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ABSTRACT

A study was conducted to determine whether cooperative testing would result in better performance and less anxiety than individual testing. Two sections of a developmental psychology class used cooperative testing, and a third section used traditional testing methods. Four multiple choice tests containing 50 items were administered to each group, with items equally divided between easy and moderately difficult items. Each student had his/her own answer sheet which contained items asking for a rating of anxiety and expected performance and an indication of preferred type of testing. Test completion times were noted when students turned in their exam. Several days prior to the first cooperative exam, students were told that they could pick a partner for the next exam, but that they would each turn in their own answer sheets. They were allowed to change partners for the second cooperative examination and were not required to participate. In one class section, 7 of 34 students chose not to participate, while in the second section 9 of 24 chose not to participate. The mean test scores of the non-participating students did not differ significantly from the means of the subjects taking individual tests. At first glance, cooperative testing seemed to produce superior performance; however, not all students benefited equally from cooperative testing. The two cooperative-testing class sections showed very different patterns of performance. Though there were no differences in anxiety between students using cooperative and traditional testing methods, students who used both methods showed a strong preference for cooperative testing. (AC)

Cooperative Testing in Introductory Level Psychology Courses

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Cooperative learning activities in the classroom have become a well-established component of teaching methodology since their popularization by Johnson and Johnson (1975). Working in groups for discussion purposes in the classroom as well as on group projects outside of the classroom has spread from the elementary school where it began as a way to enhance the learning process to the business school where it is seen as a way to prepare students for the cooperation which will be needed when they enter the work force. The widespread praise for the Japanese management style has provided one impetus for this shift in educational strategy.

When conceptualizing the cooperative learning situation, Johnson, Maruyana, Johnson, Nelson and Skon (1981) identify three different goal structures in learning situations: cooperative, in which individual rewards are proportional to the groups work; competitive, in which the individual's rewards are inversely proportional to the groups; and individual, in which the reward is for the quality of the individual's work regardless of others' performance. In their meta analysis of the effectiveness of these disparate goal structures on achievement and productivity,
Johnson et al. (1981) found that cooperation is more

effective than interpersonal competition or individualistic effort. In addition to improved performance, a cooperative approach appears to produce more positive attitudes toward the instructional activity and more positive interpersonal relationships while reducing anxiety.

The application of the cooperative learning paradigm to the classroom testing situation has received little attention in the cooperative learning literature (Slavin, 1983). There is a strong bias in our educational system toward individual accountability as our concerns with cheating demonstrate. In spite of their lack of perfection, tests are still seen as a valid measure of the unobservable construct of "knowledge". Whose knowledge would be measured if students worked together on a test?

This legitimate concern is counterbalanced by the notion that the test itself is part of the learning process (Nance and Nance, 1991). Feedback received on their test performance can presumably help students correct erroneous ideas and faulty reasoning processes. Working cooperatively on the test itself would offer the same advantages. The risk, of course, is that "social loafing" would occur with some students taking advantage

of the others.

Perhaps because of this ambivalence about cooperative testing, only one actual classroom study of cooperative testing was discovered. Farland and Gullickson (1984) studied the use of cooperative testing on course quizzes for seniors in a measurement course. Although students liked cooperative testing and thought it enhanced their performance, there was no consistent advantage for the cooperative testing group on six quizzes which were administered in a group situation nor on two exams administered individually when compared with a group which received both individual quizzes and individual tests.

This finding contrasts with those of studies such as that by Lambiotte, Dansereau, Rocklin, Fletcher, Hythecker, Larson and O'Donnell (1987) who tried to understand the reasons why groups may perform better than individuals beyond the mere pooling of information. They suggested that students have difficulty monitoring their own cognitive activity and designed a learning situation in which partners were encouraged to make their metacognitive activity in the study process explicit. The subjects also worked cooperatively on a test of the material studied again after having been given a

test-taking strategy which incorporated mutual monitoring of cognitive activity (eg. searching memory, checking for errors, organizing information, etc.). They found that cooperative study training increased accuracy of performance and that cooperative testing increased response fluency when compared with students studying and testing individually. However, the benefits appeared to be situation specific as cooperatively trained students actually performed more poorly on subsequent individual testing than did those who had been working individually all along. In spite of the disappointing lack of transfer, Lambiotte et al. (1987) suggest that their test taking training helped focus students on task relevant interactions which were likely to enhance performance.

