The Effects of Individual Preference and Interactive Style on First Graders' Performance in Solving Math Problems

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(ABSTRACT)

The effect of learning style preference on a student's performance on math problems solved both cooperatively and competitively was examined. Eighty-nine first graders were assessed for their preferences for cooperative or competitive interactive styles. Thirty-eight children were found to have clear preferences for either cooperative or competitive styles, or to have no preference for interactive style. Students were then put into pairs, consisting of students from the same or different learning preference groups. These pairs were instructed to solve math problems cooperatively and competitively. After solving the problems under both conditions, the subjects were asked which way they would like to solve the problems again. Of primary interest was the students' overall level of accuracy on the task as a function of learning preference and pair type. The differences between performance for each condition were analyzed by a 3x2x2 Mixed Analysis of Variance with repeated measures. All students performed better under cooperative conditions than the competitive condition regardless of their learning preference or type of partner, but this was not a statistically significant difference. Results also showed that students did not shift their learning preferences as a function of their group assignment. These preliminary findings support that learning preference does not appear to be associated with academic performance. Methodological limitations of the study and possible improvements are discussed.

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Introduction

In order to increase the effectiveness of school environments for students, it is important to critically evaluate learning strategies. A learning strategy is an approach a student uses to acquire information. For example, a student may use cooperative learning as a process to get information from a class. Cooperative learning occurs when two or more individuals work together towards some prescribed goal (Hansen, 1988), and share resources and information in order to complete a task (Johnson & Johnson, 1991). Importantly, performance is evaluated on either whole-group performance or an individual's contribution to the group and rewards for achievement can be given for both. In contrast, competitive learning is a more traditional Western strategy which involves individually defined goals and evaluation. Moreover, students are encouraged to vie for (rather than share) their resources (Johnson & Johnson, 1991).

Cooperative learning strategies are thought to incur many benefits over more competitive strategies, including improved academic performance and increases in positive social interchanges (Johnson, Johnson, Buckman, & Richards 1988; Rzoska & Ward, 1991; Sharan, 1980). However, it is not clear from the literature whether cooperative learning is beneficial for all students, and/or whether there is an appropriate age for children to begin to use this strategy. Moreover, it is currently not known whether individual preferences for particular learning styles interact with the effectiveness of cooperative techniques. It is necessary to understand the dynamics of cooperative learning in order to use cooperative strategies more effectively.

Cooperative, Competitive, and Individualistic Learning Structures

Traditionally American public schools have predominantly employed competitive learning strategies (Pratte, 1971). Since the purpose of education has been to promote those individuals who would succeed in society (Pratte, 1971), a competitive framework for the classroom seemed most appropriate to attain this goal.

Competitive learning can be characterized by a situation in which individuals typically work alone to obtain an exclusive goal. For example, students working alone on individual science projects to win first prize at the science fair is considered to be competitive. Evaluation of work is based on a norm-referencing, grade-based assessment of individual students' performances by ranking them comparatively (Woolfolk, 1987). According to this competitive system, one student must fail in order for another to succeed (Johnson & Johnson, 1991).

In contrast to the competitive situation, cooperative learning occurs when individuals work together to obtain a goal (Johnson & Johnson, 1991). A cooperative learning strategy can be defined as a learning structure in which students in a classroom have positive group interdependence (Hansen, 1988). This entails students working together to achieve their learning goals and helping others obtain their goals as well (Hansen, 1988). Goals can be met if and only if all students achieve them (Hansen, 1988; Mesch, Johnson, & Johnson, 1987).

According to this cooperative strategy, teachers may divide up the task and have some students work on different parts, or all may brainstorm to solve a problem. Grading is on a criterion-reference basis. In criterion referencing, certain skills or objectives must be attained in order to meet the predetermined standards to adequately accomplish a goal (Woolfolk, 1987). Grading of this sort eliminates the need for a normal distribution of grades, allowing for any and all students to perform above the criterion (Johnson & Johnson, 1991). Cooperative groups can consist of students that are homogeneously or heterogeneously grouped, based on knowledge or skill level.

In addition to competitive and cooperative strategies, a third style of learning is termed individualistic. In an individualistic structure, achievement is independent of and unrelated to any other individual's performance (Johnson & Johnson, 1991). Like the cooperative strategy, grading is also determined by criterion referencing. However, individualistic learning is different from cooperative learning in that the student does not rely on peers for problem-solving strategies or information to complete a task.

These different styles of learning (competitive, cooperative, and individualistic) create functionally different resource distributions (Johnson, Skon, & Johnson, 1980). For example, information contained in a history lesson can be dispersed in a variety of ways. In a cooperative classroom, the resources are potentially unlimited, and everyone has equal access to them (e.g., maps, globes, charts and texts). Students are responsible for acquiring information from books, media sources, the primary teacher, and their peers. Children are encouraged to use any or all of these resources to obtain the necessary skills and information. Since students are instructed to work together to learn the assigned material, no one is denied from the learning process because information is to be exchanged. In contrast, a competitive classroom typically centers the responsibility for distribution of information on the teacher, usually in a lecture format (Griffin & Cashin, 1989). Although in theory, all students have access to resource materials, in practice, resources (such as books, computers, and individual attention) are limited in such settings because students are instructed to work alone. As a result there is questionable equity across individuals for access to information. In other words, access to information is restricted to those who are able to obtain it.

