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An Empirical Test of Cooperative Learning in a Passive Learning Environment

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Abstract  
This study examines whether cooperative learning can improve the learning outcomes of students in a passive learning environment. One hundred seventy-two accounting students who were attending a major Hong Kong university participated in this study. Using a 2 X 2 between-subjects experimental design, this study finds that students who were taught using a cooperative learning approach significantly outperformed those who were taught using a traditional lecture format. Moreover, the results of this study indicate that the students in cooperative learning sessions performed significantly better in answering indirect application-type questions than those in traditional lecture sessions. Overall, the results of this experiment suggest that cooperative learning is an effective teaching pedagogy for delivering accounting topics in a passive learning environment. The implications of this study for accounting education and the directions for future research are also discussed.

INTRODUCTION

Accounting educators have called for educational reforms for over a decade (e.g., AECC 1990; Williams 1993; I FAC 1995; Stoner 1999; Allen 2000). One of the major objectives of these reforms is to move away from an individual-based and passive learning approach toward a team-based and active learning style. As the Accounting Education Change Commission (AECC) stated in its Position Statement Number One (1990, 309):

One issue the statement addressed concerns instructional methods. The AECC urges faculty members to move away from a purely lecture format where students take on the role of passive recipients of information. Rather, students should become active participants in the learning process.

From this statement, it is clear that the AECC hopes educators will move away from the traditional lecture toward cooperative learning, so that accounting graduates will become more capable of identifying, analyzing, interpreting, and exercising judgment on the reliability and relevancy of
accounting information. In response to these reforms, the purpose of this study is to explore whether cooperative learning pedagogy can improve the learning outcomes of students in a passive learning environment. This study also investigates whether cooperative learning can enhance the ability of students to apply the knowledge learned in class to solve harder or less straightforward accounting problems.

One hundred seventy-two accounting students who were attending a major Hong Kong university participated in this study. This setting offered an opportunity to test whether cooperative learning pedagogy could enhance the learning outcomes of students in a traditionally passive learning environment in which the social and educational systems are not in favor of teaching innovations.

The results of this study are encouraging. Students in a passive learning environment who were taught using a cooperative learning method significantly outperformed those who were taught using a traditional lecture format, as measured by their scores in the outcome assessment at the end of the experiment. The evidence of this study also indicates that cooperative learning significantly improves the comprehension of students when they face harder, or less straightforward, accounting questions. More importantly, this study shows that cooperative learning pedagogy can effectively enhance the learning outcomes of students in a society in which the social and educational environments are different from those of the United States.

The remainder of this paper proceeds as follows. The next section discusses why Hong Kong is a suitable site for this study. The literature review and hypotheses developments follow in the third section. In the fourth section, we discuss the research methodology, which is followed by the data analysis and empirical results in the fifth section. The last section concludes the study with a discussion of the implications and limitations of the study and highlights possible directions for future studies.

HONG KONG AS THE EXPERIMENTAL SITE

Several aspects of the social and educational environment in Hong Kong make it a suitable site for this study. Similar to many Chinese societies, Hong Kong is a society with a great power distance. That is, individuals in Hong Kong are expected to accept inequities in the power of institutions and organizations (Hofstede 1980). In this environment, students are not accustomed to participating in classroom activities, nor have they been encouraged to do so. In addition, a strictly enforced grade distribution in the university system creates rivalry among students, thus making the learning environment relatively individualistic, which may also adversely affect the effectiveness of implementing cooperative learning pedagogy.
Traditionally, the pedagogy that is adopted in Hong Kong is passive and lecture-dominated, beginning in the grade schools and continuing through to university level. Although lectures may be regarded as being a less effective teaching approach than other methods, there are several reasons why the faculty members of higher education institutions in Hong Kong do not have a strong incentive to experiment with new pedagogies. First, there is a pecking order among tertiary institutions, and graduates from reputable universities are always in demand. In making recruitment decisions, employers tend to look for factors above and beyond the learning outcomes of the graduates. The second reason relates to the way in which the faculty members of universities are evaluated for retention and promotion. As personnel decisions and financial rewards for faculty members are based mainly on research productivity, faculty members have few incentives to enhance their teaching effectiveness. Finally, faculty members are under pressure to provide students with a certain amount of material that serves the needs of the Hong Kong business community. The least strenuous way to accomplish this objective is to adopt old and traditional teaching methods (Kember 2000). Thus, many educators may try to avoid engaging in educational advances that involve less traditional teaching approaches.