Dimant and Bearison (1991) using a Piagetian model have also suggested that the facilitating effect of peer interactions on cognitive performance depends on the nature of the interactions which take place. Mere exchange of information will have little permanent effect. They suggest that the interactions must involve disagreements, questions and explanations as well as agreements for improved performance to occur. Extraneous comments related to social interaction rather than task performance are ineffective in enhancing quality of

performance.

The contradiction between the positive findings for cooperation in experimental situations and Farland and Gullickson's (1984) mixed results in an actual classroom setting may be related to the uncontrolled nature of the interactions in a natural setting. However, Farland and Gullickson also used a very short task which may not have provided a reliable measure of the potential effects of cooperation. In addition, these brief (5-item) quizzes administered in relatively large group (4-5 persons) may not have generated the same stress as typical 50 to 100 item classroom exams do. The present study used a more typical classroom exam format with 50 item tests. It was expected in the present study that the effect of cooperative testing would be more powerful because of the greater stress associated with longer, more heavily weighted exams. Thus it was hypothesized that the students would do better on cooperative tests than on individual tests and show less anxiety.

Method

Subjects

Forty undergraduate students in two sections of Developmental psychology served as subjects. In addition, a third section of students taking Developmental Psychology with traditional testing methods was used for comparison purposes. Ages of the students varied with one section having mostly traditional age students and the other mostly older students.

Materials

Four multiple choice tests containing 50 items were administered to each group. Between 34 and 43 questions were chosen from the test bank supplied with the text book (Berger, 1988). Of these, the percentage of factual questions ranged from 44 to 81 and were about equally divided between easy and moderate difficulty items.

Each student had her own answer sheet which also contained items asking the students to rate their anxiety and expected performance on a 5-point scale. In addition they were asked which type of testing they preferred. Finally the time to completion was noted when they turned in their exam.

Procedure

Several days prior to the first cooperative exam, the procedure was explained to the students. They were told that they could pick a partner for the next exam but that they would each turn in their own answer sheets. They were allowed to change partners for the second cooperative testing and were not required to participate. Seven of 34 (20%) chose not to participate in one section and 9 of 24 (35%) in the second section did not participate. The mean test scores of these students did not differ significantly from the means of the subjects when taking individual tests.

The order of the treatments was counterbalanced in the following way.

	Test			
	First	Second	Third	Fourth
Group				
A	C	I	C	I
B	I	C	I	C

Results

When the effect of cooperative testing is compared to individual testing in the two experimental groups, cooperative testing appears to provide a clear advantage, $F(1, 117) = 34.1$, $p < .01$. However, when reviewing the

Insert Table 1 about here

data, it appeared that the two groups showed very different responses to cooperative testing. Therefore, an analysis was done to see if the patterns of test scores in the two groups varied from each other. As Figure 1 reveals, while the overall shape of the curves in the two groups is similar, the magnitude of cooperative testing effect is significantly different, $F(3, 114) = 16.2$, $p < .01$). Group A which started off

Insert Figure 1 about here

with cooperative testing showed no significant variations in performance according to the type of test. In contrast, Group B which started with individual testing showed significantly better performance on the cooperative testing than on the individual testing.

In Figure 2, the scores for the comparison group are

Insert Figure 2 about here

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added to illustrate a typical pattern of course grades over the semester. The only point in time at which cooperative testing provides a distinct advantage is at the fourth exam.

In addition to the differences in performance, differences in behavior were found in the cooperative and individual sessions. Students spent significantly more time working on the test when working cooperatively than when working individually, $F(1, 117) = 10.4$ $p < .01$).