Consequently, competitive settings favor interactions that require rivalry and support superiority. Optimally in an individualistic setting, there should be a set of materials for each student (Johnson & Johnson, 1991). This would allow the student to independently access material without relying on another individual as a source of information. In reality, however, the resources may also be limited for the same reasons they are limited in a competitive setting. As in a competitive structure, the teacher is the primary source of assistance and feedback for the students (Johnson & Johnson, 1991).

Each of these learning strategies are thought to produce different learning outcomes. In a competitive classroom there are several individuals that will learn the prescribed material very well. These students will have had access to the information as well as some prior information on the topic. Other students may be less fortunate either because they had limited access to the information or because they did not have any outside knowledge on the topic, or both. These students will not learn as much on the topic and therefore when they proceed onto the next area they will be less prepared than others. In the case of the individualistic setting, materials should be present for everyone to obtain information. As in the competitive classroom, there are still students who have information that was not acquired in the classroom. Since the individualistic students are not encouraged to work together, some students will be at an advantage. In a cooperative classroom, it must be assured that all students are equally contributing to the output. Individual accountability is ensured by individual performance evaluations. While individual accountability is being ensured, students work together to solve problems and learn information, and all information is shared. This includes information that is not from the classroom. As a result, students are not denied knowledge that helps them to progress.

In designing a suitable framework for specific course work, it is necessary to weigh the benefits of the three types of learning structures against any of their possible disadvantages. Another concern is the developmental appropriateness of the program for children of different ages. Educators must consider the student's developmental level when designing and implementing learning environments or else any benefits of the program will be lost on students that are unable to participate or are uninterested in the activities. Both competitive and cooperative learning strategies derive their assumptions from certain aspects of developmental theories.

Developmental Aspects of Educational Practices

The use of cooperative and competitive learning strategies is consistent with some developmental theories, particularly those of Vygotsky and Piaget (McCarthy &

McMahon, 1992; McLean, 1992; Slavin, 1987a). For example, Piaget stressed that interaction and activity are the main ways that children learn and develop understanding about the world. Children are able to understand and take another person's perspective only through repeated social interactions and significant cognitive development (McLean, 1992). Children's interests and desires to be actively involved in the learning process create motivation to learn.

Both cooperative and competitive strategies can fulfill these cognitive requirements. In either situation, learning can be an active process, including opportunities for hands-on experience. Piaget did not discuss his theory in terms of interactions with others, but did not rule out social interactions as active and motivating experiences. Vygotsky, on the other hand, explicitly stressed social interaction as a main source of learning, which is more functionally related to cooperative learning strategies.

Vygotsky (1978) held a constructivist view of knowledge, but additionally emphasized the role of social relationships (i.e., he also endorsed contextualism). He believed that knowledge is constructed through social interactions (McCarthy & McMahon, 1992; Tudge, 1990) making social communication very important to cognitive development. During an interaction, peers are able to confront and contrast each other with their thoughts on how to address a problem (McLean, 1992). In doing this, the thought processes are made explicit and open to critique. After the exchange, individuals leave with more information, as well as a different perspective from which to view the material. The communication that transpired becomes incorporated into the children's thinking. The idea that one individual can expand a child's reasoning skills and information is directly relevant to Vygotsky's concept of the "zone of proximal development."

The "zone of proximal development" refers to the level of a task that is too difficult for an individual to accomplish alone, but can be successfully completed with more skilled peers or caretakers. For example, a child may put together pieces of a puzzle only when their parent shows them the proper piece to put in a certain place. Theoretically, an individual may perform above their actual ability when cooperative learning strategies are employed, which often occurs when individuals of different skill levels are incorporated within a group. Regarding grouping decisions, it has been shown that when students are homogeneously grouped, the low performance group does not achieve as much as when they are put into heterogeneous groups. There is no significant difference between the high performance students in either groups (Hooper & Hannafin, 1988). Homogeneously grouped individuals have the same level of competence, and therefore there is a lack of more competent peers to aid the individuals at a higher level of processing. Low and mid performance individuals of a heterogeneous group have the high performance individuals to aid them in learning the material. The high performance students benefit from the tutorial role they play in the heterogeneous group.

Using cooperative groups to induce interactions between students enhances learning by creating cognitive conflicts that can then be resolved through group action (Slavin, 1987a). The development of higher cognitive strategies is a direct result of these interactions. As children interact, they communicate verbally and gesturally, and the actions that one child performs can be observed by another child. The second child can learn the strategy that the first child used to accomplish the activity.

The use of peer interactions as a strategy for learning has been the topic of several studies. A review of these studies is necessary to understand the general findings.

Empirical Work on Cooperative and Competitive Learning Strategies

There have been numerous studies done on the effectiveness of cooperative and competitive strategies to promote academic achievement, with a certain degree of contradictory outcomes and conclusions. A few exemplar studies will be reviewed to illustrate this literature.

Empirical Evidence Supporting Competitive Strategies

Several studies have shown that under certain conditions, a competitive learning structure produces as much or more achievement as cooperative strategies. These studies indicate fact memorization (Johnson & Johnson, 1991) and other lower level cognitive functioning (Sharan, 1980; Slavin, 1980) are domains in which competitive learning strategies are more productive.

A study by Okebukola and Ogunniyc (1984) showed that competitive learning strategies improved lab skills for ninth graders. The individuals in competitive groups were instructed to learn the material better than any other student in the group, and not to discuss their ideas with anyone. The cooperative condition required students to share and discuss ideas and information. Trained observers coded types of interactions that occurred in all conditions to verify treatments. Significant differences were found between conditions, ensuring the procedures were followed. A Science Practical Test was used to test students on lab procedures (i.e., describing observations, determining and preparing adequate solutions). Performance was based on the evaluation of three judges that were described as 'seasoned science teachers'. Individuals in the competitive groups received significantly higher performance evaluations than students in the cooperative condition.

