COOPERATIVE LEARNING GROUPS

Cooperative Learning Groups at the College Level

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Abstract

The effects of cooperative learning study teams on exam performance were examined for 384 undergraduate students enrolled in one of 10 large sections of an introductory educational psychology course over a two-semester period. Students were assigned to 5-member cooperative groups based on previous exam achievement (low, average, high). Bonuses (20% of exam score) were offered to groups who improved their mean exam performance to a pre-established criterion in the cooperative-group phase. Results yielded an overall effect size of 0.42 for cooperative study versus individual study. However, although the exam performance of low and average achievers improved significantly during cooperative study, the high achievers' exam scores decreased significantly. The findings are discussed within cognitive and behavioral perspectives of learning.

Objectives

The two-fold purpose of this study was (a) to compare the overall effects of cooperative learning team study (CLTS) and individual study (IS) on the exam performance of undergraduate students enrolled in large sections of an introductory educational psychology class, and (b) then compare the effect of the CLTS on the exam performance of students identified as high, average, and low performers on previous exams.

Theoretical Framework

D. W. Johnson, R. T. Johnson, and Smith (1998) suggested that the foundation for small-group cooperative learning structured to maximize each student's learning is derived from social interdependence theory, cognitive-developmental theory, and behavioral learning theory. These authors postulated a relationship between cooperation and the achievement of goals, cognitive growth, and reward conditions. Critical elements for successful formal cooperative learning experiences include teacher structuring of pre-instructional decisions to ensure positive interdependence, individual accountability, face-to-face promotion, effective social skills, and group processing.

Slavin (1995, 1996a) examined two possible perspectives to explain the achievement effect of cooperative learning. The first is a motivation perspective, which emphasizes the use of group-reward structures based on the individual learning of group members. For example, Student Teams-Achievement Divisions (Slavin, 1994) is structured to allow students to work in mixed-ability teams to master teacher-presented material in preparation for individual testing. Group rewards are based on the attainment of group improvement goals, which are linked to individual improvement within the group. Second, Slavin examined the relevance of the developmental perspectives of Piaget (1926) and Vyvotsky (1978), which attributed cognitive growth within groups to the creation of cognitive disequilibrium for individual learners. Within this framework, higher ability students are postulated as the source of the cognitive conflict needed for the cognitive growth of lower ability students.

A number of authors (e.g., D. W. Johnson & R. T. Johnson, 1994; Slavin, 1996b) have reviewed the positive effects of cooperative learning activities and achievement outcomes in K-12 settings. The research base on cooperative learning and achievement in post-secondary settings is less extensive than that for K-12 students. Nonetheless, a meta-analysis on the effects of various forms of group learning in undergraduate science, mathematics, engineering, and

technology undergraduate courses noted an overall effect size of 0.51 for small group learning and student achievement (Springer, Stanne, & Donovan, 1999). D. W. Johnson et al. (1998) suggested that their review of over 168 studies comparing the academic achievement of students 18 years or older exposed to different instructional methods (cooperative, individual, competitive) located significant and meaningful effect sizes favoring cooperative learning.

The research base is particularly thin for comparing cooperative learning achievement for college students previously identified as high, average, and low achievers. In K-12 settings, Slavin (1996) cited studies that examined the effects of cooperative learning groups on students at different achievement levels and concluded that most studies "found equal benefits for high, average, and low achievers" (p.10). However, Hampton and Grudnitski (1996) reported low achieving undergraduate business students benefited the most from cooperative learning. Additionally, Kenneth and Young (1999) specifically investigated the effect of cooperative learning groups on the academic achievement of high-achieving pre-service teachers and noted that cooperative learning did not enhance their academic performance.

Method

Participants

A total of 384 students participated in this repeated-measures mixed-design study. All students were members of identical introductory educational psychology classes offered in the fall and spring of 2002-2003. The course was required for admission to the teacher education program at a large state university. The ages of the participants ranged from 17-55 (M = 23.70, SD = 7.60), with a mean GPA of 3.00 (SD = 0.66). Approximately 70% of the sample was female, and more than 95% of the sample was Caucasian American. The mean number of previously completed semester hours of the participants was 58.00 (SD = 51.37).

