Learning Together at a Distance

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Abstract: Two studies explored the effects of cooperative and individualistic structures on student learning and attitudes in a simulated distance education environment. In Study 1, 117 male and female college students were randomly assigned to complete a case study assignment online for a business strategies course either with a partner or alone. In Study 2, 107 male and female students were randomly assigned to complete two case studies online either with a partner or alone. In addition, to explore the effects of familtarity, students in the pairs condition were stratified into those who had worked together previously and those who had not. There were few differences between students in their attitudes and achievement due to working cooperatively with a partner or individually. The differences which were found suggested that students in the pairs condition took longer to complete learning tasks and expressed slightly more frustration than students in the individual conditron. Nevertheless, students expressed a desire to work with a partner again The studies also explained gender differences. For female students those In the cooperative condition were more positive about their performance and the opportunity to exchange ideas than those working alone. These results are discussed in terms of both the differences between distance education and traditional instruction and the methodological and design limitations of the studies which limrt generalizability. Prescriptions are offered for the design of future research and the implementation of cooperative learning in a distance education environment.

Résumé: Deux études ont exploré les effets des structures individuelles et coopératives dans l'apprentissage et les attitudes de l'étudiant dans un environnement qui simulait l'éducation à distance. Dans la première étude, on a demandé à 1 1 7 étudiants de niveau collégial, hommes et femmes, de compléter individuellement ou en équipe de deux une étude de cas à l'intérieur d'un cours par ordinateur portant sur les stratégies en affaires, Dans la deuxième étude, on a demandé à 107 hommes et femmes aussi aux études de compléter, individuellement ou avec un partenaire, deux études de cas. De plus, afin d'explorer les effets de la familiarité, les étudiants travaillant en équipe de deux ont été devisés en deux groupes; ceux qui avaient déjà travaillé ensemble, et ceux qui travaillaient ensemble pour la première fois, Peu de différences au plan des attitudes et des réussites ont été notées entre les étudiants travaillant en équipe et ceux travaillant seuls, Les différences trouvées suggèrent que les étudiants travaillant en équipe ont pris plus de temps pour compléter la tâche d'apprentissage et ils

ont exprimé un peu plus de frustration que les étudiants travaillant seuls. Néanmoins, les étudiants ont tout de même exprimé le désir de travailler en équipe dans le futur. Les études ont aussi démontré une différence quant aux sexes des étudiants. Pour les femmes étudiantes, celles travaillant en équipe étaient plus positives envers leur performance et sur l'opportunité d'échanger des idées que celles travaillant seules, Ces résultats sont discutés au plan des différences entre l'éducation à distance et l'éducation traditionnelle ainsi qu'au plan des limites apportées par le plan de recherche et la méthodologie employée qui limitent la généralisation des résultats. Des suggestions sont apportées pour des plans de recherches ultérieurs et pour l'implantation d'apprentissage coopératif dans une situation d'éducation à distance.

Keegan (1986) described distance education as a learning environment where the learner and teacher are geographically separated. It is also an environment where students are often physically separated from one another. Distance education offers the learner a degree of flexibility seldom encountered in traditional instruction by allowing students to determine where they will receive instruction and when they will learn. Thus, distance education appears to lend itself to individualized learning structures where students learn for themselves and by themselves: there is independence between the means to learning among students and the learning goals of individual students.

Although distance education differs from traditional classroom education, numerous studies have demonstrated that there is seldom a significant difference between the attitudes toward learning and the achievement of distance and traditional learners (Bissell, Coombs, Medvedeff & Rogers, 1987; Blackwood & Trent, 1968; Boswell, Mocker, & Hamlin, 1968; Cheng, Lehman & Armstrong, 199 1; Hoyt & Frye, 1972; Puzzuoli, 1970). However, distance education is not problem free; student attrition appears to be a major difficulty (Haile, 1986; Kember, 1989. 1990; Mason, 1989; Sweet, 1986).

