Homogeneous and Heterogeneous Gender Pairs, Controlling Behavior, And Achievement on a Cooperative Learning Task

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Abstract

This study investigated the effects of controlling and cooperative behavior on a specific task. Twenty pairs of middle school students were categorized by one of three gender pairings. Each pair partook in a cooperative learning task involving the flight simulator at a West Virginia Challenger Learning Center®. Each pair was videotaped to record controlling and cooperative statements, sharing headphones, and the total time of the mission. Statistical analysis showed that there was no significant difference in the time it took for each pair to finish the task (.358), that females made insignificantly more controlling statements (X=22, 10, and 11), cooperative statements were not significantly greater in any one pair (.072). Headphone sharing between the groups approached significance (.068).

Homogeneous and Heterogeneous Gender

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Since its inception in the 1970's, cooperative learning has been praised by the educational world as an exciting alternative to the lecturing method (Cohen, 1994). Some advantages of cooperative learning over individual work are greater learning gains, higher order thinking, and increased pro-social behavior (Nystrand, 1986; Yelland, 1993; Thompson, 1996). Many students also prefer the group work over regular lecturing style because it gives them a feeling of being involved in the learning (Thompson & Taymans, 1996). A productive pair will be encouraging of one another and will solicit opinions as to how to solve the problem at hand (Heck, 1991).

It is no easy task putting together a cooperative learning pair that works effectively together, i.e. a productive pair. The field of cooperative learning has been plagued with mixed research conclusions over what type of pair is most effective. Pairs could be matched by achievement level (high and low) or by gender. The achievement method has been beneficial for both students according to Webb (1982), Frank (1984), and Johnson & Johnson (1984). But there are also studies that show that this method is nonconductive to learning. Peterson, Janicki, and Swing (1981) came to the conclusion that students who receive help from their peers may or may not improve their performance. Harrison and Covington (1981) found that low achieving students are hindered by the fact that they may be holding their group back in a task.

Researchers also disagree as to which type of gender pair works most productively. Although one study states that homogeneous pairs consisting of either males or females work the best (Dalton, 1990), another study claims that heterogeneous pairs (male and female) work most effectively (Yelland, 1993).

There is even less research and consensus on how various types of pairs differ in their interactions during a cooperative learning task. The pair my not even be cooperating. The high achiever may be doing all of the work or controlling the task by telling the low achiever what to do. Various forms of commanding statements made by one student to the other have a negative influence on cooperative learning and achievement of the task (Frank, 1984). When one person is doing all the work and demanding help, the two are unable to collaborate and combine their efforts to achieve the task in the least amount of time.

Controlling behavior and its effects on cooperative learning have not been researched enough to come to any conclusion, but it is reasonable to expect that controlling behavior would have a negative effect on achievement. This is due to the fact that it negates the whole purpose of cooperative learning and the educational benefits each student might receive.

The purpose of my study was to find out which kinds of student pairs are most productive and have the most cooperative interactions in a cooperative learning task at the Center for Educational Technologies. The task centered around a Challenger Learning Center Space Shuttle simulator. Pairs of students worked on a shuttle simulation task together to find an unknown comet. Their interactions were videotaped so that both their productivity and their interactions could be observed.

Gender Differences in Cooperative Learning Efficiency

When comparing homogeneous male and homogeneous female pairs in cooperative tasks, researchers have come to many different conclusions. Some research has found that male pairs are more effective than female pairs in cooperative learning tasks. Webb (1991) found that male pairs accomplish tasks in the shortest amount of time possible and are very competitive in their tasks. Other research states that female pairs are more efficient in cooperative learning. Cohen (1994) found that the females work is more deliberate and consistent to make sure that the task is completed and that the fewest amount of mistakes are made. In a word performance study by Underwood & Jindal (1994), eight-and nine-year-old male and all-female pairs tried to recall the most words in a reading task. The females attempted to recall the most words and got more symbols right than the boys in the same amount of time. Thus, girls had a better memory in the specific task. However, the study did not measure which pair cooperated the most in the memory task. It was assumed in the study that the girls cooperated in the task even if they were not told to and that boys needed to be told to cooperate.

In a study by David Dalton (1990), interactive video was used to teach a science lesson to homogeneous and heterogeneous gender pairs. The results showed that male and female pairs scored very similarly in a post-test after using an instructional video that they progressed through at their own rate (males scored 13.94, females 13.67 on a twenty- question test). In an attitude survey after the test, males demonstrated the urge to compete with their partners by trying to speed up the lesson to get done. Females in the study were more than satisfied with letting the video run its course at the set pace.

Thus, even though males and females use different styles to accomplish a task, past research suggests that both styles can be effective. Therefore, it is hypothesized that male and female pairs will complete the task sooner than heterogeneous pairs.