Recently, however, university administrators have been under pressure to recruit students of a higher caliber. To promote their institutions, some universities have decided to modify their existing curricula and have encouraged their faculty members to experiment with new pedagogies. For instance, in 2000, one local university established a Center for Learning Enhancement and Research. Since its establishment, the Center has hosted several training programs on how to use cooperative learning in the classroom. Although cooperative learning is being promoted, it is uncertain whether it can enhance students’ learning in a passive learning environment, such as that of Hong Kong.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Cooperative Learning

Vygotsky’s educational theory suggests that individuals first learn through person-to-person social interaction, and then internalize knowledge individually (Fogarty 1999). Based on this theory, cooperative learning is a structured and systematic instructional design in which small groups work together toward a common goal (Davidson and O’Leary 1990). The implementation of cooperative learning in the classroom means that all members in a group can learn together through person-to-person interaction, and will subsequently perform better as individuals (Johnson et al. 1998, 22). Such a method of instruction enhances the achievements of students and improves their attitudes toward learning (Johnson et al. 1991; Slavin 1985). More importantly, when compared to a traditional lecture, cooperative learning provides a more hospitable environment, in which students
efficiently and effectively grasp the key concepts of a subject (Bohmeyer and Burke 1987). According to one report published by the Cooperative Learning Center at the University of Minnesota, cooperative learning may be the most effective teaching method, compared to both competitive and individualistic learning, for the achievement of performance objectives in college and adult education settings (Johnson et al. 1998). To implement cooperative learning successfully, it is necessary to foster a positive interdependence among group members by holding individuals accountable for their own performance, which gives students the incentive to learn and to contribute to the learning process (Holubec 1992; Peek et al. 1995; Ellis and Fouts 1997).

As cooperative learning has produced positive results in the enhancement of learning outcomes in mathematics, physics, education, music, and the social sciences, educators have begun to explore whether it can enhance learning outcomes in accounting (e.g., Lindquist 1995; Peek et al. 1995; Ravenscroft et al. 1995, 1997; Marcheggiani et al. 1999; Apostolou et al. 2001; Lancaster and Strand 2001). However, mixed results have been reported in the literature as to the effectiveness of using this pedagogical method to teach accounting subjects. Several studies have reported a positive impact from the introduction of cooperative learning techniques. For example, Lightner (1981) compared the individual exam performance of a control group with no group requirement to an experimental group with a group requirement in an intermediate accounting class. Measured by individual performance, Lightner (1981) found that the performances of the individuals who worked in groups were, on average, better than those of the individuals who had worked alone. Ravenscroft et al. (1995) investigated student exam performance after learning through cooperative learning techniques in an accounting principles class. The results indicated that the students who had been evaluated based on both individual performance and team effort substantially outperformed those who had been evaluated entirely on their individual effort in the examinations. Moreover, Lindquist (1995) conducted a case study in an auditing course and found that cooperative learning improved attitudes and achievements of students. Hite (1996) also examined the effectiveness of team-based cooperative learning in a junior-level taxation course. The results showed that students who worked in teams to review their midterms achieved higher scores in their final exams.

However, some studies do not demonstrate strong support for the effectiveness of cooperative learning. For instance, Wilson (1982) compared individual performance in the AICPA Achievement Test among three control group classes that were taught using a lecture format and three treatment classes that were taught using a Team-Learning Model. In the study, Wilson (1982) failed to find a significant difference in performance in the AICPA Achievement Test between the students in the control group and those in the treatment group. In addition, Ravenscroft et al. (1997) presented the results of seven studies in which the exam performances of students were compared under varying conditions that involved student teams and group grading. The results suggested that there is little...
or no improvement in exam scores either when students worked in teams or when they were graded using group incentives.

