperation-Triad Measure. The Cooperation-Triad Measure requires each triad of children to make something out of six objects within ten minutes. After completing the task, each group is given a cooperation score based on the following

criteria: (a) Score of 1 is assigned if the children in the triad did not work on the same task; each child either produced his or her own project, or did not produce anything. (b) Score of 2 is assigned if the children did not work together on one task; each produced a similar project. (c) Score of 3 is assigned if the children worked on and produced one task. Children were randomly assigned to triads. The score represents each triad's performance.

Naturalistic Observation. The frequency of occurrence of cooperative behaviors was recorded using an observation scale based on four types of cooperative behaviors: (1) sharing, (2) giving assistance, (3) seeking assistance, and (4) active listening. Three observers were trained in the use of the scale with four videotapes and six classrooms independent of the study. Of the six classrooms, three were observed on three different occasions. An estimate of the reliability of the three observers, using an analysis of variance procedure (Winer 1971), was found to be .93. Each classroom was observed for 30 minutes each day, with the time block randomly selected for each classroom each day. Observers were naive as to the purpose of the investigation.

Data Analysis

A hierarchical multiple regression analysis was used to conduct the analyses of covariance (Cohen & Cohen 1975). Relevant programs were selected from SPSS (Nie et al. 1975) and from BMDP (Dixon & Brown 1977) to perform the data-analytic procedures on a Control Data Corporation CYBER 730 computer.

Results

The analysis of covariance of the triad scores yielded a significant main effect due to student involvement, with F (1,182) = 57.08, p. 00001. A significant main effect due to teacher involvement was also revealed F (2,182) = 5.273,

p. .01. None of the interactions were significant, and so were pooled with the residual. To assess the magnitude of the effects, a hierarchical multiple regression analysis was conducted. After the relationship between the triad scores and the covariate was accounted for (41% of the triad score variance is shared with the pretest score variance), it was determined that an additional 15% of the variance of the triad scores is explained by student involvement, but less than 4% of the triad score variance is explained by teacher involvement.

Post hoc analyses, using Tukey's honestly significant difference (Winer 1971), revealed mean performance on the triad measure for both teacher microtechnology and teacher modeling to be significantly greater than teacher control, but not significantly different from each other. Mean performance of student microtechnology was significantly greater than mean performance of student control. Table 1 shows the means and standard deviations of the groups.

The analysis of covariance of the cooperation-competition scores yielded a significant main effect due to grade ($F(2,548) = 6.45$, $p < .00001$), student involvement ($F(1,548) = 2.013$, $p < .00001$), and teacher involvement ($F(2,548 = 41.53$, $p < .00001$). The hierarchical multiple regression analysis showed that, after the pretest was taken into account (3%), student involvement explained almost 66% of the variance in the posttest scores. Teacher involvement accounted for slightly over (28%) of the variance. Although the interactions were found to be significant ($p < .05$), none explained more than 1% of the variance. The sheer number of observations probably contributed to the significant interactions.

Post hoc analyses were performed on the means of the students involvement and teacher involvement groups, using Tukey's honestly significant difference procedure. Students in the microtechnology condition took fewer moves, on the average, than students in the control condition. Students have teachers in

both the microtechnology and modeling conditions took fewer moves, on the average, than students of teachers in the control condition. Students of teachers in the microtechnology and modeling conditions did not differ significantly from each other in terms of number of moves. Table 2 describes the means and standard deviations.

In general, inspection of the graphs in Figures 1, 2 and 3 summarizing the time series analysis reflects a substantial increase in level of cooperative behaviors for student involvement with all three conditions of teacher involvement. Of the three conditions of teacher involvement, the control group shows the weakest effect with student involvement over the three grades.

Insert Tables 1 and 2 and Figures 1, 2, and 3

Discussion

The result of this study supports the findings of the earlier study reported by DeVoe (1976).