Other studies that have found equal benefit or advantages from competitive strategies may be less convincing because of methodological flaws. For example, Sherman (1988) studied two high school biology classrooms using either cooperative or competitive strategies to learn biomes. Students were responsible for learning information on five different sub-units of the biome, as well as a final written report and an oral presentation by the group. All students were given a pretest. Members of the cooperative group received the same grade which was based on a criterion referenced evaluation system. The competitive classroom students worked individually on the same assignment, and received grades based on a norm-referenced evaluation system.

Both strategies significantly increased posttest scores equally. This equal increase in performance, as opposed to one strategy being superior, may be the result of several factors, the most obvious being that most of the work was done at home and unsupervised. This lack of condition verification may have lessened the effect of the cooperative treatment. An essential part of a cooperative structure is the interaction between individuals in order to share and explain information between group members. This was not assured because there was no experimental check to verify the procedures were being adequately followed.

Another weakness of the study was the timing of the treatment; that is the study began near the end of the school year (Sherman, 1988). As a result, some students may have been resistant to the change in the classroom norm, leading to yet another problem. The students had already formed social circles and found it difficult to become attached and feel responsible to a new group (Sherman, 1988). This persistence in 'old group' cohesion had been speculated in other studies (Okebukola, 1986; Sharan, 1980). Okebukola (1986) found increased benefits from cooperative learning when it was instituted at the beginning of the year and implemented for several weeks.

Ross (1988) compared cooperative learning to a whole-class method for learning problem solving skills using fourth graders. The whole class method involved whole-group instruction on problem solving techniques. The cooperative groups used Student-Teams and Academic Divisions (STAD) methods, but were allowed to develop their own procedures. STAD is a cooperative strategy that allows students to review information that was obtained from the teacher using peer tutoring. Students are then tested and graded based on comparisons of scores within the group. There was a control group that consisted of knowledge-driven units, where the problem-solving skills were to be learned incidentally. In these lessons there were opportunities to learn the problem solving skills, but the students were never instructed or encouraged to do so. The results indicated there was no difference in comparative thinking for cooperative vs. whole-group conditions. An example of comparative thinking was "compare two sports." The whole-group condition did perform better in the experimental thinking condition (how-to-decide questions). An example of decision making questions was "Suppose your class is going on a school trip. How should the class decide where to go?" Also, individuals in both treatment conditions outperformed the control group.

Unfortunately, the Ross (1988) study also lacked in treatment verification. Students in the cooperative STAD condition were not given any formal instructions on how they should be working together, and each group was allowed to develop their own procedures. A highly structured schedule is required for the proper application of STAD (Sharan, 1980). Therefore these procedures may have interfered with the proper application of STAD conditions, and as a result, affected the results.

<u>Empirical Evidence Supporting Cooperative Strategies</u>

In the 1940s, Morton Deutsch was the first to systematically examine the effects of cooperation and competition in the classroom (Deutsch, 1949a, 1949b). These classrooms were established from Introductory Psychology courses. College-age volunteers were placed in experimental groups that would learn the same material as the regular classes, but at different times and in smaller groups. Ten of these small groups were created, half being exposed to cooperative conditions and the other half worked under competitive conditions. Grades in the competitive condition depended on students' individual input, and cooperative grades were assessed on the whole group's discussion and performance. The major distinction between the groups was their different goal structures. In the competitive structure, for one student to achieve their goal another had to be thwarted from that same goal. For example, if one student had the best paper, another student could not. In the cooperative structure, the contribution of one student towards a goal advances the others in the group. Deutsch called this "promotively interdependent." As a treatment verification, all groups were rated by four 'blind' observers. These observers rated both individual and group behaviors for all class activities. They found that the cooperative groups worked together more frequently and were more highly coordinated on these activities than the competitive groups. The results indicated the cooperative students had higher grades on their term paper than the competitive students. Also, the cooperative students were rated as friendlier and more helpful than the competitive students.

Slavin (1977) reviewed several articles on individuals sharing or withholding resources. Overall, he found that individuals who worked cooperatively had higher achievement than either competitive or individual efforts. This is most evident for conceptual problems where the sharing and discussion of information is vital to solving the problem.

Other empirical work that has been done on learning strategies usually falls into one of two sub-categories: academic achievement and social benefits. There will be a short discussion of these topics, to be followed by a few exemplary studies.

Academic Achievement.

Most of the research on cooperative learning has centered on the effects of cooperative, competitive and individualistic strategies on achievement (Johnson, Maruyama, Johnson, Nelson & Skon, 1981). There have been mixed results because of procedural differences as well as individual differences and outcome measures, but the majority of the studies indicate that cooperative learning strategies significantly increase achievement. Overall, compared to studies which support competitive learning over cooperative learning, many more studies that find cooperative benefits use manipulation checks to ensure that procedures are being adequately followed.

Johnson, Skon, and Johnson (1980) compared the effects of cooperative (group learning), competitive, and individualistic conditions on problem solving performance. First graders were assessed for math and reading ability and separated into high, medium, and low categories. They were then randomly assigned to one of the three heterogeneously grouped learning style conditions. Students of every ability level in the cooperative condition performed significantly better on several measures than students in either the competitive or individualistic conditions. It was concluded that the cooperative condition allowed for the development of superior cognitive strategies to solve the problems. When individuals worked together, the discussion of ideas and synthesis of everybody's information created a situation where the group produced results which could not be achieved by individuals. These researchers assured the proper implementation of the treatment conditions by having teachers praise and reward behaviors that were appropriate for each condition.