Insert Table 2 about here

They also decreased the time spent on the tests as the semester progressed, $F(1, 117) = 44.1$, $p < .01$). Of course, the atmosphere was very different during the two types of testing with talking and laughing during the cooperative testing. No systematic observation of the content of the interactions was done but informal observation revealed a range of interactions from debates over the answers to social exchanges.

Analysis of the anxiety scores revealed no differences in anxiety for the two types of testing although there was a tendency for anxiety to decrease with repeated exposure. There was a strong preference

Insert Table 3 about here

for cooperative testing which was independent of the type of test the student was taking that day, p (46) < .001.

Insert Table 4 about here

When asked to predict their expected performance when compared to their performance on the previous exam, the two classes showed different patterns of expectation for success, $F(2, 70) = 5.6$, $p < .05$). As Figure 3

Insert Figure 3 about here

shows, the students who started with cooperative testing were unaffected by the type of exam while the students who started with individual testing expected greater success with cooperative testing than with individual testing.

Discussion

At first glance, cooperative testing did seem to produce superior performance, a finding consistent with the cooperative learning literature. However, closer inspection of the patterns of performance within groups suggests that not all students benefit equally from cooperative testing. The two groups in this counterbalanced design showed very different patterns of performance prompting speculation about the conditions under which cooperative testing makes a difference.

There were two major systematic differences between the groups in the study: order of testing and subject variables. Group A received cooperative testing first and consisted largely of traditional age students. Group B received individual testing first and consisted largely of older, continuing education students. These two factors are confounded and it was not possible to analyze age as a separate factor.

In thinking about a possible order effect, it may be that some sort of contrast effect produced the decline in Group A's performance from their initial cooperative testing to the following individual testing. Lambiotte et al. (1987) have suggested that partners may become dependent on each other and may suffer from a loss of

support when they subsequently must work individually. In the present study, however, subjects had repeated trials with the two modes of testing and both groups showed similar up and down patterns across conditions regardless of which type of testing was received first. Another implication of these up and down findings is that whatever benefit derived from cooperative testing did not transfer to the individual testing situation. This lack of transfer is certainly consistent with previous findings (Lambiotte et al. (1987) and Farland and Gullickson (1984)).

It would appear, then, that subject variables are at work in producing the differences in the two groups. Since this was an experiment in a natural setting, subjects could not be randomly assigned to conditions. The major systematic difference in the groups appears to be age: traditional versus non-traditional. The data suggest that the non-traditional students benefit more from the opportunity to work cooperatively.

Exactly which characteristics of the adult learner might account for their greater responsiveness to cooperative testing is difficult to pinpoint. As Brookfield (1986) notes, the research provides no evidence of a consistent learning style among non-

traditional students. In fact, there may be more diversity in learning styles among adults than among younger learners since adults have the potential for a much broader range of cognitive developmental levels.

The most consistent finding in the adult learning literature seems to be that adults prefer learning situations which are tied to their life experience and which provide a supportive, collaborative atmosphere (Brookfield, 1986). The cooperative testing paradigm would seem to be consistent with this latter preference. More research is needed in this area, however, since there is no empirical support for the notion that collaboration or cooperation raises the actual level of performance of the adult learner (Imel, 1991).

In addition to performance factors, other qualitative differences were also found between cooperative and individual testing. Students clearly preferred cooperative testing. However, students did not have to participate in the study and 20% of the traditional students and 35% of the nontraditional students chose not to participate. Thus it may be, particularly among the adult learners, that only those whose self-perceived learning style is compatible with working cooperatively chose this modality. It may be

that traditional age students are less aware of their optimum modality or are more reluctant to go against the group trend. Thus the variation in the benefits of cooperative testing may represent a testing by learning style interaction.

There was also a difference in expectations for success in the traditional and non-traditional groups with the adult learners perceiving greater performance benefits from cooperative testing. Since they actually did benefit more, this difference may simply represent accurate perceptions of performance on the parts of the two groups.