Setting

The highly organized course targeted in this study emphasized different developmental themes (physical, cognitive, psychological, social, and character). A study guide that included questions over both the readings and class discussions provided the framework for notetaking in all classes, and all students had access to identical copies of the lecture notes posted at the course web site. Grades were assigned on a criterion-referenced basis.

Exam scores from the 3rd unit (Pre IS) served as the baseline measure of classroom performance. At the beginning of the 4th unit, students were grouped heterogeneously into cooperative learning groups of 5 students (hereafter called CLTS) based on their Pre-IS performance. Each group contained at least one student identified from their previous performance as a high achiever (upper quartile, composite n = 97), low achiever (bottom quartile, n = 99), and an average achiever (middle quartiles, n = 194). An additional 10 bonus points were added to each group member's 4th individual exam score if the cooperative group's mean exam score on this unit was 1 point above its mean Pre-IS score. This reward contingency was announced at the beginning of the 4th unit.

Given that the topic of the 4th unit was social development, explicit instruction on successful cooperative learning was provided throughout the unit in the form of lectures, assigned readings, and a video. Additionally, during this unit each cooperative group was seated together and limited time was provided in each class session for within-group meetings. Students also were instructed to use the group communication option in the course web site and schedule out-of-class meeting(s). The cooperative learning groups were discontinued for the last unit and the data from the last unit exam scores are designated as Post IS.

Data Sources

Each 50-item unit exam (Pre IS, CLTS, Post IS) was administered in the last class session in each unit. Close to two-thirds of the items required logical reasoning regarding course information, with many of the items requiring both specific recall and logical reasoning (Wallace & Williams, 2003). Students placed their answers on a scantron form, and the forms were scored before the students left the testing area. Students were given the opportunity to see which items they had missed and to re-examine those items before leaving the class on test day.

Results

The content of each examination was identical for both semesters, and an initial examination of the scores revealed no significant differences between semesters I and II for Pre-IS and Post-IS mean scores. However, a significant semester difference ($p < .005$) was obtained for mean CLST scores. Therefore, results are presented for individual semesters, as well as far the combined semesters. (It should be noted that reported scores on the CLTS exams do not include bonus points.)

Overall Effect

Significant differences ($p < .001$) were located between the repeated measures (Pre IS, CLTS, Post IS) for the composite mean scores, $F(2, 376) = 78.83$. Specifically, the mean score of the CLTS exams ($M = 39.09$, $SD = 5.39$) was significantly higher ($p < .001$) than the mean of the Pre IS exams ($M = 36.78$, $SD = 6.00$, $d = 0.39$) and the mean of the Post IS exams ($M = 35.66$, $SD = 7.76$, $d = 0.44$). A significant decrease ($p <. 001$, $d = - 0.19$) also was noted from the Pre- to Post-IS exams means. Table 1 presents these data for each semester, as well as the combined data across semesters I and II.

Effect on Low, Average, and High Achievers

The self-same repeated measures analyses then were performed with the addition of the between-subject factor of previous achievement level (low, average, high). Figure 1 displays the outcome of the cooperative learning experiences for the composite exam scores by achievement groups. The interaction effect of exam scores by grouping was significant ($p < .001$). Paired t-tests indicated that the low achievers' composite Pre-IS exam scores ($M = 28.89$, $SD = 3.29$) and Post-IS exam scores (29.70, $SD = 7.60$) were not significantly different. However, a significant difference ($p < .001$) was obtained between the mean exam score ($M = 34.25$, $SD = 5.41$) for the cooperative learning condition (CLST) and the exam scores for both the Pre-IS ($M = 28.89$, $SD = 3.29$, $d = 1.63$) and Post-IS ($M = 29.70$, $SD = 7.60$, $d = 0.60$) treatment conditions (individual study).

The average achievers' mean composite exam scores followed a similar pattern to that of the low achievers. The composite exam scores under the CLST phase ($M = 39.29$, $SD = 4.46$) were significantly different ($p < .001$) from the exam scores under both the Pre-IS ($M = 36.87$, $SD = 2.36$, $d = 1.03$) and Post-IS exam phase ($M = 35.43$, $SD = 6.39$, $d = 0.60$). The average group evidenced a significant decrease ($p < .001$, $d = -0.23$) from the Pre-IS to Post-IS exam scores.