To obtain any benefits in terms of achievement from a cooperative learning environment, it is necessary to be sure that it has been correctly put into practice. There has been much debate over which components of cooperative learning are responsible for its success over and above other styles of learning (Hansen, 1988; Mesch, Johnson & Johnson, 1987; Slavin, 1983; 1987b). Several researchers have conducted component analyses to determine which aspects of cooperative learning are required to obtain increases in achievement measures. Slavin (1983) divides cooperation into two components, cooperative incentive structure (CIS) and cooperative task structure (CTS). Johnson and Johnson (Mesch, Johnson, & Johnson, 1987) refer to these same components as positive reward interdependence and positive goal interdependence, respectively. Cooperative incentive structure (CIS) occurs when two or more individuals must successfully complete a task to receive a shared reward. For example, students may be required to complete a report on a foreign country to get a good grade. The report could be divided into topics which the students work on separately. Cooperative task structure (CTS) occurs when individuals are encouraged or required to work together to complete a task but may or may not be working for the same reward. An example of this might be two individuals working on a model sail boat. One of the students may have to do it for a class project and the other just wants to sail it. CIS may encompass CTS, but the reverse is not always true. An illustration of this is would be two students helping each other learn spelling words to earn an extended recess. The CIS is learning spelling words to get more recess, the CTS is having the students working together to learn the words. In Slavin's (1983) review of studies on cooperative learning and student achievement, 89% of experiments with group study combined with group reward (CTS + CIS) for individual learning resulted in positive effects on achievement.

Another study evaluating cooperative learning indicated the importance of CTS and CIS to increase students' achievement levels (Mesch, Johnson & Johnson, 1987). Tenth grade social studies classes were given either an individualistic or cooperative learning experience for 24 weeks. The cooperative group also contained four students classified as academically handicapped and who performed at an eighth grade level. CTS was invoked for the cooperative group by informing the students that all members of the group were responsible for the material being covered. In addition, group members were tested individually. To obtain CIS, in addition to CTS, the group's average quiz score was compiled and bonus points were given for maintaining a high average or improving their score by 5% (this condition was termed 'Academic Group Contingency'). The groups were observed daily to check that the conditions were successfully implemented. During baseline, the two groups were not significantly different in percent correct performance on weekly quizzes. After the application of the conditions, the cooperative group performed significantly better than their baseline performance on the quizzes. However, the individualistic group did not show significant gains over baseline, and the highest achievement was obtained during the combined condition of CTS and CIS. Interestingly, the four academically handicapped students' performances also significantly increased. Once the positive reward interdependence was withdrawn, performance declined slightly. Mesch, Johnson, and Johnson (1987) concluded that positive goal interdependence can increase achievement, but when it is combined with positive reward interdependence, it results in even greater increases in achievement.

Slavin (1983) also noted the need for individual accountability for the work done within the group to ensure that all members actively contribute to the group outcome. If all students are not held accountable for their portion of the work, there is a chance that some of the students will end up doing the majority of the work and the rest will not contribute. Individual accountability can be implemented by giving individual rewards, or by creating a team score based on the percent improvement of each student. All of the studies cited that showed an advantage of cooperative over competitive learning strategies implemented individual accountability by using individual testing.

Along with other studies on the effectiveness of cooperative, competitive and individualistic strategies, a meta-analysis has been done on 122 of these studies (Johnson, Maruyama, Johnson, Nelson, & Skon, 1981). The studies reviewed were selected on the basis that they were conducted on North American samples and contained at least two of four strategies (the fourth being cooperation with intergroup competition). In general, it was found that cooperation is superior in promoting achievement and productivity compared to competitive, individualistic, and cooperative strategies that have intergroup competition.

Although schools systems are primarily concerned with the academic achievement of their students, students' well-being, motivation, and positive self-regard are also important. Several studies have been conducted to analyze the impact of cooperative learning on these social concerns.

Social Benefits Associated with Cooperative Learning.

Cooperative learning has been shown not only to improve academic achievement, but also to positively impact social interactions, self-esteem, and individual perceptions of peer support (Johnson, Johnson, Buckman, & Richards 1988; Rzoska & Ward, 1991; Sharan, 1980). Some of the social benefits are class cohesion (Johnson, Johnson, Buckman & Richards 1988), and increased amounts of unprompted sharing (Orlick, 1981). Other benefits of cooperation include improved race relations (Johnson & Johnson, 1985), more positive attitudes towards school (Hansen, 1988), and the perception of effort rather than ability as most important in successful outcomes (Chambers & Abrami, 1991). Long-term benefits of cooperative strategies for students include increased positive perceptions of themselves as well as of others (Johnson, Johnson, Buckman, & Richards 1988). Slavin, (1985) hypothesized that students learn to respect and like each other because they are in a situation where they must contribute to a common goal. This entails listening to each other and supporting one another.

A study by Johnson, Johnson, Buckman and Richards (1988) indicates that this supportive environment is related to the amount of time spent cooperating. Eighth grade students were asked to indicate how much time they spend in cooperative groups during class. With this information, students from either classrooms that used cooperative learning more than half the time or less than half the time were asked to rate the truth of statements about classroom life. These statements referred to perceptions of support from peers and teachers, self-esteem, cooperative learning, and its structures. Students from the high cooperative classroom perceived teachers as more supportive both academically and personally, were more intrinsically motivated, perceived the grading system to be fairer, and liked cooperative learning more. The longer the students were in the cooperative classrooms, the more they perceived their peers as supportive and concerned with helping them learn. Students also liked working with each other more, and felt less alienated as timed passed. These results indicate that classrooms using cooperative learning can create a more supportive environment in which individuals feel comfortable.