As different parameters, such as topic and outcome assessment, are examined in the literature, it is difficult to discern how and to what extent the mixed results reported in the literature are driven by different treatments or measurements. Moreover, some researchers have expressed concern as to the transferability of cooperative learning pedagogy across educational contexts, because almost all of the studies that are reported in the literature were conducted in the United States (Johnson et al. 1998). Therefore, it is uncertain whether cooperative learning could be successfully implemented in different countries or regions in which the social and educational systems are different from those of the United States. To address this void in the literature, this study was conducted in Hong Kong, where the learning environment is perceived to be passive and pedagogy is lecture-dominated (Kember 2000). If cooperative learning is an effective pedagogical method for the enhancement of learning outcomes in this type of environment, then we expect to find that:

**H1:** Students in a cooperative learning group will outperform those in a lecture group, based on their individual test scores.

This study also attempts to explore whether a cooperative learning method can improve the ability of students to apply the knowledge that has been learned in class. According to Bloom’s taxonomy (1956), the application level of learning is defined as the use of abstractions in both particular and concrete situations. These abstractions may take the form of general ideas, rules of procedures, or generalized methods. They may also include technical principles, ideas, and theories that must be remembered and applied. As cooperative learning is a structured and systematic instructional design, its implementation in the classroom allows students in a group to learn from one another, and hence improves the ability of the students to apply the knowledge learned in class to solve accounting problems. If this is the case, then we expect that students in the cooperative learning groups will perform better in the application of knowledge than those in the traditional lecture groups, based on individual test scores. Hence, we hypothesize that:

**H2a:** When solving accounting problems that require the direct application of knowledge learned in class, students in the cooperative learning groups will perform better than those in the lecture groups, based on individual performance as measured by their individual test scores.

As cooperative learning facilitates learning through person-to-person interaction, and such interaction allows students to learn from one another, we expect that students in cooperative learning groups will gain a deeper understanding of the subject matter. If this is the case, then cooperative learning may be powerful enough to strengthen the ability of students to solve indirect (harder and
less straightforward) accounting problems. Hence, we expect that:

**H2b:** When solving accounting problems that require the indirect application of knowledge learned in class, students in the cooperative learning groups will perform better than those in the lecture groups, based on individual performance as measured by their individual test scores.

**RESEARCH METHOD**

**Experimental Design**
The experiment employs a 2 x 2 between-subjects design with two independent variables: teaching method (traditional lecture versus cooperative learning pedagogy) and type of question (direct application versus indirect application of knowledge learned in the classroom). An intermediate accounting course was chosen for this study because this course builds up the core knowledge that is necessary for accounting majors to gain an in-depth understanding of financial reporting. We selected earnings per share (EPS) as the topic because of its importance in financial reporting and because coverage for both the treatment (cooperative learning) group and the control (traditional lecture) group could be completed in a three-hour interval. In addition, the level of complexity of EPS allows the authors of this study to design a reasonably sophisticated instrument to evaluate the learning outcomes of the students immediately after the experiment.

A handout that covered the theories, procedures, and illustrative examples of EPS was distributed to all the participants in both the control group and treatment group. Thus, all participants in the experiment were provided with identical materials to learn EPS concepts. This handout included six subtopics of EPS: (1) the definition and usefulness of EPS and the reporting requirements for both basic and diluted EPS, (2) methods for the computation of basic EPS, (3) the complexity of capital structure and why complex capital structures have a potential dilutive effect on EPS, (4) the potential dilutive effects of options/warrants (including the impact on the numerator of EPS and the impact on the denominator of EPS using the treasury stock method), (5) the potential dilutive effects of convertible preferred stock or bonds on EPS (including the impact on the numerator of EPS, the impact on the denominator of EPS, and the ranking of the dilutive effects), and (6) a comprehensive example of basic EPS and diluted EPS. For each subtopic, we also decided how much time to allot to each subtopic and determined the amount of time that was needed to learn the theories, procedures, and illustrative examples.

As the control groups (traditional lecture sessions) and treatment groups (cooperative learning sessions) were not conducted simultaneously (that is, they took place in the same week, but several days apart), it was important to control any possible information leakage that may have favored the learning outcome of the treatment groups. To this end, we decided to conduct the cooperative
learning sessions first, and to instruct the students at the end of the experiment not to share information with anyone. With the control groups, the instructors taught the lesson using the traditional lecture pedagogy that is used to teach other intermediate accounting topics throughout the semester. For the treatment groups (cooperative learning), we structured the experimental procedures following the group investigation model proposed by Sharan and Hertz-Lazarowitz (1980). This model includes the following steps: (1) the class is provided a general area of study; (2) students form groups (either by their own choice or having them assigned); (3) groups are assigned a subset of the general area for analysis; (4) groups plan their investigation (assigned tasks and work independently); (5) students first teach one another, then the group makes a presentation; (6) students are required to learn all materials, followed by a performance evaluation.