Hypothesis one, students taught by teachers using microtechnology techniques will display more cooperative behavior than students whose teachers do not employ microtechnology, was supported. Evidence from all three dependent measures is consistent. Microtechnology in the hands of teachers seem to be beneficial in promoting cooperative behavior in students in this particular sample. Hypothesis two, students taught by teachers modeling cooperative behavior will display more cooperative behavior than students of teachers who do not model cooperative behavior, was also supported. It does not seem to make any difference whether a teacher is using microtechnology or serving as a model; both are equally effective in fostering cooperative behavior in students, at least in the sample of

the study. Finally, hypothesis three, students applying microtechnology techniques among themselves will demonstrate more cooperative behavior than students not using microtechnology procedures, was supported as well. The magnitude of the effect of student involvement was substantially greater than the magnitude of the teacher involvement effect, even though both attained significance. However, the effects seem to diminish with time. Microtechnology, especially in the hands of students, does seem to have some short term transfer to the classroom, at least within the limits of this investigation.

A direction for future research might be student modeling of cooperative behavior. Perhaps the comparatively powerful effect of student involvement could, in part, be attributable to students imitating other students in the microtechnology condition. The novelty of the procedures may have contributed to its apparent influence as well. The components of the microtechnology process could be appraised separately and in various combinations to determine their relative importance.

Future research supports the test of generalizability of the microtechnology technique. This generalizability defined as the occurrence of the specific behavior under non-laboratory conditions was the focus of a study by Reisinger (1978). Generalization of learned cooperative behavior was observed in a small group of pre-school children. This research is supported by results with preschool children (Siegel 1980), however Sagotsky, Wood-Schneider, & Konop (1981) found first graders did not generalize their behavior but third graders did. The profoundly retarded adults also did not generalize the cooperation learned in the laboratory situation (Samaras & Ball 1975). The research to date does not clearly support a technique that insures generalizability.

The findings of this study show that a deliberate, systematic approach to teaching cooperative behavior in young children within a classroom setting

can yield positive consequences, without leaving this important class of pro-social behaviors to chance.

Research on cooperative-competitive behavior in schools indicates that co-operation is the exception and competition is the rule. Not only do children perceive schools as being competitive (Johnson 1973), the older children get and the longer they remain in school, the more competitive they become (Madsen 1971). That is not to say that competition is all bad, or that it can not be used in a constructive sense, but rather that the disproportionate emphasis, by virtue of instruction and evaluation, can inhibit rather than facilitate the learning process of children (Holt 1972; Kohl 1969; Lindgren 1967).

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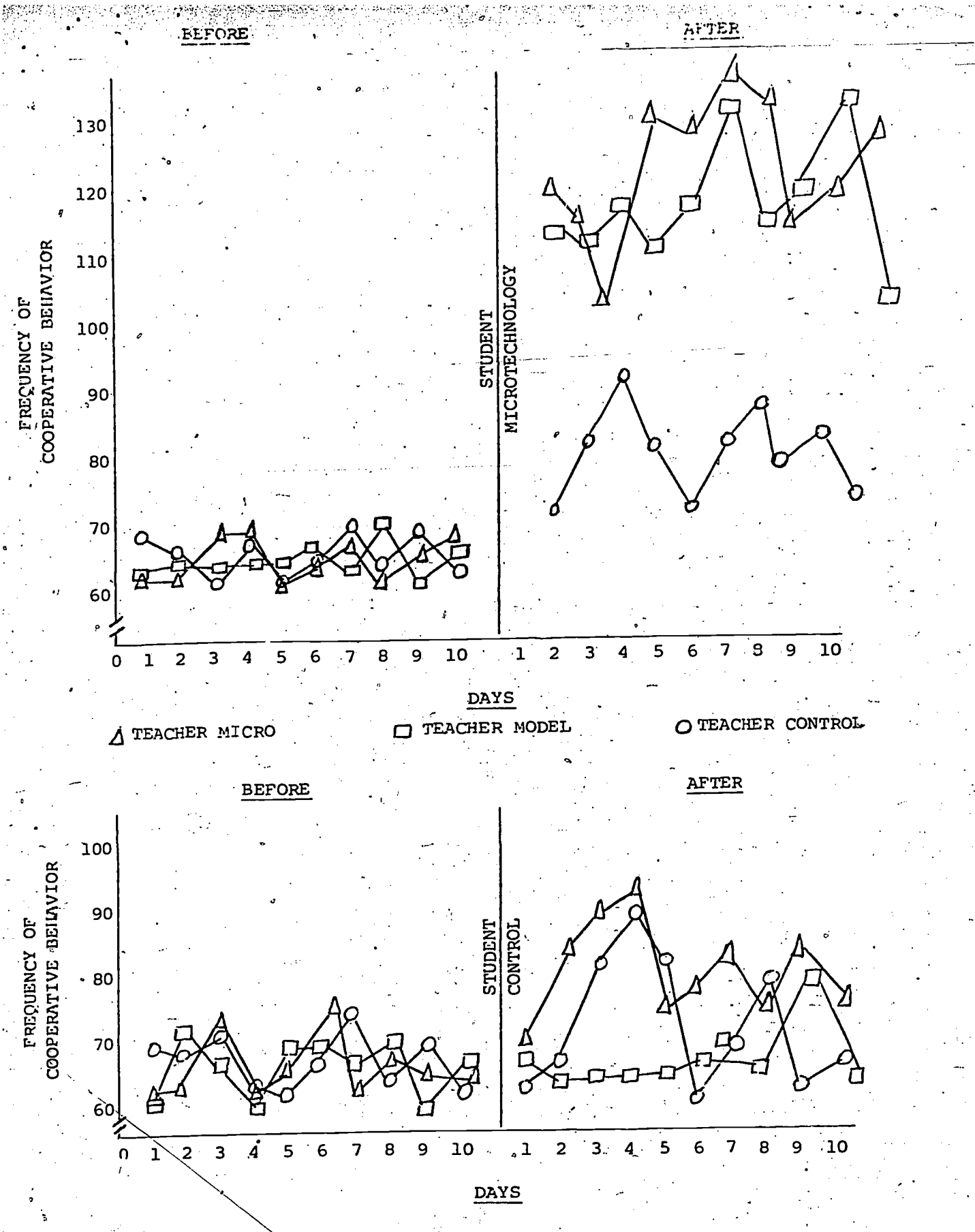