There is a possible confound in this study. Instead of the teacher creating a cooperative classroom, perhaps student characteristics (i.e., no discipline problems) allow for a different environment that lets the teacher be more supportive and friendly. To rule out this alternative explanation, it is necessary to use two classes that have been matched on student characteristics and the same teacher and then implement large amounts of cooperative strategies in one and low amounts in the other. If the results are still the same, the first conclusions would be supported.

The positive effects of cooperative learning carry over into other activities as well. Hertz-Lazarowitz, Sharan, and Steinberg (1980) conducted a study to assess the spontaneous use of cooperative strategies in completing a task. Students (third through seventh grade) from whole-class instruction or cooperative small-group classrooms were instructed to construct as many words as possible using letters of another word (i.e., anagrams). Students were encouraged twice to work together, but no formal instructions were given. The number of words created was a measure of productivity, and observations as to the types of interactions students engaged in were also dependent measures. Students from small group cooperative classrooms were more cooperative, relaxed, and less competitive than students from traditional classrooms. In three out of five grades, small-group classrooms produced more words than traditional classrooms; the remaining groups created approximately the same amount of new words. It was also noted that students used cooperative strategies without being explicitly rewarded for them. Classrooms that use some cooperative strategies create social norms that support peer cooperation.

In sum, a majority of studies on cooperative learning indicate that it serves to increase academic achievement, and also creates a positive classroom climate which may increase self-esteem and increase the enjoyment of learning. An additional component that appears to contribute to the effectiveness of cooperative strategies used in a classroom is cultural background. That is, certain individuals may be more or less responsive to cooperative learning because of their cultural and ethnic histories.

Cross-Cultural Studies of Cooperative and Competitive Learning Strategies

Along with communities and families, the education system is a route by which culturally approved behaviors are transmitted (May & Doob, 1937). Children from various cultures are often socialized differently, producing different interactive styles (May & Doob, 1937). This is a major educational concern because of the failure of some ethnic groups to perform well in traditional American classrooms. Researchers have been interested in the influence of ethnic background on the effectiveness of cooperative learning. These studies try to understand if there are cultural differences in responding to different learning structures.

Using both cooperative and competitive conditions, Rzoska and Ward (1991) looked at the effect of these conditions on math achievement, self-concept, attitudes towards school, and cross-ethnic friendships of children (ages 7 to 11 years old) from three different cultures (Pakeha, Samoan, and Maori). It was hypothesized that because Pakeha children were raised in a culture that emphasizes competitive and individualistic behaviors, they would not excel in the cooperative condition. The results showed that although there were no differences in math achievement, Pakeha children had the least positive attitude toward the cooperative condition. The only children who had a significant amount of cross-ethnic friends were the Samoan children. It was noted that, in the competitive conditions, children helped each other, thus the distinction between the conditions was blurred. This may have reduced the differences between the groups.

Orlick, Zhou and Partington (1990) studied the incidence of cooperation and conflict behaviors in 5-year-old children in China and Canada. The kindergarten children were observed and rated on the frequency of these behaviors by individuals indigenous to each country. Inter-rater reliability was assessed at 92% to 100% with the Chinese children showing significantly higher amounts of cooperative behaviors and significantly lower amounts of conflict than the Canadian children.

Certain cooperative learning methods used competition as a testing technique (Widaman & Kagan, 1987). For example, after students help each other learn spelling words, a spelling Bee is used to determine who has learned the words. One study compared two cooperative strategies that only differed in the way students gain points to evaluate group achievement for Anglo-Americans and Mexican-Americans. In Student Teams-Achievement Divisions (STAD), students take quizzes, and in Teams-Games-Tournaments (TGT), team members compete one-on-one to win points for the team. Subjects were children from second through sixth grade from traditional, STAD and TGT classrooms. Performance on a spelling test as well as on the Stanford Achievement test were dependent variables. There was no difference for either dependent measure across the different classroom structures.

However, there were significant differences when children were separated into ethnic groups. Anglo-Americans had significantly greater gains in performance in the TGT classroom as opposed to the traditional classroom. Surprisingly, the Mexican-Americans showed significantly greater gains in performance when in the traditional classroom. It was hypothesized they would perform better in the cooperative condition because minority students usually perform better in cooperative situations (Sharan, 1980).

Widaman and Kagan (1987) also assessed individual students on their cooperative-competitive social orientation. African-Americans were significantly more cooperative than either Anglo-Americans or Mexican-Americans, who did not significantly differ. The article did not make it clear whether Anglo-Americans and Mexican-Americans were competitive or cooperative. African-Americans did perform better in the cooperative classroom, but this effect did not reach a significant level. In other analyses, a positive correlation was found between spelling gains and the STAD classroom but a negative correlation was found between both TGT and traditional classrooms and spelling gains.

Minority-student performance in classrooms is generally poorer than majority-student performances. This may be, at least in part, due to the type of classroom structure being used (Widaman & Kagan, 1987). When given the opportunity to work in a cooperative classroom, minority students indicated a more positive attitude for the setting than Anglo-Americans. This may be because minority students may have more cooperative social orientations (Widaman & Kagan, 1987) and, therefore, prefer it in the classroom.