Immediately after the experiment, the participants in both the control and the treatment groups were asked to complete ten objective multiple-choice questions on an individual basis as an assessment of learning outcome. This design is to ensure individual accountability in the cooperative learning exercise, as discussed in the literature (Slavin 1985; Johnson et al. 1991; Peek et al. 1995). As pointed out by Peek et al. (1995), students learn the material in a group setting but are tested on an individual basis, reducing the problem of “free riders” and increasing individual accountability. This outcome assessment should also be conducted according to a noncompetitive, criterion-referenced grading system (Cottell and Millis 1993).

Materials

The research materials that were used in this study included a cover letter, an objective multiple-choice question paper, and a debriefing questionnaire. Two versions of the multiple-choice question paper, one that featured “direct application” questions and the other that featured “indirect application” questions, were designed, according to Bloom’s taxonomy, to assess the ability of the participants to apply the knowledge that they had learned during the experiments. The participants who received the “direct application” questions would be able to solve these questions as long as they were able to remember and directly apply the knowledge that they had learned during the experiment. However, the participants who received the “indirect application” questions needed to demonstrate a deeper understanding of the EPS knowledge learned in class to solve the harder and less straightforward questions in the paper.

We designed the direct application multiple-choice questions first. Some of the questions were designed by the authors, and the remaining multiple-choice questions were adopted and modified from test items that were provided by the publisher of a popular intermediate accounting textbook. After developing the direct application multiple-choice questions, a set of indirect application multiple-choice questions was prepared by modifying the direct application questions to ensure the parallelism of the two sets of questions. For each multiple-choice question, there were four answer
choices. The choices were designed in such a way that the participants could always find an answer, even though they did not fully understand the key aspect of EPS in the question. This design was intended to reduce the possibility of participants merely guessing the right answer. Samples of these multiple-choice questions are provided in the Appendix.

Eight accounting seniors who had taken the intermediate accounting course the previous year were invited to pilot test the research instrument to ensure its completeness, validity, and clarity. Two sets of four students were randomly assigned to evaluate each set of research materials. After taking their comments into account, we modified and finalized the research materials before conducting the experiment.

**Experimental Procedures**

Both the cooperative learning and traditional lecture sessions of the experiment were designed to last for approximately three hours with one 10-minute intermission. Two instructors were involved in the experiments. Each instructor was asked to conduct one cooperative learning session and one traditional lecture session. The two instructors who conducted the experiment had ten and four years of teaching experience, respectively.

The participants were asked to sign up for the instructional sessions. Subjects signed up for sessions (self-selected) before they had any knowledge of the fact that some sessions would use cooperative learning while others would use the traditional lecture. As instructors are allowed to make alterations to the teaching schedules, and such arrangements are not unusual in the institution where the experiment took place, there is no reason to believe that the participants were aware of the two pedagogies that were used to teach EPS. In both the cooperative learning and traditional lecture sessions, the participants received an identical handout and were also informed at the beginning of the experiment that there would be an individual assessment at the end of the session.

The experimental procedures were structured as follows. The instructors of the control group conducted these sessions in the traditional lecture format. For the treatment groups (cooperative learning), participants formed small groups by themselves with five to eight individuals in each team upon arrival at class. The formation of small groups allowed the students to cultivate person-to-person interactions among the team members. After forming small groups, the instructors distributed the handouts to the participants, and explained how the class would be conducted. The instructors also informed the participants that teams would be drawn randomly to make a presentation at the end of discussion period for each subtopic. The chosen team would be responsible for answering any questions that were raised by the participants in the class. The instructors first gave a brief introduction to each subtopic of EPS. Group members in each team were required to participate in the group activities, which included the review and discussion of the
accounting theories and rules in each subtopic. The participants in the cooperative learning sessions were required to work on the same numerical examples that were provided to the students in the traditional lecture groups.