Figure 1. Observations of cooperative behavior before and after treatment for the third grade students.

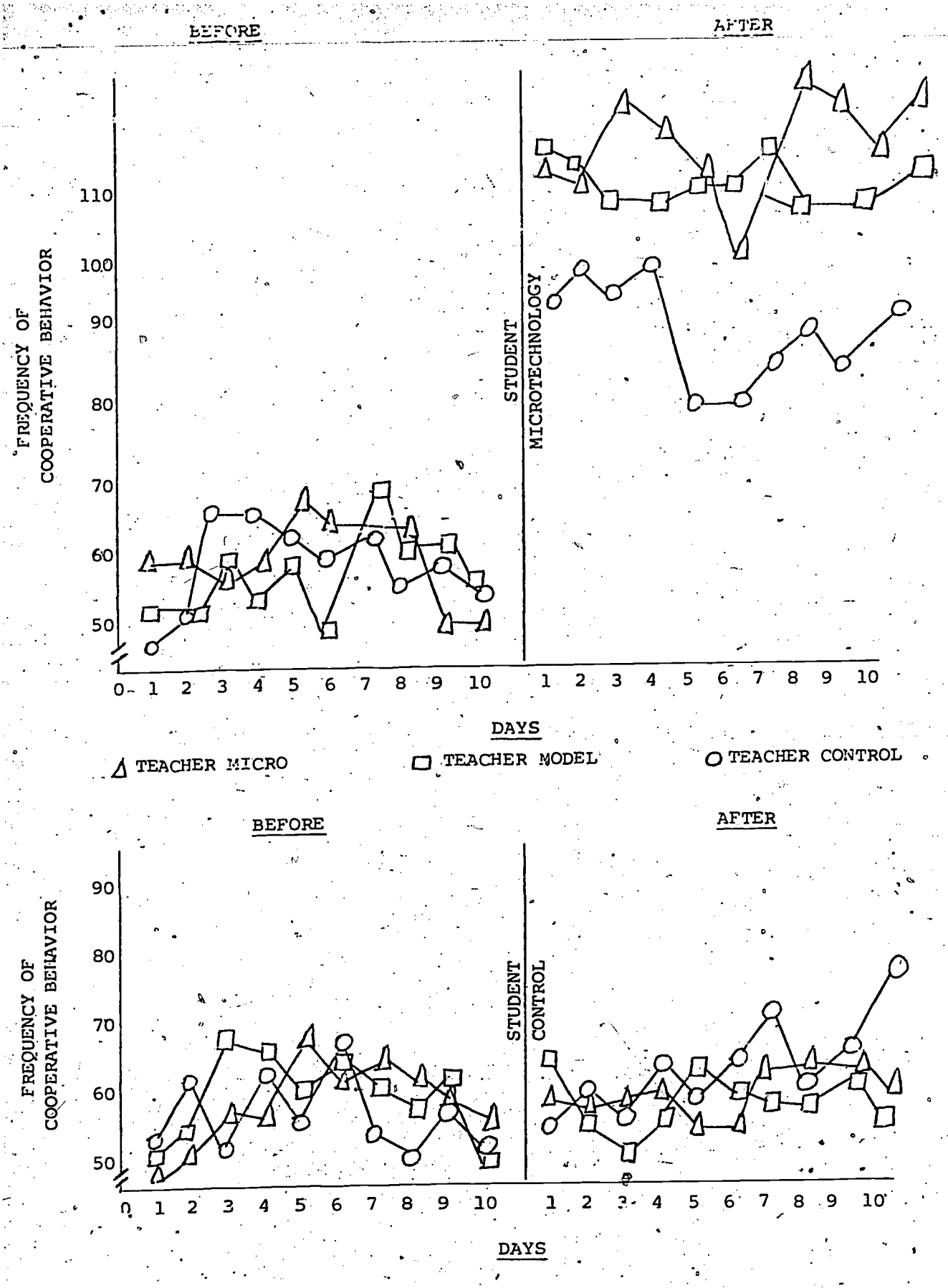

Figure 2. Observations of cooperative behavior before and after treatment for the fourth grade students.