One reason for using cooperative situations is the positive affect that generally surrounds them (Johnson, et al (1981), Lambiotte, et al (1987), Farland & Gullickson (1984)). It had been expected that working in pairs might reduce anxiety and that anxiety reduction might be a mediator of improved performance. However, no difference in self-rated anxiety was found among the various groups, a finding which is consistent with Farland and Gullickson (1984).

Finally, it was found, not surprisingly, that students taking a test cooperatively spend longer working on the test. It is not clear whether this extra time

reflected just simple social communication or information sharing or if it reflected more substantive discussions. Dimant and Bearison (1991) have found that frequency of interaction in dyads in a problem solving situation is associated with improved performance but only if the interactions are task relevant. They considered interactions which had the potential to move college student subjects from the concrete operational to the formal operational stages. Although we have no data on this question it is possible that the older students engaged in more task relevant interactions at higher cognitive levels resulting in greater benefits from the cooperative testing situation.

The present study parallels earlier studies of cooperative testing in that the results fall into no simple pattern. Although cooperative testing appears to have some performance benefits, who benefits and the precise nature of the benefits remain to be clarified. The one consistent finding across numerous situations is that students like cooperative learning and testing and feel that it helps their performance. This positive attitudinal benefit may be enough to justify its use particularly in situations where repeated testing can lead to negative affect.

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Table 1

Mean Scores on Tests Taken Cooperatively and Individually

Trial	Type of Test	
	Cooperative	Individual
1	42.13	38.73
2	42.68	39.43

Table 2

Mean Completion Time (in min.) for Cooperative and Indivual Testing

Trial	Type of Testing	
	Individual	Cooperative
1	38.95	44.33
2	33.43	42.7

Table 3

Anxiety Levels on Individual and Cooperative Testing

Trial	Type of Testing: Individual	Type of Testing: Cooperative
1	2.8	2.78
2	2.68	2.53

Table 4

Percentage of Students Preferring Cooperative Testing Following Administration of Individual or Cooperative Exams