The exam scores of the high achievers also were compared across the different treatment phases. The results revealed a significant decrease ($p < .005$) from the Pre-IS composite-exam scores *(*$M = 44.12$, $SD = 2.21$) to the CLST exam scores ($M = 42.99$, $SD = 3.80$, $d = -0.51$).

Additionally, high achievers' exam scores significantly decreased ($p < .005$) from the CLST phase to the Post-IS exam phase ($M = 41.85$, $SD = 5.14$, $d = -0.22$).

Finally, data were analyzed separately for the two semesters. Figures 2 and 3 demonstrate the same trends in both sets of data and mirror the overall results discussed previously. It appears that both the low and average achievers consistently benefited from the cooperative learning experience, whereas the high achievers did not.

Educational Importance

This yearlong examination of cooperative learning groups used in conjunction with a 2½-week course unit devoted in large part to the research and theory on cooperative learning was a success for a majority of the students. Organizing cooperative groups heterogeneously (based on previous exam performance) and fostering group interdependence and group-reward goals appeared to benefit low and average achievers significantly. That is, the mean low-achievers exam score increased 10%, and the average-achievers mean score increased 5%. In contrast, high-achievers mean scores decreased.

Two possible explanations for the findings, based on Slavin's (1996a) and D. W. Johnson, R. T. Johnson and Smith's (1998) theoretical foundations, appear worth exploring. Developmental learning theory suggests that cognitive conflict supports cognitive growth. It certainly appears that low and average achievers within the groups benefited from the inclusion of a high achiever. Yet, high achievers may not have had the opportunity to experience this cognitive conflict. This hypothesis is supported by feedback from the high achievers in the various groups, which suggested that many felt they spent most of their cooperative learning time reiterating concepts they had previously mastered. Many felt this arrangement detracted from the time they would have spent in individual study.

Additionally, a behavioral theorist would contend that the reward contingency affected students differentially at the three performance levels. It is likely that the possible 20% bonus increase in the exam score of low and average achievers was reinforcing for those students. For high achieving students, this contingency may not have had the same appeal, given that they were already operating at a near ceiling level and did not need the bonus credit. In the future, high achieving students may regard cooperative learning activity as actually detracting from their reward potential.

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Table 1

Descriptive Statistics for Pre-IS, CLST, and Post-IS Exam Scores by Semester and Year

	Pre-IS exam		CLST exam		Post-IS exam
Semester I (n = 191)					
Mean (SD)	36.36 (5.67)	<[a]	39.79 (5.16)	>	36.11 (7.16)
d values[b] (Pre – Post IS)			0.51 - 0.60		
Semester II (n = 193)					
Mean (SD)	37.01 (6.30)	<	38.13 (5.46)	>	35.05 (8.29)
d values (Pre – Post IS)			0.18 - 0.37		
Composite (N = 384)					
Mean (SD)	36.78 (6.00)	<	39.09 (5.39)	>	35.66 (7.76)
d values (Pre – Post IS)			0.39 - 0.44		

Note. [a] < and > represent statistically significant differences at the .001 level. [b]d values represent Cohen's measure of effect size. Because CLST was the focus score and the other scores the comparison scores, the standard deviations of the Pre-IS and Post-IS phases were used in the computation of effect sizes. The effect sizes reported in the table represent the comparisons between exam performance under the CLST condition versus the Pre-IS and Post-IS conditions.