There are also differences in the number of cooperative behaviors produced by individuals in different cultures. Using a marble pull game, Madsen (1971) assessed cooperative and competitive behaviors of Mexican-American and Anglo-American children, ages 4 to 11 years old. The 'game' consisted of a Plexiglas marble holder that held a marble, releasing the marble if the holder was tugged at both ends. The object of the game is to get 10 marbles into your own cup, which can only be accomplished by both children cooperating. If both children try to pull the marble to their own cup, the marble is lost. Anglo-American children decreased in cooperativeness on this task as age increased. The older children actively competed for the marbles, so most were lost. Mexican-American children were more cooperative at every age than their Anglo-American counterparts. Attributing these results to ethnicity may be considered questionable in light of the very different living conditions of the subjects. These differences go beyond differences that can be attributed to culture. There was a large discrepancy between SES of the two particular instances of these cultures that were chosen as comparison groups. The Mexican-Americans were from a town with a population of 800 and were described as living in homes that were "quite primitive". The Anglo-Americans lived in Los Angeles and were described as "middle class". Therefore, culture may not be the only driving force behind these results.

These studies indicate that there are different learning and interactive styles that may be the result of cultural influences. These results emphasize the need to look at individuals' aptitudes for cooperative, competitive, or individualistic styles. If children do respond differently to cooperative and competitive learning structures, it is necessary to understand this dynamic in order to maximize learning potential for all individuals. In other words, there may not be a single best-method to teach all students. The main purpose in looking at cross-cultural findings is to demonstrate that cooperative research findings can not always be generalized.

Purpose of this Study

One question that has yet to be addressed in previous studies was how the individual child's particular preference for cooperative or competitive learning strategies aids or hinders performance in the learning environment. It is important to assess such preferences before students are exposed to success or failure in either cooperative or competitive structures to evaluate whether preferences influence performance outcome (rather than being solely determined by outcome). Therefore, the purpose of this study was to address how individual learning preference and learning condition interact in determining math performance in first graders.

It was expected that some first grade children would have preferences for the interactive styles they encounter. This may be the result of cultural influences, family structure, exposure to day care, as well as other factors (e.g., involvement in sports). It was predicted that cooperative individuals and individuals with no distinct learning style preference would perform better in a cooperative task than in a competitive task. The competitive students would perform well in both tasks, but would do better in the competitive structure when compared to the cooperative students. Across the cooperative situation, both the cooperative, competitive and no preference students would perform equally well.

Method

Subjects. Eighty-nine first grade children (50 boys and 41 girls) from two Montgomery County Schools participated. Children with physical or mental impairments, such as Downs syndrome, that detracted from their ability to perform the tasks were omitted as subjects. Students were also omitted as a result of unavailability for testing due to class demands. Nine students of the original 89 did not have a score for the Learning Preference. Two students did not complete the LPSS, and seven were unable to be tested because they were either unavailable for testing due to class scheduling (5), hearing impairment (1), or Downs Syndrome (1). Of the remaining 89 children, 38 were found to have clear enough preferences to participate in the study and were available for testing (See Table 1).

Insert Table 1 Here

Written parental consent as well as the child's consent was obtained before participation began (See Appendix A and B).

Design. Students were assessed for their learning preference style, either cooperative, competitive or no preference. Then each subject was asked to work on a set of computer generated math flashcards cooperatively and competitively with a partner. These flashcards consist of addition problems that range from zero plus zero to ten plus ten. After each task condition (cooperative or competitive), the subjects were asked (individually) how much they liked to play the 'game.' After the subjects completed both task conditions, they were asked which way they would like to play it again, either helping their partner or trying to be better than their partner. Table 2 is a diagram of this design.

Insert Table 2 Here

Group Assignment. The Learning Preference Scale-Students (LPSS) (Owens & Straton, 1980) was used to assess each child's preference for learning style. The measure consisted of 30 statements about learning cooperatively, competitively or individualistically (See Appendix C). Owens and Straton (1980) report internal-consistency reliability scores using Cronbach's alpha for the LPSS as .72, .71, and .72 for the cooperative, competitive, and individualistic sub-scales respectively. The Minnesota School Affect Assessment sub-scales (cooperation, competition, and independence) were used to correlate with the LPSS sub-scales (cooperation, competition, and individualistic) to estimate concurrent validity scores, resulting in correlations of .53, .60, and .49 for the cooperative, competitive, and individualistic scales. The subjects used a four point scale to respond to the statements; 'Always', 'sometimes', 'not usually', and 'never' like to do what was described. The response sheet was altered to accommodate first graders, consisting of four faces ranging in expression from very happy to very unhappy (see Appendix D).

After receiving the parent's and child's consent, the children were assessed for their interactive style. The LPSS was administered individually to each eligible child (see Appendix E for instructions). The statements were read out loud twice, and then the child responded by recording their answer on the response sheet. If the child wished to hear the question again, the experimenter repeated it. If they had any questions, the experimenter clarified the information until the child understood. The scores were evaluated by totaling the points for each of the sub-scales (cooperative, competitive, or independent) and getting an average score for each. High ratings for each learning style was any response average above 3.0 (possible range 1.0 to 4.0). Children who were rated high on the cooperative scale were placed into the

Cooperative Group and those scoring high on the competitive scale were in the Competitive Group. If the child did not score above a 3.00 on any of the sub-scales, she or he was incorporated into the study as a third group, called the No Preference Group. Subjects that scored over 3.0 on two or more of the sub-scales were not run as subjects. Subjects that scored over 3.0 on all sub-scales were not run because it was impossible to differentiate a positive response bias from true preference for all three learning strategies. Multiple preference students were also not incorporated into the study because of the few numbers of subjects.