Type of Test	% Perferring Cooperative Testing
Individual	78
Cooperative	85

Figure 1. PATTERNS OF TEST SCORES

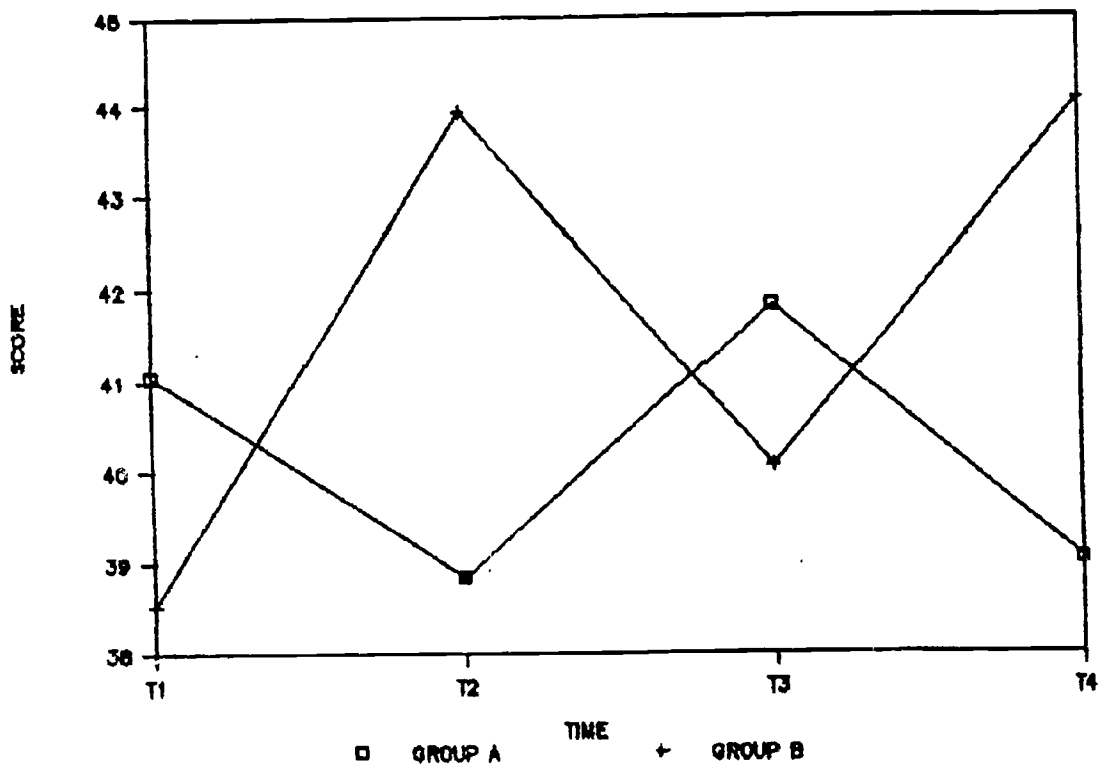

Figure 2. PATTERNS OF TEST SCORES

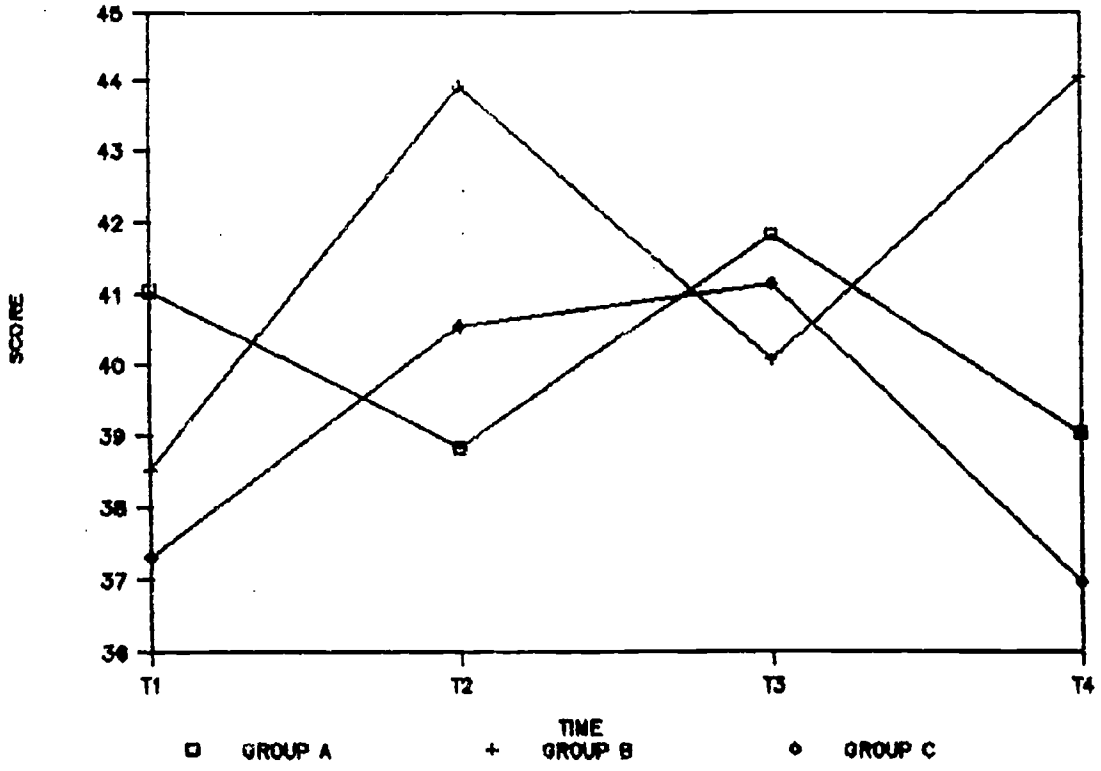

Figure 3. EXPECTATIONS FOR SUCCESS