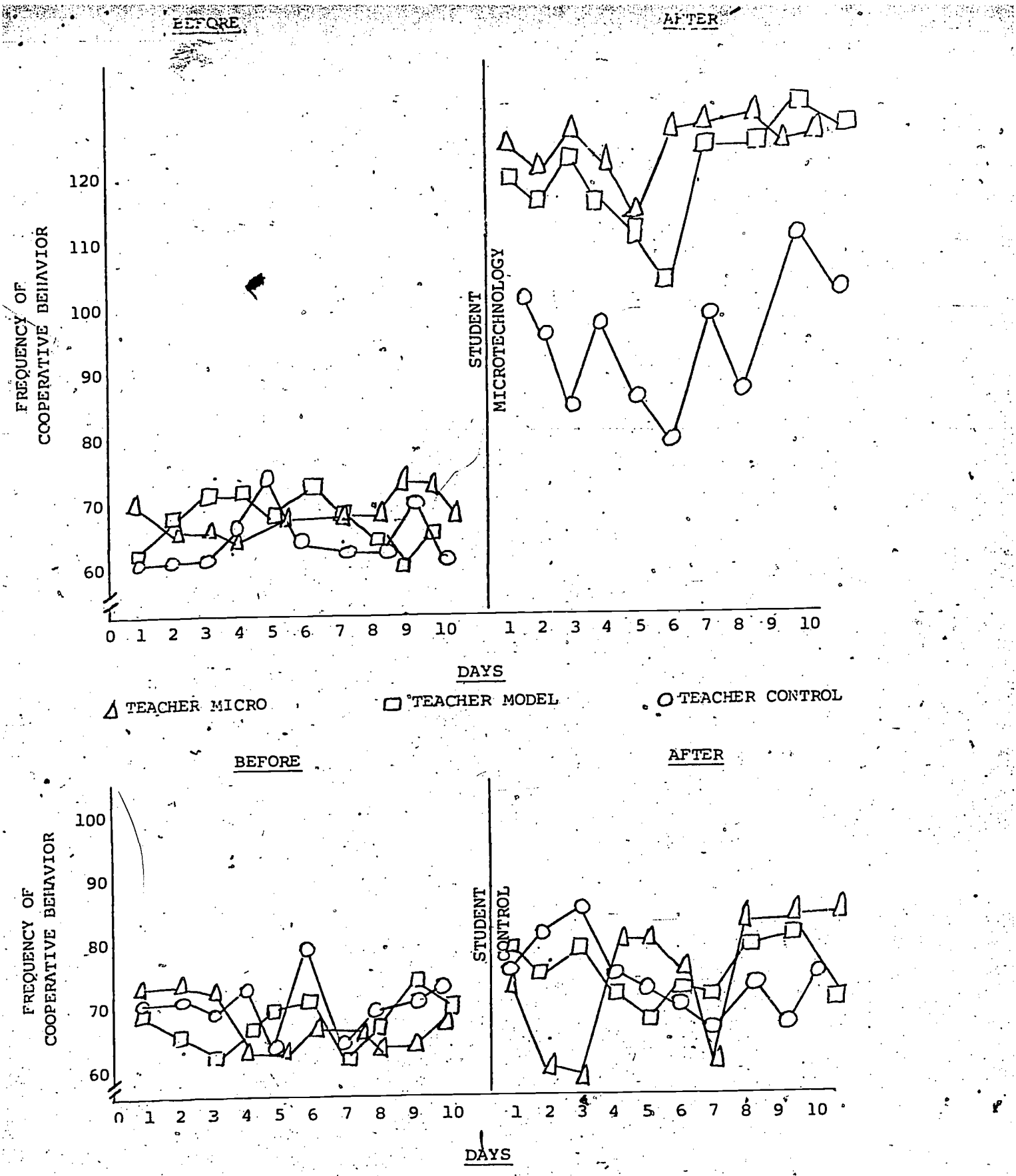

Figure 3. Observations of cooperative behavior before and after treatment for the fifth grade students.

Table 1

Pre and Post Triad Means and Standard Deviations for Grades and Treatments

THIRD GRADE

		Student Pre	Micro Post	N[a]	Student Pre	Control Post	N
Teacher Micro	$\bar{X}$	1.62	2.44	14	1.69	1.72	12
	SD	.90	.77		.95	.95	
Teacher Model	$\bar{X}$	1.38	2.19	13	1.45	1.39	12
	SD	.83	.86		.81	.70	
Teacher Control	$\bar{X}$	1.57	1.75	13	1.48	1.60	12
	SD	.89	.89		.70	.79	

FOURTH GRADE

		Student Pre	Micro Post	N[a]	Student Pre	Control Post	N
Teacher Micro	$\bar{X}$	1.49	2.20	12	1.58	1.49	10
	SD	.79	.71		.83	.69	
Teacher Model	$\bar{X}$	1.47	2.30	10	1.62	1.72	11
	SD	.86	.86		.79	.87	
Teacher Control	$\bar{X}$	1.49	2.01	11	1.29	1.34	11
	SD	.69	.93		.69	.52	

FIFTH GRADE

		Student Pre	Micro Post	N[a]	Student Pre	Control Post	N
Teacher Micro	$\bar{X}$	1.19	2.12	10	1.37	1.74	11
	SD	.69	.92		.65	.92	
Teacher Model	$\bar{X}$	1.57	2.42	10	1.56	1.74	11
	SD	.88	.72		.92	.86	
Teacher Control	$\bar{X}$	1.65	2.00	10	1.67	1.36	11