The conclusion of researchers such as Webb (1991) and Underwood & Jindal (1994) is that homogeneous pairs (both male and female) outperform heterogeneous pairs. In Dalton's study of computer tasks and cooperative learning (1990), homogeneous pairs worked more effectively than heterogeneous pairs. Although boys competed and girls cooperated, both types of pairs still achieved their goal of getting the computer task done effectively. This was not the case with heterogeneous pairs because male traits of competition and female traits of cooperation kept both children from working together. This research was also supported the study by Underwood and Jindal (1994). In a word recall test, heterogeneous pairs finished last in every category of word

recall, word attempts, words correct, and letters correct. This research was both challenged and supported by Yelland (1993), who did similar studies in computer tasks with homogeneous and heterogeneous pairs. The three types of pairs had to manipulate an image through complex mazes. The heterogeneous pairs finished second in how many moves it took to finish the task, last in time taken to finish the puzzle, and second in number of errors. It was also found that the heterogeneous pair had the least number of interactions out of the three pairs.

Yet, other research shows that heterogeneous pairs outscore homogeneous pairs in various other tasks. Some believe that heterogeneous groups are more suited to the real life versions of cooperative learning (Williams, 1991). Heterogeneous groups can also implement both styles of learning that boys and girls bring into a project (Yelland, 1993), in verbal ability and cognitive style problems (Dansereau, 1988). I expected homogeneous pairs to finish the computer task sooner than heterogeneous pairs in my task because this outcome would be consistent with the majority of research in the field of cooperative learning. I also expected such a conclusion based on the fact that homogeneous pairs have outperformed heterogeneous pairs in other computer tasks similar to mine.

Gender DIfferences in Cooperative Learning Interactions

Controlling behavior should logically be one of the major hindrances to cooperative learning. It involves one student taking over most of the work in the project. Controlling behavior may stem from competition on any project that the pair may be working on. Meta-analysis by Johnson, Maruyama, Johnson, et al. (1981) found that cooperation is superior to competition in promoting achievement and productivity. This was specifically true in students under college age, and this also held true in all subjects in school. Unfortunately, if one student is doing all the work it negates the whole purpose of cooperative learning. Non-cooperative behavior can affect a pair in two ways. First, the individuals may work seperately, or second, one person takes control of the task and forces the other person into either working with them or giving up the task completely. Few researchers have directly measured controlling behavior during cooperative learning tasks. Cohen (4), who is one of the few to study controlling behavior and cooperative learning, states that each member of the pair should hold certain pieces to solving the problem. Only by combining their answers and working together can the pair reach their goal successfully and quickly. Aldous (1975) believed that controlling behavior by parents, as well as peers, influenced the lack of achievement in the children. It was hypothesized that controlling behavior would have a negative effect on cooperative learning in each type of pair, and furthermore, that it would hinder the achievement of the specific task. Specifically, pairs that used more controlling statements would complete the task less quickly than those who used fewer controlling statements.

Summary of Hypothesis

1. Homogeneous pairs who complete the mission will achieve their task faster than heterogeneous pairs.

2. Homogeneous male pairs will use more controlling statements than female pairs.
3. Homogeneous female pairs will use more cooperative statements than homogeneous male pairs.
4. Homogeneous females will have the lowest discrepancy scores when using the headphones.
5. Cooperative statements will have a positive effect on task completion time.
6. Controlling behavior will have a negative effect on task completion time.

Method

Participants

Twenty pairs of students were observed at the West Virginia Challenger Learning Center® flight simulator. The pairs were comprised of 6th, 7th, and 8th grade males and females from various schools around the Wheeling, West Virginia area. The students were participating as part of a required school assignment. Some individuals were paired by the teacher, other students selected their own partners. Upon the students' arrival, researchers informed the students of the study. All signed a consent form allowing their mission to be videotaped.

Setting

Students first familiarized themselves with the navigation station in the mission control center of the flight simulator. The pair looked through their flight manual, which gave them the instructions for the mission. As they reviewed their area, they had one set of headphones and a television monitor to view various star fields. The pair was searching for an unknown comet, but first they identified certain other star fields in the area seen on the television screen. The marking of these star fields was done by a separate pair in the space station on a similar television monitor. The navigation pair in the mission control communicated via headphone to the space station telling them which star fields to mark on the grid using certain coordinates that the navigation station had. Mission control had no control over which star field could be marked; it could only give directions. When the navigation team found the unknown comet, Part One of the mission was completed, and the two groups switched roles, ending Part One of the mission.

The mission control center had a video camera that was used to videotape the navigation pair as they worked through Part One of the simulation, which lasted thirty to forty minutes. There was also a microphone to record the conversation between the pair.

Procedure for Coding Interactions

Each statement made by the pair was coded as cooperative or controlling. Cooperative statements were defined as helping statements that the two used to solve any of the problems during the mission such as "What do you think of this?" and "How do we use the headphones?" Controlling statements are defined as explicit commands from one person to another to do some

action or to give information so the person can work individually. Examples of controlling statements are, "Push that button." "Type in the code." Each controlling and cooperative statement was recorded on a behavior chart (Appendix A). I compared total cooperative statements in each type of pair with controlling statements to see if there was a significant difference in the amount of cooperative statements versus controlling statements that took place in each type of pair.