The problems in distance education which result in increased dropout arise from two sources: student related and course related. Student related factors include home and work environments which interfere with a student's ability to study (Haile, 1986; Kember, 1989, 1990; Naidu, 1989-1990; Peruniak; 1983). Haile (1986) and Naidu (1989- 1990) claim that social and intellectual isolation are two of the course-related factors that contribute to the decision of distance learners to dropout. That is, distance learners experience fewer opportunities to interact with course instructors and other students in order to discuss course content, assignments, learning strategies, and concerns about their learning. This isolation may amplify student perceptions of external control-the belief that success and achievement are generally a function of factors beyond individual control. Kember (1990) and Peruniak (1983) found that external locus of control was a factor related to the drop out rate. One way to ameliorate the deleterious effects of social and intellectua1 isolation is to increase the level of learner interaction with other

and the instructor. A medium which lends itself to such interaction among learners is computer-mediated communication (CMC).

Computer Mediated Communication

CMC can increase student contact with their institution and with their peers (Bissell, 1987; Davie and Wells 1991: Kaye, 1989a; Hiltz, 1988; Henri, 1988). Moreover, Bissell (1987), Davie and Wells (1991) and Kaye (1989b) claimed that the immediacy of contact and feedback made possible by CMC may lead to higher completion rates for distance learners. Kaye (1989) and Mason (1990) stated that CMC facilitates group discussions, encourages learner autonomy, enables frequent feedback and gives learners greater access to experts. Dede (1990) surveyed students using CMC and found that students: were able to benefit from peer teaching; obtained extrinsic motivation from peer approval; and felt that they had more of an equal opportunity to participate in discussions. Schriner (1989) found that computer conferencing appealed to both shy and disadvantaged students. Finally, this medium allows for a permanent record of interaction which can later be used for analysis (Davie and Wells, 1991; Davies, 1988; Kaye, 1989).

Although CMC has the greatest potential for increasing teacher-to-student, student-to- student, and student-to-institution interaction, it does have some disadvantages (Carrier & Schofield, 1991; Cheng, Lehman, & Armstrong, 1991; Davie & Wells, 1991; Harasim, 1987; Henri, 1988; Howard, 1987; Naidu, 1989- 1990; Wild & Winniford, 1993). The weaknesses are: software is not "user friendly"; hardware is often unreliable; students frequently do not receive sufficient training in the use of technology; student and teacher workload is sometimes increased; time constraints are amplified by a longer communication cycle; weaker writers are more reticent to participate; and student progress may not be sustained over time.

To take fuller advantage of the strengths of CMC may require restructuring the learning environment to further encourage both the participation and interaction of students. Techniques for group learning used in traditional classroom settings may be adaptable to distance education. Cooperative learning strategies, in particular, may facilitate learning together at a distance. Cooperative Learning

According to Abrami et al. (1995) cooperative learning is an instructional strategy in which students work together in groups that are carefully designed to promote positive interdependence among students. This positive interdependence is coupled with individual accountability so that students are responsible for their own learning as well as a contribution to the group task. Developing positive interdependence can be facilitated in several ways including: sharing resources, working toward a common learning goal, depending on one another for obtaining a reward given equally to all team members, and so on. Demonstrating each individual's responsibility for helping the

group meet its goal successfully is individual accountability. Individual accountability can be encouraged in several ways including: having group members sign projects with their names and area of responsibility, summing individual improvement scores to create a group score, and so on.

The results of a review conducted by Johnson and Johnson (1989) suggested that cooperative goal structures have moderately large positive effects on productivity and achievement compared to either competitive or individualistic goal structures. The average effect sizes exceeded +.60; the percentile advantage for cooperation was about 24 percent. Furthermore, very few of the studies (eight percent or less) showed results where either competitive or individualistic goal structures were superior to cooperative goal structures. Finally, large positive effects were found for cooperative structures on social and affective outcomes.

The results of the more selective review conducted by Slavin (1989) also revealed positive effects on achievement for cooperative learning methods compared to control conditions. The average effect size (+0.21) was modest in size resulting in a percentile rank advantage of almost nine percent. Furthermore, the majority of the studies (72 percent) were in the direction favouring cooperative learning methods. Only a fraction (15 percent) had evidence favouring the control methods.

