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ABSTRACT

This study was designed to investigate differential achievement effects of cooperative learning instruction in mathematics on students who seek group membership and on those who do not. The study was conducted in a suburban school district in Colorado. Participants were 3 classes of 5th-grade students (N=56) along with teachers who had received extensive training in cooperative learning methodology. At the beginning of the school year the Fundamental Interpersonal Relations Orientation B (FIRO-B) was administered to students. In addition, students were pre-tested in October and post-tested in May on the mathematics scale of the SRA Survey of Basic Skills achievement test. Teachers provided an average of 32 percent of mathematics instruction using cooperative learning methodology. Results suggest that something other than a desire for group membership mediates academic success; and regardless of a student's desire to participate, cooperative learning is equally effective in terms of achievement measures. Thus, students can be instructed in both academic and social skills simultaneously without concern for socialization or isolation references. (Contains nine references.) (LL)

Cooperative Learning Instruction: Effects of Wanting or Not Wanting to Participate On Mathematics Achievement

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Introduction

The room was arranged so that three or four student desks were pushed together to form a group. In this setting, students appeared to be working together to solve a mathematical problem their teacher had just presented to them. There was no shouting or horseplay. One student in each group was acting as "recorder" and writing down the suggestions and ideas for solving the problem. Students were taking turns and listening to each other, reflecting or rephrasing what the other had just said, and encouraging one another with words of support and praise. The teacher was silently observing her students, and taking notes about what she saw and heard. Later they would "debrief"--discussing possible solutions to the mathematics problem, and evaluating how they performed as a group working together to solve the academic problem.

This model of cooperative learning instruction was being implemented by the classroom teacher not only for mathematics instruction, but also for language, social studies, and science instruction. She believes that learning to work together is as important for students as learning specific academic content. Further, she sees cooperative learning as an instructional alternative to the issues of grouping and equity.

She is not the only one who holds those beliefs. When asked what educators can do to better prepare students to function in the world of work, business and industry responds: teach them how to work cooperatively to solve a problem (personal communication, Hank Zentgraf, IBM Consultant, November 16, 1990). Yet, schools are frequently viewed as competitive environments were students compete for grades, for instructional time, and for adult and peer attention. However, cooperative learning has been proposed as an instructional model that will reduce competition and further cooperation within a classroom or school environment.

Findings from studies of cooperative learning instruction are generally positive, although somewhat dependent upon the particular method of cooperative learning instruction being used and the measures used to identify outcomes. There are numerous studies which document positive effects of cooperative learning on student achievement, but Slavin reports that cooperative learning methods that consistently increase student achievement are those that provide a group reward for individual learning (Slavin, 1983). Studies have also investigated the effectiveness of cooperative learning as it compares with competitive and individualistic learning situations (Johnson, Johnson, and Anderson, 1978). Others have examined the effect of pre-interaction influences such as prejudice, mistrust, and negative attitudes on cross-ethnic and cross-handicapped groupings in cooperative learning situations (Cosden, Pearl, and Bryan, 1985; Madden & Slavin, 1983; Sharan, 1980; Slavin, 1980).

However, no studies could be found which assessed the effect of differences in socialization preferences on cooperative learning instruction. The degree to which an individual seeks-out or avoids interaction with others may mediate the effectiveness of cooperative learning instruction. Johnson and Ahlgren (1976) theorized that a highly social person may be able to cooperate and compete appropriately, while a nonsocial person may want to avoid people and therefore may not want to cooperate .. compete, but no studies that investigated this hypothesis could be found.

This study was designed to investigate differential achievement effects of cooperative learning instruction for those who seek group membership (scoring high on measures of

Wanted Inclusion), and those who do not seek group membership, scoring low on measures of wanted inclusion. Such an attempt to understand which children will benefit more from cooperative learning instruction is an important contribution to both the cooperative learning and adaptive education research.

Method

Subjects

This study was conducted in a middle-sized suburban school district in Colorado. Three classes of fifth-grade students participated in this study. The district has a high minority student population (43%) and a large percentage of the students are identified as low SES based on eligibility for free or reduced lunch (47%). Because of high transience throughout the district (percentage varies by school, but the district averages a 44% turnover rate each academic year), only 56 of the students in this study who began the school year remained in their respective classes for the entire school year. These 56 students were enrolled in classes of teachers who had volunteered to participate in the study. These teachers had all received extensive training in cooperative learning methodology, and all three teachers frequently served as resources to other district teachers who had questions about implementation or who wanted to observe cooperative learning instruction. Two of the teachers taught staff development classes and made state-wide presentations on cooperative learning instruction.