While the students in the cooperative learning sessions were engaging in activities, the instructors provided guidance and also ensured that social interaction was taking place among the group members of each team, without closely monitoring or intervening in the teams’ activities. Unlike the traditional lecture sessions, in which the instructors taught all of the subtopics of EPS in detail, in the cooperative learning sessions the instructors highlighted the key concepts of each subtopic only without going through a detailed explanation of the topic. If the group members did not understand the materials or encountered difficulties in explaining the materials to one another, then the instructors guided the students through the handout and answered any questions that were raised by the students. After completion of the group discussions on each subtopic, a group was drawn randomly to make a presentation. The presentation team was also responsible for answering questions from the rest of the class. This process was repeated for all six subtopics during the experiment.

At the end of the experiments, all of the participants in the cooperative learning and traditional lecture sessions were required to complete the multiple-choice questions on an individual basis. As part of the research materials, a debriefing questionnaire was designed to elicit the participant’s gender, overall grade point average (GPA) as validated by the university official records, the amount of time taken to complete the multiple-choice questions, and the level of attention during the experiment. A detailed flow chart of the experiment procedures is presented in Figure 1.

Grading Scheme and Performance-Based Reward
The same grading scheme and reward system was used for the control groups and the treatment groups. A participant received one point for each correct answer, from which a quarter of a point was deducted for attempts that resulted in an incorrect answer. Participants were allowed to skip questions without incurring a penalty. As the outcome assessment of the experiment was not part of the final grade of the participants (this practice is not allowed at the experimental site), a monetary reward was used to ensure that the participants stayed focused during the outcome assessment phase of the experiment. Participants were paid based on their individual score on the multiple-choice questions that were given at the end of the experiment. For each point earned, the participants received eight Hong Kong dollars (equivalent to one U.S. dollar). For example, if a participant attempted to answer all ten questions but incorrectly answered three of them, then he/she received 50 Hong Kong dollars (i.e., \[1 \times 7 - 3(1/4)\] \(\times 8 = 50\)). To find out whether the monetary reward helped the participants to stay focused on the outcome assessment, we asked each participant to rate on an 11-point scale (1 = no difference, 11 = definitely more) whether the monetary
incentive provided in the experiment had motivated them to concentrate when answering the multiple-choice questions. The results show that the monetary incentive was moderately effective for all participants (mean = 6.81, standard deviation = 2.77).

RESULTS

Participants
One hundred seventy-two students participated in this study. One hundred thirteen (65.7 per-cent) were female and fifty-nine (34.3 percent) were male. The average overall GPA of the cooperative learning group and the traditional lecture group was 3.312 (standard deviation 0.231) and 3.272 (standard deviation = 0.244), respectively. The difference in the overall GPA between the control and
treatment groups was not significantly different ($t = 0.218, p < 0.225$).

We asked the participants to record how much time they took to complete the multiple-choice questions. The average time taken was 24.44 minutes (standard deviation = 5.55 minutes) for the cooperative learning groups and 23.75 minutes (standard deviation = 6.51 minutes) for the traditional lecture groups. A t-test revealed no statistical significance between the control groups and the treatment groups ($t = 0.647, p < 0.519$). The participants rated their level of attentiveness during the experiment on an 11-point scale (1 = not at all, 11 = totally). The average rating of the participants in the cooperative learning groups was 7.663 (standard deviation = 1.724) and in the traditional lecture groups was 7.286 (standard deviation = 1.849). The difference between the two groups of participants was not statistically significant ($t = 1.362, p < 0.175$). Finally, the control and treatment groups were similar in terms of other demographic dimensions, such as gender, years of accounting education, and prior exposure to EPS.

**Overall Results**

Table 1 presents the results of the Analysis of Covariance (ANCOVA). The dependent variable of the ANCOVA model is a participant’s individual score on the multiple-choice questions that were given at the end of the experiment, which could range from 0 to 10. In this study, we included the overall GPA of the participants in the ANCOVA model as a covariate because GPA is known to explain variation in student performance (Doran et al. 1991; Ravenscroft et al. 1997; Marcheggiani et al. 1999; Lancaster and Strand 2001).