CMC and Cooperative Learning

A review of the research revealed two studies utilizing cooperative learning in a CMC environment (Harasim ,1987; Hiltz; 1988). Harasim (1987) analyzed user patterns and rates of participation of students enrolled in online seminars and workshops. Goals and rewards were interdependent among students working in groups. Students reported that the interaction made possible by the online system, promoted learning. They enjoyed the lack of competition for air space and perceived computer conferencing as an "equalizing force". Harasim (1987) reported that students found that on-line courses promoted more equal participation than face-to-face classes. A student reported "I learned much more than in a regular three hour course because of the action of all the students in the course. It is much more interesting this way" (Harasim, 1987, p. 181). Harasim concluded that cooperative learning can be used to provide a highly active, interactive and effective distance learning environment. However, although high rates of participation were found, learning in this study was not directly measured.

In order to determine if cooperative learning was more effective and supportive than the traditional classroom approach, Hiltz (1988) compared the achievement and attitudes of live classes of students who were exposed to frontal teaching, computer mediated communication, and cooperative techniques with CMC. Hiltz (1988) found that course grades were significantly higher in one of the classes using cooperative techniques on-line. However,

there were no significant differences between the midterm or final examination scores in any of the five courses surveyed. Finally, Hiltz (1988) found that the group utilizing cooperative learning online collaborated the most out of the three groups. Forty-nine percent of the students perceived that they had more interaction with the other students online than they had in the past in a traditional class.

Together, these studies offer some support for the use of cooperative learning in distance education. These studies argue against the notion that the conveniences of distance education-learning alone where and when one wishes-outweigh the benefits of collaboration with peers. Consequently, we wanted to explore further the effects of learning structure (individualized versus cooperative) in a computer-mediated environment on a range of student variables, including perceived effectiveness, involvement, affect, and achievement.

In addition, we wondered whether the effects of cooperative or individualistic structures would be uniform for all students. In particular, we wondered whether student gender would interact with structure, particularly in view of the use of computers as the communication medium.

There is evidence of gender differences in user patterns and attitudes towards computer usage among students. For example, Chen (1986) found that males had more interest, confidence and respect for computers than females and that computer anxiety was lower in males than females. Males reported using the computer 6.1 hours per week while the females used the computer 3.6 hours per week. When the amount of experience and access was controlled, significant differences were not found in computer interest between males and females.

To explore the effects of structure and gender in a distance education environment, two studies were completed with groups of university undergraduates working on-line. It was hypothesized that a significant difference would be found in the achievement and attitudes of males and females working on-line either alone or in cooperatively structured pairs. It was further predicted that gender and structure would interact; the effects of structure would be greatest for female students.

STUDY 1

Method

Participants. The sample consisted of two intact classes of male and female undergraduate business students enrolled at a university in the Northeastern United States. All students were registered for a business strategies course. Each class was taught by the same professor during the Spring, 1993. The classes met twice a week for discussions; in addition, students were

couraged to use email to correspond with their professor and students at other universities, thereby simulating the likely future of business communications. Of the 117 students who participated, 45 were randomly assigned to work individually and 72 students were randomly assigned to work in cooperative pairs. Random assignment insured that experimental groups were equivalent in technical abilities save for the operation of chance.

Students were free to discontinue their participation in the data collection without penalty. Students could also elect not to work in the assigned condition. However, the instructor reserved the right to assign alternative material.

Design. Study 1 was a gender (male, female) by structure (cooperative pairs, individuals) between groups factorial design. The unit of analysis was the individual participant.

Procedure. Students were informed that they would be receiving an assignment online, which was a case study requiring a solution to a marketing problem, and which was to be completed within a week either individually or in pairs for homework. Those students assigned to the pairs condition were sent their partner's email address and were told to contact their partner in order to complete the assignment. With the assignment, students were given an outline of procedures to follow. They were informed that the assignment would be graded and worth three percent of their final mark. This grade would be either an individual grade or group grade for a collective effort, depending on their individual or pairs status. Students were directed not to speak face-to-face with their assigned partner in order to simulate a distance education environment. The dependent measures were collected in class the week following the completion of the assignment.

Measures. An attitudinal questionnaire consisting of 35 Likert scale items was administered. The questionnaire measured: a) the level of cooperative or competitive orientation (6 items); b) the feelings generated as a result of completing an assignment entirely online (16). Also included in this category was a manipulation check that was used to determine if the students actually did complete the task online; c) the effectiveness of the simulation of distance education (3); d) the amount of effort needed to complete the assignment (1); e) the degree of involvement (3); f) the perceived locus of control (5); and g) the time-on-task (1). Lower scores indicated higher levels of agreement.