Procedures

At the beginning of the school year students were administered the FIRO-B, a "measure of a person's characteristic behavior toward other people in the areas of *inclusion*, *control*, and *affection*" (Schutz, 1978, p. 4). Positive inclusion is defined as a relationship in which people wish to associate, attend to, join, or communicate with one another, while negative inclusion is characterized by self exclusion or isolation (Schutz, 1978). The technical manual indicates acceptable reliability and validity data and reports coefficients of stability (test-retest) ranging from .71 to .82 for the FIRO-B subscales (.75 for the *Wanted Inclusion* subscale) as well as data on both content and concurrent validity studies. For this study neither students nor teachers were aware of the scores obtained on the FIRO-B.

In addition, all students were pre-tested in October and post-tested in May on the Mathematics scale of the SRA Survey of Basic Skills achievement test. The Mathematics scale includes three subtests: Computation, Concepts, and Problem Solving, as well as a Total Mathematics score. Test norms from 1986 were used for scoring purposes, and NCE gains were calculated by subtracting 1990 obtained NCE scores from 1989 obtained NCE scores.

Teachers were asked to provide an average of 40% (at least two mathematics lessons a week) of the mathematics instruction using cooperative learning methodology; however, students received an average of only 1.6 mathematics lessons per week using cooperative learning strategies. Teachers documented the frequency of these lessons, and were observed by the researchers to document their adherence to the model.

Results

The FIRO-B questionnaire was scored and Wanted Inclusion ratings obtained according to the FIRO-B clinical interpretation manual which categorized results on a zero to nine scale. Students scoring in the 0-3 range were designated as "low" in wanted inclusion, while student scoring in the 7-9 range were designated as "high" in wanted inclusion. Twenty of the fifty-six students were identified as low in wanted inclusion, while thirteen were designated as high in wanted inclusion.

Means and standard deviations for students scoring high or low in wanted inclusion by SRA subtests are reported in Table 1.

Table 1
SRA Mean NCE Gain Scores and Standard Deviations
For Students Scoring Low, Middle, or High
On FIRO-B Wanted Inclusion Scale

	N	Computation Mean	(s)	Concepts Mean	(s)	Problem Solving Mean	(s)	Math Total Mean	(s)
Low "WI"	20	14.95	20.72	10.35	17.42	-.25	12.14	9.95	12.60
Middle "WI"	23	9.95	18.07	7.30	16.38	.87	13.42	8.39	15.06
High "WI"	13	16.00	17.50	3.00	15.67	7.38	13.55	9.23	11.31

Although differences between means for students scoring "High" and "low" in Wanted Inclusion appear large for both the Concepts and Problem Solving subtests an ANOVA of gain scores indicated no difference were statistically significant (for Computation, $F(1, 32)$ = .023. p = .881; for Concepts, $F(1, 32)$ = 1.514, p = .228; for Problem Solving, $F(1, 32)$ = 2.846, p = .102; Total Math, $F(1, 32)$ = .028, p = .869). ANOVA tables are reported in Appendix A. ANOVA comparisons were also made among all three groups. No significant differences were identified.

Because of the small and unequal sample size the data was also analyzed using the Mann-Whitney U procedure. This is a non-parametric alternative to the student's t for two independent samples. The statistic operates with better than 95% of the power of the parametric t and is especially appropriate with small samples where violation of homogeneity of variance may be a concern. Again, no differences were reported to be statistically significant (for Computation, 2-tailed p = .8971; for Concepts, 2-tailed p = .2608; for Problem Solving, 2-tailed p = .1919; for Total Math, 2-tailed p = .6184).

Discussion

Some caution must be used in interpreting these data--the sample size was small and groups were not equal. Further, the treatment was not intense: only about 32% of mathematics instruction was delivered using a cooperative learning model. Still, the findings are somewhat encouraging regarding the academic results of cooperative learning instruction even when students are less than eager to seek group relationships.

The findings suggest that something other than "desire for group membership" is mediating academic success in cooperative learning instruction. If replications of this study, with a larger sample, support this finding, there are important implications for instructional practice. There are a growing number of students entering public school setting with poor or minimal socialization skills. Findings from this study indicate that regardless of a student's desire to participate, cooperative learning is equally effective in terms of achievement measures. Thus, students can be instructed in both academic and social skills using cooperative learning methodology without concern regarding the socialization or isolation preferences of individual students. As there appear to be a growing number of students entering school who lack good social schools cooperative learning instruction would seem to be both an efficient and effective way to deal with both socialization and academic needs simultaneously.

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Appendix A
ANOVA Summary Tables

A. Computation Gain by Wanted Inclusion

Source of Variance	df	MS	F	p
Main Effects				
Index	1	8.686	.023	.881
Residual	31	381.579		

B. Concepts Gain by Wanted Inclusion

Source of Variance	df	MS	F	p
Main Effects				
Index	1	425.632	1.514	.228
Residual	31	281.050		

C. Problem Solving Gain by Wanted Inclusion

Source of Variance	df	MS	F	p
Main Effects				
Index	1	595.234	2.446	.102
Residual	31	161.382		

C. Math Total Gain by Wanted Inclusion

Source of Variance	df	MS	F	p
Main Effects				
Index	1	4.076	.028	.869
Residual	31	146.750		