As reported in Table 1, the statistical results suggest that, after controlling for the overall GPA, both the teaching method (TM) and type of question (TQ) are significant in explaining the test scores of the participants, with one-tailed F-values of 7.360 ($p < 0.004$) and 9.298 ($p < 0.002$), respectively. As two instructors were involved in the experiments, and each instructor conducted one cooperative learning session and one traditional lecture session, it is essential to determine whether the instructor affected the participants’ performance in the outcome assessment. Similar to the study of Marcheggiani et al. (1999), we examine the possible main effect of the variable Instructor on the test scores. The ANCOVA results indicate that Instructor did not significantly affect the participants’ scores in the multiple-choice questions (F-value = 0.582, $p < 0.224$). Table 1 also shows that variable Instructor did not significantly interact with either the teaching method (TM x Instructor) or the type of question (TQ x Instructor).

**Tests of the Hypotheses**

In H1, we predicted that participants in the cooperative learning groups would outperform those in the traditional lecture groups, based on their individual test scores. Table 2 shows that the participants in the cooperative learning groups performed significantly better than those in the traditional lecture groups. The mean difference in the average scores between the two groups of
participants is statistically significant at the 0.01 level. Hence, H1 is supported.

### TABLE 1
Analysis of Covariance (ANCOVA) on Individual Test Scores

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>Sum of Square</th>
<th>d.f.</th>
<th>Mean Square</th>
<th>F-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching method (TM)</td>
<td>28.317</td>
<td>1</td>
<td>28.317</td>
<td>7.360</td>
<td>0.004</td>
</tr>
<tr>
<td>Type of question (TQ)</td>
<td>35.771</td>
<td>1</td>
<td>35.771</td>
<td>9.298</td>
<td>0.002</td>
</tr>
<tr>
<td>Instructor (I)</td>
<td>2.240</td>
<td>1</td>
<td>2.240</td>
<td>0.582</td>
<td>0.224</td>
</tr>
<tr>
<td>Covariates(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPA</td>
<td>50.145</td>
<td>1</td>
<td>50.145</td>
<td>13.034</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Interaction Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TM (\times) TQ</td>
<td>2.949</td>
<td>1</td>
<td>2.949</td>
<td>0.767</td>
<td>0.192</td>
</tr>
<tr>
<td>TM (\times) I</td>
<td>8.092</td>
<td>1</td>
<td>8.092</td>
<td>2.103</td>
<td>0.075</td>
</tr>
<tr>
<td>TQ (\times) I</td>
<td>0.512</td>
<td>1</td>
<td>0.512</td>
<td>0.133</td>
<td>0.358</td>
</tr>
<tr>
<td>TM (\times) TQ (\times) I</td>
<td>2.806</td>
<td>1</td>
<td>2.806</td>
<td>0.729</td>
<td>0.197</td>
</tr>
<tr>
<td><strong>Residual</strong></td>
<td>627.121</td>
<td>163</td>
<td>3.847</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) The covariate is the overall GPA of the participants before the experiment.

As to the effect of the teaching method on the test scores of the participants, we report the marginal (covariate-adjusted) means by separating the participants into groups based on the type of question that they answered. For those who answered the direct application-type of questions, we find that the participants in the cooperative learning sessions outperformed those in the traditional lecture sessions in the direction predicted. However, the difference is not statistically significant (\(p < 0.12\)). Therefore H2a is not supported.

Referring to H2b, we predicted that the participants in the cooperative learning groups would perform better than those in the traditional lecture groups when they were asked to answer indirect-application-type questions. The statistics reported in Table 2 confirm our prediction. The mean difference in test scores between the two groups of participants is statistically significant (\(p < 0.01\)). This statistical result suggests that cooperative learning can enable participants to solve indirect (harder and less straightforward) questions that require a higher level of understanding of the subject.\(^14\) Figure 2 illustrates the learning outcome enhancement of the implementation of cooperative learning pedagogy for both the direct-application- and the indirect-application-type of questions.

**DISCUSSIONS**

Educators should find the results of this study encouraging. Results suggest that students in a passive learning environment achieve better learning outcomes through cooperative learning than though traditional lecture pedagogy. Results also suggest that cooperative learning can improve the ability of students to apply the knowledge that they have learned in the classroom. The degree of
improvement in the learning outcome is particularly significant when students are faced with
darker or less straightforward accounting problems.