The second measure was an achievement test. A second case study (the posttest) measured the skill transfer of strategies developed while completing the online case study. For the posttest, students were required to analyze, in-class, a case study which was similar in nature to the one that they had been required to be completed online. The second case study was completed individually.

Results. Two sets of analyses were conducted, the first on all students in the study, and the second on students in the individual condition plus students who were in 'pure' groups. Pure groups were defined as a pair where

both individuals had input on the assignment (N= 36). Students (N= 36) were eliminated from the second analyses based on the following criteria: a) if they contacted their partners by means other than email; b) if they did not contact their partners; c) if they did not work on the assignment with their partners: or d) if they strongly agreed with the manipulation check. The results for 'pure' groups and individuals are summarized below.

The results revealed only two significant differences between the individualistic structure and the cooperative pairs structure in attitudes. First, students were less comfortable completing the online assignment cooperatively (M = 2.69) compared to individually (M = 1.95), F (1, 71) = 5.34, p .05. Second, students expressed more frustration completing the online assignment cooperatively (M = 3.23) compared to individually (M = 3.69), F (1, 71) = 4.75, p <05. There was no significant difference between the groups in achievement (p > 05).

There were only two significant interactions of gender and structure. The Gender X Structure interaction effect was significant regarding the amount of effort students extended in completing the online assignment compared to other assignments, F (1, 7 1) = 5.79, p < 05. In particular, females in the cooperative condition reported working harder (M = 2.7 1) than females in the individual condition (M = 3.19). There was also a significant interaction effect for perception of course performance, F (1, 71) = 5.16, p < 05. Females in the cooperative condition were less likely to denigrate their performance (M = 3.77) than females in the individualistic condition (M = 3.19).

Discussion. Study 1 attempted to simulate a distance education environment, with male and female students who were required to complete an assignment by email either working alone or working cooperatively with a partner. The study found many similarities between the cooperative and individualistic conditions in promoting student attitudes and achievement; differences were limited to students feeling less comfortable and more frustrated working in cooperative pairs. One possible implication of these experimental results is that students will continue to show no strong preference for either individual work or cooperative work online under practical, field conditions of longer duration and greater isolation from the instructor and other students. Furthermore, these data are mildly encouraging for the use of cooperative structures for female students learning online.

A second interpretation of these results considers methodological and design factors such as the duration and strength of the treatment, the fidelity of the treatment, and the quality of the measures. For example, the treatment was brief, the task may not have been challenging enough (all students earned relatively high grades), despite student reports that they had insufficient time to complete it. The assignment was not worth a significant percentage of the grade for the course (3%) which may have affected student motivation. Also, the assignment came at a time when the students were occupied

preparing for midterm examinations. Finally, about half of the students were eliminated from the cooperative pairs condition for reasons ranging from not working with their assigned partners to working with others in ways not prescribed by the experimenters.

O'Malley and Scanlon (1990) conducted a study to determine student preferences for working collaboratively or individually. They found that: a) although students preferred working alone, online collaboration was perceived as helpful; b) appropriateness of group activities may be task depend ent; and c) there is value in synchronous online group activities. Furthermore, Wild and Winniford (1993) reported positive effects of CMC when students were given the choice of selecting partners with whom to work.

Consequently, we decided to conduct a second study to explore further the effects of cooperative and individualistic structures on male and female students learning online while taking into account some of the shortcomings of Study 1. Several changes were made. First, to limit differential mortality, students provided informed consent prior to being assigned to experimental conditions. To further strengthen the treatment, the assignment was worth more of the course grade than in Study 1, it was more challenging, and in the cooperative condition, promoted goal interdependence among the pairs. To further encourage interdependence, communication among pairs was synchronized as opposed to the asynchronized communication used in Study 1. The length of the treatment was also doubled. Finally, to explore the effects of familiarity and cohesiveness, the pairs were divided into two groups: those who had worked together previously and those who had not. We expected that the attitudes and achievement of the cooperative pairs in the familiar condition would be higher than the attitudes and achievement of the cooperative pairs in the unfamiliar condition.