	SD	.95	.86		.86	.72	

[a] Number of Triads

Table 2

Pre and Post Game Means and Standard Deviations for Grades and Treatments

THIRD GRADE

		Student Micro			Student Control		
		Pre	Post	N	Pre	Post	N
Teacher Micro	$\bar{X}$	46.04	16.98	37	50.92	49.62	30
	SD	11.01	6.92		4.65	4.92	
Teacher Model	$\bar{X}$	48.62	16.30	34	51.89	51.33	33
	SD	8.42	3.86		4.99	5.92	
Teacher Control	$\bar{X}$	52.89	19.99	38	53.01	50.04	38
	SD	4.78	7.98		7.18	6.79	

FOURTH GRADE

		Student Micro			Student Control		
		Pre	Post	N	Pre	Post	N
Teacher Micro	$\bar{X}$	49.12	12.12	37	48.12	46.80	32
	SD	5.33	6.12		7.16	12.13	
Teacher Model	$\bar{X}$	52.03	17.62	28	55.32	53.45	32
	SD	4.85	8.13		4.53	5.72	
Teacher Control	$\bar{X}$	48.75	23.58	29	50.12	52.79	28
	SD	8.98	12.82		6.22	5.89	

FIFTH GRADE

		Student Micro			Student Control		
		Pre	Post	N	Pre	Post	N
Teacher Micro	$\bar{X}$	48.72	16.17	28	48.78	52.81	35
	SD	5.50	7.02		5.02		
Teacher Model	$\bar{X}$	48.71	18.03	31	53.70	50.62	35
	SD	6.53	8.33		5.13	6.02	
Teacher Control	$\bar{X}$	48.30	48.35	29	49.23	49.02	29
	SD	8.99	9.01		12.08	6.98	