<table>
<thead>
<tr>
<th>Types of Questions</th>
<th>Traditional Lecture</th>
<th>Cooperative Learning</th>
<th>Overall Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct application</td>
<td>6.3&lt;sup&gt;d&lt;/sup&gt;</td>
<td>7.0&lt;sup&gt;e&lt;/sup&gt;</td>
<td>6.7&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Indirect application</td>
<td>5.0&lt;sup&gt;e&lt;/sup&gt;</td>
<td>6.2&lt;sup&gt;e&lt;/sup&gt;</td>
<td>5.6&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Overall average</td>
<td>5.7&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.1</td>
</tr>
</tbody>
</table>

<sup>a</sup> All of the figures reported in this table are marginal (covariate-adjusted) means and they have been rounded to one decimal place.

<sup>b</sup> For all of the participants in the experiment, the mean difference in test scores between the traditional lecture groups and the cooperative learning groups is statistically significant (p < 0.01).

<sup>c</sup> For all of the participants in the experiment, the mean difference in test scores between those who took the direct-application-type questions and the indirect-application-type questions is statistically significant (p < 0.01).

<sup>d</sup> For those who took the direct-application-type questions, the mean difference in the test scores between the traditional lecture groups and the cooperative learning groups is not statistically significant (p < 0.12).

<sup>e</sup> For those who took the indirect-application-type questions, the mean difference in the test scores between the traditional lecture groups and the cooperative learning groups is statistically significant (p < 0.01).

There are two major implications for accounting education based on the results of this study. One is that students can and will adjust to cooperative learning pedagogy as long as the course is properly structured. Another implication of this study is attributable to the use of international students as experimental subjects. The results show that students accustomed to a passive learning environment appear to benefit from cooperative learning.
There are several limitations to this study. First, the experiment was conducted in a single university for a single topic of an intermediate accounting course. Therefore, it is important to confirm the external validity of the findings of this study by conducting large-scale experiments using a variety of accounting topics. To achieve this objective, researchers are encouraged to adopt or to modify the research design of this study to investigate whether cooperative learning can lead to a significant improvement in learning outcomes over a variety of accounting subjects with a broader range of participants. Second, this study evaluates the learning outcomes of the participants using objective multiple-choice questions. As there are other ways of evaluating performance, it is unclear whether the reported findings of this study would be attainable if another form of assessment, such as written reports, were used to evaluate the learning outcomes of the participants. Third, the learning outcome of the participants was evaluated immediately after the completion of the experiment in this study. Therefore, we were not able to determine whether the learning enhancement reported in this study is persistent. To address this concern, a comparison of the level of knowledge retention between the cooperative learning and the traditional lecture groups at a later date is desirable. Finally, it was not possible to randomize subjects to the two teaching methods. Rather, subjects were permitted to select which instructional meetings they attended. At the time subjects made this choice, they did not know that different teaching methods would be used in the various meetings. Although it is unclear whether, and to what extent, this self-selection process affects our results, readers should exercise caution in drawing conclusions.

Several issues deserve attention in future research. First, it would be beneficial to develop instruments, such as open-ended cases and essays, to examine whether cooperative learning helps learners to achieve a higher level of learning outcome according to the structure of Bloom’s taxonomy (1956). Second, researchers could design studies to investigate how, and to what extent, cooperative learning improves analytical and critical thinking, and research skills. Finally, the effectiveness of the educational processes probably goes beyond testing the learning outcomes in a classroom setting. For example, future studies could concentrate on whether cooperative learning fosters a positive attitude in accounting graduates to pursue lifelong learning.

APPENDIX
Examples of the Multiple-Choice Questions Used in the Experiment

Direct application (Q3)
The Dromedary Company has 29,000 shares of common stock outstanding in 2001. In addition, Dromedary has stock options outstanding for the whole year that allow executives to purchase 5,000 shares of common stock at $16/share. The average market price of the common stock in 2001 is $20/share. The net income reported for the year 2001 is $84,000. Applying the treasury stock method, what would be the diluted earnings per share?

a. $2.47  b. $2.80  c. $2.90  d. None of the above
Indirect application (Q3)

The Dromedary Company has 29,000 shares of common stock outstanding in 2001. In addition, Dromedary has stock options outstanding for the whole year that allow executives to purchase 5,000 shares of common stock at $16/share. The net income reported for the year 2001 is $84,000, and the diluted earnings per share is $2.80. Applying the treasury stock method, what would be the average market price of the common stock per share in 2001?