STUDY 2

Method

Participants. The sample consisted of two intact classes of male and female undergraduate business students registered for a business strategies course. Each class was taught by the same professor during the Fall, 1993. Of the 107 students who participated, 33 were assigned to work individually and 74 students were assigned to work in pairs. Those assigned to the pairs condition were stratified into pairs who had worked together previously (N=47) and pairs who had not (N=27). For various reasons, 6 students assigned to the pairs condition worked alone and their data were withheld from analysis.

Design. Study 2 was a gender (male, female) by structure (familiar cooperative pairs, unfamiliar cooperative pairs, individuals) between groups factorial design. The unit of analysis was the individual participant.

Procedure. Students were initially informed that a study was being conducted which would require them to complete two case study assignments online in the university's computer lab either individually or in pairs. Students were required to complete the assignments as part of the course requirements. However, the students could choose not to have their data used for research purposes.

The students were randomly assigned to either the individual or cooperative pairs condition. Those students assigned to the pairs condition were sent their partner's email address and were told to contact that partner in order to complete the assignments. All students were informed that this exercise was to simulate distance education, therefore, they should not speak directly to their partners or professor all queries were to be sent via email.

Along with the first assignment, students were given an outline of procedures to follow. They were informed that the two assignments would be graded and together worth five percent of their final mark. This grade would be either an individual grade or group grade, depending on their individual or pairs status.

Feedback on the first assignment was sent to each student prior to the second class. The second assignment was completed exactly as the first. That is, students resumed with the same partner they had during the first assignment or they continued working alone. The assignment was completed online, during class time at the university's computer laboratory. Finally, students were administered the attitudinal questionnaire and the posttest during the class following the completion of the second assignment.

Measures. The attitudinal measure was a refined version of the questionnaire used in Study 1. Several item stems were eliminated or clarified and some of the response alternatives were slightly modified. In addition, the response anchors were reversed such that a high score indicated increased agreement. The case study posttest was thematically similar to the one used in Study 1 but was more challenging and graded somewhat more stringently. Results: The results revealed no significant achievement effects ($p > 05$) and few attitudinal effects attributable to structure. Students in the individual condition reported needing less time to complete the assignments ($M = 1.61$) than students in either the familiar pairs ($M = 2.57$) or unfamiliar pairs conditions ($M = 2.37$), $F(2, 96) = 4.74$, $p < 05$. However, compared to students working individually ($M = 2.79$), students who had the opportunity to work with a partner, whether familiar ($M = 3.70$) or unfamiliar ($M = 3.59$), expressed a greater desire to work with a partner in the future, $F(2, 96) = 3.42$, $p < 05$. Finally, there was a single significant Gender X Structure interaction effect. Female students reported the greatest satisfaction with idea exchange

in the familiar pairs condition (M = 4.59), followed by the unfamiliar pairs condition (M = 4.20), and the least satisfaction with the alone condition (M = 3.57), $F(2,96) = 3.46$, $p < 05$.

Discussion. As in Study 1, Study 2 also found many similarities between the cooperative and individualistic conditions in promoting student attitudes and achievement. The differences found suggested that the work took longer with a partner yet students in the pairs conditions wanted to work with another student again in the future. Furthermore. female students liked the idea exchange possible when working in cooperative pairs.

Methodological and design factors may also have compromised treatment efficacy. The treatment, while longer in Study 2, was still only a fraction of a complete course. The value of the assignments was also greater in Study 2, but still was only a small part of the grade for the course. Students in both studies only simulated distance education; the degree of isolation and separation from teachers and peers was apparent only during the brief treatment phase of one business course. Which is incongruent with the constant separation from teachers and peers that most distance learners experience. Furthermore, these students registered for an in-class course and may have held a set of expectations that may differ from those of "free choice" distance learners, aware that they will forfeit contact with teachers and peers for scheduling flexibility.

Finally, there were unanticipated difficulties with computer use. Some students lacked enough email experience to fully communicate with their partners. A small number did not try.

GENERAL DISCUSSION

The growing importance of education coupled with large worldwide enrolments in courses taught at a distance argue for increasing efforts to develop technological and pedagogical tools to enhance learner success. These developments depend on educational research for their validation.