Figure 1

Composite Mean Exam Scores by Achievement Group

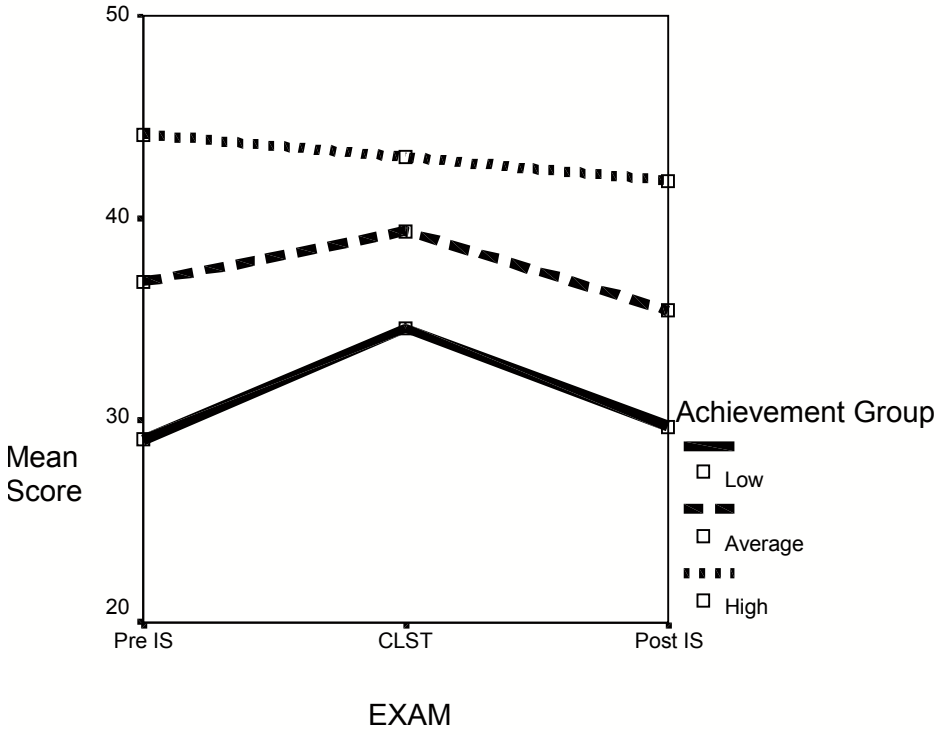

Figure 2

Semester I Mean Exam Scores by Achievement Group

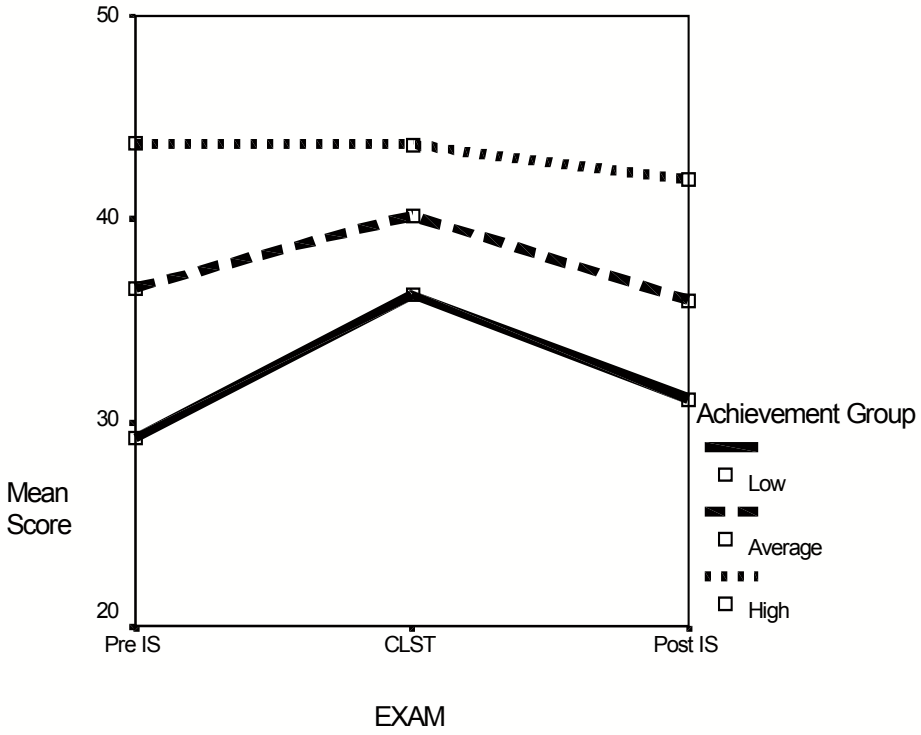

Figure 3

Semester II Mean Exam Scores by Achievement Group