a. $30  b. $20  c. $25  d. None of the above

Direct application (Q5)

As of December 31,2000, the Golden Stars Corporation had the following capital structure:

**Common stock 100,000 shares**  **Convertible preferred stock 10,000 shares**

During 2001, Golden Stars paid dividends of $1.00/share on its common stock and $2.50/share on its preferred stock. Each preferred share is convertible to six shares of common stock. The net income for the year ending December 31,2001 was $400,000. The income tax rate was 30%. The diluted earnings per share is:

a. $2.34  b. $3.75  c. $2.50  d. None of the above

Indirect application (Q5)

As of December 31,2000, the Golden Stars Corporation had the following capital structure:

**Common stock 100,000 shares**  **Convertible preferred stock 10,000 shares**

During 2001, Golden Stars paid dividends of $1.00/share on its common stock and $2.50/share on its preferred stock. The net income for the year ending December 31,2001 was $400,000. The income tax rate was 30%. If the diluted earnings per share for the year ending December 31,2001 was $2.50, how many shares of common stock could each convertible preferred stock be converted to?

a. 6  b. 5  c. 7  d. None of the above

FOOTNOTES

1. Similar grade control systems have also been implemented in Singapore and other countries in the Asia-Pacific region.

2. In recent years, Hong Kong universities have offered more scholarships to attract top-tier students. Given the media coverage and road shows, secondary school students now pay more attention to the quality of academic programs and to the variety of curricula offered by universities.

3. The effectiveness of cooperative learning has been tested in several accounting courses, including the following: accounting principles (e.g., Wilson 1982; Ravenscroft et al. 1995, 1997; Caldwell et al. 1996; Marcheggiani et al. 1999); cost and managerial accounting (e.g., Peeketal.
1995; Ciccotello et al. 1997; Ravenscroft et al. 1997; Lancaster and Strand 2001); taxation (Hite 1996); auditing (Lindquist 1995; Ravenscroft et al. 1997); and intermediate accounting (Ravenscroft et al. 1997).

4. Topics such as pensions and leasing may take longer than three hours to cover in detail.

5. Lindquist (1995) adopted the same model to conduct a study on the issue of audit reporting.

6. On average, the cooperative learning groups took approximately 15 to 20 minutes more than the traditional learning groups to complete the entire experiment, including the time taken for the quiz. This difference is not a concern, as it takes time for a cooperative learning group to take turns in making presentations.

7. In Wilson’s (1982) study, each of the three instructors taught a control class in traditional lecture format and then an experimental treatment class.

8. The participants in this study took three regularly scheduled classes during the day (session 1: Monday morning and Wednesday morning, session 2: Monday morning and Wednesday afternoon, and session 3: Tuesday morning and Thursday morning). The experiments, on the other hand, were scheduled in two evenings, with the treatment groups conducted first, followed by the control groups, during the specifically scheduled evening hours.

9. Aronson and Goode (1980) suggest groups of six students for the Jigsaw method that they proposed. Rau and Heyl (1990, 146) suggest that groups should range in size from four to eight students, depending on the size of the class. However, there is a point beyond which the group size becomes unmanageable.

10. Such procedures are designed to foster interdependence among the team members in the cooperative learning treatment.

11. The role of the instructor during the experiment is similar to that described in Vygotsky’s theory of constructivism in education.

12. In the traditional lecture groups, each participant was paid based on individual performance. However, for the cooperative learning groups, the participants were paid based on a weighted average score of individual (70 percent) and group performance (30 percent). This rule was intended to foster a positive interdependence among the group members and to hold individuals accountable for their performance (e.g., Holubec 1992; Ravenscroft et al. 1995).

13. Supplemental analyses have been conducted with additional variables including participants’ accounting credit hours earned, accounting GPA, and years of accounting education prior to the experiments. The results were not materially altered.

14. In Table 1, the interaction between TM and TQ is not significant. However, based on t-tests of cell means, results in Table 2 indicate that an interaction between these two variables may exist. Thus, the results reported in this study are somewhat equivocal on whether there is an interaction between TM and TQ.
REFERENCES


The George Washington University, ERIC Clearinghouse on Higher Education.