A secondary measure of cooperative behavior versus controlling behavior was based on how much the pair shared the headphones. The total amount of time each individual in the pair had the headphones was measured. The total amount of usage time for person A would be subtracted from person B's time to find the discrepancy in total amount of headphone usage. A measure of perfect cooperation of headphones would be a discrepancy score of 0. This score was analyzed across pairs to see if one type of pair shared the headphones more than the other types.

Coding of Task Efficiency

Each pair's speed at completing Part One of the mission was used as a measure of efficiency, or achievement. When the pair typed in the start- up code, the mission began. This was the starting time of the simulation and the beginning of timing how long it took the pair to complete Part One of the simulation. The time score, in seconds, was compared between groups to find which type of pair elicited the quickest achievement task. The starting time was subtracted from the time at the completion of Part One to get a total score.

Results

A one-way ANOVA was used to test all hypotheses. An alpha level of .05 was used for all statistical tests. The first hypothesis, that both male and female pairs would complete the mission faster than heterogeneous pairs was not supported $F(1,19)=.358$ ns.

My second hypothesis was that male pairs would use more controlling statements than homogeneous female pairs $F(1,19)=.111$ ns. This did not support my hypothesis that males make the most controlling statements.

My third hypothesis was that female pairs would use more cooperative statements than homogeneous male pairs. The main effect for testing cooperation approached significance $F(1,19)=.072$ ns. This came close to supporting my hypothesis on cooperation.

My fourth hypothesis was that females would have the lowest discrepancy score. The main effect for testing discrepancy approached significance $F(1,19)=.068$ ns. This came close to supporting my hypothesis that females cooperate the most of the three gender pairs.

My fifth hypothesis was that cooperative statements would have a positive correlation with task achievement. The correlation was not significant -.006. The hypothesis that controlling

behavior would have a negative effect on task achievement was not supported .486. \

Discussion

My first hypothesis, that homogeneous male and female pairs would complete the task before heterogeneous pairs, was not supported. In fact, males took the longest to complete the task. It may be safe to assume that since all the pairs finished in about the same amount of time (Table 1), the person assigning the pairs should not have to worry about one type of gender pair completing the task in significantly less or more time. Even though this finding is inconsistent with past research, I do not think it is to be used as a discrepancy in past research. With a larger number of pairs, the numbers could change enough to support the past research. My results may also show that the computer task is a fair test of achievement for the three types of gender pairs. It does not favor one type of pair or task achievement method, e.g. cooperation, over another.

Table 1

	Mean	Number
Male	33.34	6
Female	30.25	4
Mixed	39.9	10
Total	31.3	20
		Significance
		0.358

My test of controlling statements also yielded no significance. The female homogeneous pairs made the most controlling statements. I believe that my measure of controlling behavior was invalid since most researchers state that males make most of the controlling statements (Table 2). Such a large number of controlling statements in females may just mean that girls like to communicate while working through the computer tasks.

Table 2

	Mean	Number

Male	9	6
Female	14.75	4
Mixed	6.5	10
Total	8.9	20
		Significance
		0.072

My measurement of cooperation approached significance. Again, female homogeneous pairs had the most cooperative statements (Table 3). My measure of cooperation through statements may have been more accurate than my measure of controlling statements. Females made the most cooperative statements. This also supports the research saying that female homogeneous pairs converse more during cooperative tasks than male homogeneous and heterogeneous.

Table 3

	Mean	Number
Male	10	6
Female	22.5	4
Mixed	11.5	10
Total	13.25	20
		Significance
		0.111

My second measure of cooperation, the discrepancy of headphone use came close to significance. The female homogeneous pairs shared the headphones more than the male homogenous pairs. Significance may have been researched if the number of pairs of females had been larger (Table 4). The results also point to the fact that my behavioral measure of

cooperative behavior was correct, while my use of cooperative behavior did not convey cooperation.

Table 4

	Mean	Number
Male	1458.33	6
Female	411.7	4
Mixed	1143.7	10
Total	1091.77	20
		Significance
		0.068

The lack of correlation between cooperation and task achievement was not significant (Table 5). The implications of this are hard to recognize since the correlation is so small. The second hypothesis, that controlling statements have a negative correlation with task achievement was not supported. This tells me that my definition of controlling statements was probably intertask conversation and that this is what leads to the fastest task completion. It would be helpful to look at the statements made by the pair as on or off task statements and correlate them with task completion time.

Table 5

		Cooperation	Total Time	Control
Male	Cooperation			0.303
Female	Total Time			**468***
Mixed	Control			

The results of my study might have resulted in different conclusions had the task not centered around a computer.

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