The two studies reported here attempted to use techniques of field experimentation (e.g., random assignment) to study the effects of cooperative versus individualistic structures on male and female college students. In general, the data suggest few differences between students in their attitudes and achievement due to working cooperatively with a partner or not in a computer mediated environment. The differences which were found suggested that students took longer to complete learning tasks and expressed slightly more frustration when working with a peer. On the plus side, students expressed a desire to work with a partner again. while female students in the cooperative condition were more positive about their performance and the op-

portunity to exchange ideas than those who worked in the individual condition.

There are two interpretations of these findings. The first interpretation focuses on the unique features of distance education. It suggests that the effects of cooperative versus individualistic structures in a simulated distance education environment are smaller than those which occur in traditional classrooms where students have the opportunity to interact face-to-face in real time. For example, the attraction of distance education is that students are free to learn where and when they chose. Using cooperative learning may not support the extent to which these benefits are realized.

There are at least two interrelated features of distance education which may ameliorate the effectiveness of cooperative learning: communication effectiveness and social loafing. Group problem solving depends on the ability of group members to communicate with one another when assistance is necessary. The asynchronous communication in Study 1 may have limited communication effectiveness while the synchronous communication in Study 2 may have slightly facilitated it, explaining those students' preferences for collaborative work in the future. Nevertheless, the time and effort required of written communication may not suit many learning tasks as well as the efficiency and immediacy of oral communication.

In contrast, Carroll (1990) found that students who participated in asynchronous conferences with structured decision support (the use of topic headings or the use of topic headings and moderator support) demonstrated high quality decisions. Carroll also claimed that when CMC is asynchronous, it has the potential to promote communication patterns that are more effective that those that occur face-to-face. However, she recognized that CMC can lose its focus without structure and a moderator. Carroll concluded that the structure in the conference provided students with a means of coordinating their discussion.

One of the attractive features of distance education and an asynchronous environment, is that it allows students to work when it is most convenient for them. Nevertheless, if placing students in cooperatively structured groups is desired, then it may be necessary to ensure that they are on-line at the same time or that they understand that others (their partners) are depending upon them to do their share of the work.

A second distinguishing feature of distance education is the relative anonymity of each partner's learning effort. Research on group performance and productivity suggests that several factors contribute to the tendency for individuals to minimize their efforts on a collaborative task, such as equality of efforts, personal responsibility, and involvement or whether the individual perceives the work as worth it, too costly, or not necessary (Shepperd, 1993). In particular, Harkin (1987) showed that individual efforts decreased when others could not identify individual contributions. If such is the case, coopera-

tive learning structures which promote individual accountability may be essential for effective distance learning among peers.

Further research is necessary comparing cooperative versus individualistic structures in distance learning and traditional classroom settings and which explores the possible mediating effects of communication effectiveness and social loafing. However, these problems may be overcome when fourth generation distance education technology permits visual, oral, and written communication in real time.

The second interpretation focuses on the design and methodological constraints of the studies-the duration and strength of the treatment, the fidelity of the treatment, and the quality of the measures-which limit their generalizability. Together these limitations also offer certain prescriptions for the design of future research and the implementation of cooperative learning using CMC in a distance education environment.

1. Students should be equipped with the appropriate technical skills to use CMC effectively prior to working with peers.
2. The learning task should lend itself to collaboration by requiring input from all members of the group.
3. Sufficient time should be available for meaningful dialogue and for the treatment to "take hold".
4. Students should have the requisite collaborative and communication skills to work effectively with others; this may be facilitated through the use of online teambuilding activities.
5. Students should be motivated to learn cooperatively; this may be accomplished by the use of outcome, means, or interpersonal structures which promote interdependence.
6. Students should believe that learning is important, that working together facilitates performance, and that they are responsible for their own learning and the learning of others. The latter may be accomplished by the use of structures which promote individual accountability.

Finally, more research in needed to determine the cognitive gains made possible through the use of CMC. For example, does the use of CMC promote or inhibit deep processing skills? Using an instructional strategy which promotes deep processing is particularly important in distance education. Kember (1989) found that distance education students who consistently used a surface approach were more likely to dropout. That is, those students who habitually used rote learning were less likely to finish a course by distance than those who used higher order learning skills. One learning strategy that can overcome the problems of CMC and promote deep processing skills is cooperative learning. According to et al (1995) higher order processing skills are required when interacting for a group goal.

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