Test Materials. The flashcards were presented on a Macintosh SE/30 computer. The program was run on MacLab software, and the stimuli were created using MacPaint software. A set of 20 or 40 addition problems were presented on the black and white screen in Geneva font, size 72.

Procedures. Children were randomly assigned partners. Two pair types were created, same pair (e.g. two cooperative children) or mixed pair (e.g. a competitive and no preference child). For each task, children were paired with a new partner, to insure there were no carry over effects. The student pairs were randomly assigned either to the cooperative or competitive condition first. The day after the LPSS was given, the pairs of students were taken to a quiet area of the school, (e.g., the speech room) and given their first condition. One day later the child, with their new partner, was given the second condition to complete.

Each pair-group sat and worked together on the same computer. They were seated side by side in front of the computer so that both children could see the screen and easily reach the keyboard. The experimenter read the directions out loud and asked if either student had any questions (See Appendix F for instructions). When questions arose, the experimenter elaborated on the required procedures and again asked if there were any questions.

If no questions were asked, the experimenter began the experiment by having the students practice the flashcard game. When the flashcard practice trials started, a "GO" screen appeared. The subjects started each trial by pressing a "GO" key designated on the keyboard. Once the "GO" key was pressed an addition problem was presented vertically with one number over the other in the center of the computer screen. For the cooperative condition, the students were told to talk and come to an agreement on an answer. This included having the pair count up the answers on their fingers together. If the students did not do this spontaneously, the experimenter requested it. Also, neither student was allowed to press an answer unless both had agreed upon it. When they decided on an answer, one child responded by typing a numeric answer on the keyboard. The responses were automatically recorded.

Once an answer was given, the correct answer was presented on the screen
for thirty seconds to give immediate feedback. This was followed by another "GO" screen. For the cooperative condition, the pair received a total of 7 practice addition problems.

When the practice trials were complete, the experimenter again asked if the students had any questions. If there were questions, they were answered until none remained. The experimental trials then followed. Again, as in the practice trials, the "GO" screen was presented to start each trial. When the subject initiated the trial, the addition problems appeared vertically in the center of the screen. Once they agreed, one student typed in the answer on the keyboard. After the number was typed in, the correct answer appeared on the screen, followed by another "GO" screen. This continued for a total of 20 problems. To score the cooperative task, each child received the total number correct that the joint effort produced.

After each condition, both subjects were asked how much they liked to play the flashcard game. A screen identical to the row of faces in the LPSS answer sheet appeared on the screen. Each child was asked to type in the number under the face that matched how much they liked playing the game. The very happy face meant "I loved to play it", the next happy face meant "I thought it was fun", the slightly sad face meant "It was not much fun", and the very sad face meant "I did not like to play".

In the competitive condition, the children took turns solving the math problems. They were instructed not to help each other, and told to see who can answer the most problems correctly. The practice and experimental trials proceeded the same as the cooperative condition, with a few exceptions. First, one of the children in each pair was randomly assigned to answer the first question. Therefore, they answered the odd numbered addition problems. The second student in the pair then answered the even numbered problems (to facilitate this, each subject had a "GO" key). Only the student assigned to the odd numbered trials could initiate the next odd addition problem, as was the case for the even numbered trials and the second subject (i.e., the "GO" key was always pressed by the student who was to answer the next problem).

Once the proper "GO" button was pressed, and the problem appeared, the student typed in an answer to the problem. The correct answer appeared on the screen, and was followed by the "GO" screen for the next subject. Next, the even numbered student pressed the "GO" key to initiate their problem. The second subject typed in a response and saw the correct answer. The experimenter monitored the children to assure that the subjects alternated answering the questions and made sure the "GO" key was pressed by the appropriate subject. The subjects each solved seven practice trials and

20 experimental problems. The students were not allowed to help their partner during this condition. This was ensured by having the experimenter present reduce the amount of interference and/or help from the other child. For the competitive task, each child received the score their individual efforts produced. After the competitive condition, the students were again asked to rate how much they liked to play the game using the same scoring system described above.

After the second task was completed, the experimenter asked each child if they could use the flashcards again, would they like to play it cooperatively or competitively. The question was worded "If you were to play this flashcard game again, would you like to take turns answering the questions, or would you like to work together on the answers?" These responses were recorded as frequencies.

Results

Of primary interest was the data from the math problems. Table 3 presents the means for same and mixed pairs for each preference group under both conditions. The

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Insert Table 3 about here

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data indicate a possible advantage of cooperation over competition to produce higher math scores. The learning preference and pair type do not seem to differentially influence scores. A mixed three-way analysis of variance (ANOVA) was conducted on math flashcard scores, with Group (Cooperative, Competitive, and No Preference) and Pairs (Same vs. Mixed) as between subject factors and Task Type (Cooperative and Competitive) as the within subject factor. The results of this ANOVA indicated no significant effects of Groups, Pairs, or Task Type, although the main effect for Task Type approached significance, $\underline{F}(1,32) = 3.42$, $\underline{p}=.07$ (see Table 3). No other main effects or interaction effects were statistically significant.

Insert Table 3 about here

The 'play again' frequencies were analyzed using the Chi-Square test. Overall, there was no significant play-again preference (X^2 (2) = 4.4, $\underline{p}>.1$), even though eight of the ten competitive subjects said they would rather compete if asked to play again (See Table 5).

Insert Table 5 about here

There were no significant differences between the 'how much did you like to play' scores for cooperative and competitive conditions for each preference group (see Table

5). The results on the 'how much did you like to play' indicate the subjects enjoyed both conditions very much. The means were 3.68 for the cooperative condition and 3.78 for the competitive condition, which is not a statistically significant difference ($t(7) = -.707$, $p > .1$).

Insert Table 5 about here

Discussion

None of the hypothesized main effects or interactions were supported by the results. There were no differential effects of learning preference or pair type on flashcard scores. Also, contrary to the hypothesized superiority of the cooperative task, the results showed that task conditions did not have a significant impact on math performance, although there was marginal support for cooperative learning over competitive in producing higher math scores ($p < .07$). This trend was expected based on previous studies. In Johnson, Maruyama, Johnson, Nelson and Skon's (1981) meta-analysis of 122 studies, cooperative efforts were found to be more effective than competitive ones in producing increases in achievement. Slavin (1980) explained the superior performance in cooperative conditions as being due to the pooling of skills and ideas. Group members seem to serve as facilitators, encouraging each other to share ideas and problem solve.

There are several reasons why no significant results were found. First, there was a ceiling effect associated with the task. Secondly, the students may not have been all that different in regards to learning preferences. This might be a result of the measure used (LPSS) or possibly the children were too young to have developed strong preferences, or both. Finally, the simplicity of the math flashcard task might not have been sensitive enough to detect or produce differential responding. A more complex task may be necessary to invoke cooperative and competitive learning strategies. Further elaboration of these ideas is necessary.

A possible interpretation for the lack of superiority of the cooperative condition is that the addition problems were too easy, allowing all of the students to perform well regardless of the task conditions. Perhaps a certain level of difficulty must be obtained in order for the cooperative task to show an advantage over the competitive task. Future work may illuminate any differences in performance as a function of task difficulty and learning preference style. Previous research does indicate certain learning strategies and skills work well together to produce high academic achievement (Johnson & Johnson, 1991; Sharan, 1980; Slavin, 1980).

Additionally, the data also indicated a possible "learning to learn" phenomenon. That is, since students were tested from the beginning of September to the middle of November, the scores for both task conditions for the first five subjects were compared to the last five subjects. _T_-tests indicated a significant increase in performance for both the cooperative and competitive condition over the duration of the study. This time difference allowed the students tested later in the term to learn more math than those tested in the beginning of September.

As the data indicated, there seemed to be no influence of learning preference on performance. This may be due in part to the lack of differentiation of learning preference characteristics. As seen in Table 1, students that were classified as 'cooperative' had high scores on the cooperative sub-scale (M=3.6) and fairly low scores on the competitive sub-scale (M=2.2). In contrast, the 'competitive' students averaged low on the competitive sub-scale (M=3.2), just making the cut-off mark for being classified as competitive. Also, their cooperative scores were relatively high (M=2.8). This discrepancy in group scores suggests that the competitive students were not as strong in their dominant preference as the cooperative students. This would not explain why the cooperative task did not produce better math performance over the competitive task, but it does raise the question as to how extremely competitive students would have performed. Having very competitive students with low cooperative scores may have resulted in a significant difference between preference groups. These students may have also influenced pair performance. Students' competitive behaviors may elicit reactions from their partners which may help or hinder the partner's performance. Monitoring behaviors (Pepitone, 1985) such as looking at someone else's work to see how you compare, is considered a competitive behavior. For example, a competitive student watching and commenting on their partner's performance may motivate a competitive partner, but make a non-competitive partner uncomfortable or discouraged. This type of partner influence may affect performance for both competitive and cooperative task. The partner may feel judged, and withdraw from the interaction.

Contrary to the available literature, no interaction between task condition and learning preference was found. Previous studies have indicated an influence of modality preference as well as learning preference on achievement (Domino, 1971; Lilly & Kelleher, 1973; Widaman & Kagan, 1987). Domino (1971) studied the interaction between achievement orientation and teaching style. He found that when teaching style and achievement orientation matched, achievement was significantly increased. Also a study by Widaman and Kagan (1987) found an interaction between cooperative-competitive social orientation, ethnic status, and classroom structure on gains in achievement for spelling. Spelling gains were positively related to participation in cooperative learning (STAD) and negatively related to participation in a traditional competitive classroom.

One possible explanation of the lack of interaction between learning preference and task condition in the present study might be the lack of strong competitive preference for the competitive condition. As mentioned earlier, the competitive students liked to cooperate almost as much as they liked to compete, according to their LPSS sub-scale scores. Perhaps if there was a stronger preference for competition in these students, performance on the competitive task may have differed as a function of preference. This reduced competitiveness may have also been a function of the students' ages. In trying to obtain a 'natural' preference for interactive style, natural preference may have been obtained at the expense of getting strong and stable preferences from older individuals. Therefore definite preferences for a certain interactive style may have been lacking. This in turn may have led to the failure of finding more significant differences between groups.

The low reliability scores of the LPSS may indicate a need for multiple measures of learning preference in order to accurately assess preference. One measure of learning preference may be used to give concurrent validity to the LPSS assessment is the fourteen matrices used by Hertz-

Lazarowitz, Sharan, and Steinberg (1980). These matrices were an expanded version of Madsen's domino game that are used to assess children's cooperative and competitive preferences. Another possible measure to corroborate learning style preference may be the cooperative and competitive scales from the Minnesota School Affect Assessment (MSAA) (Ahlgren & Johnson, 1979). These scales used in conjunction with the LPSS may provide a better assessment of students' learning preference.

It is also possible that learning preference does not influence math performance, and that cooperative learning is not superior to competitive learning. It may be that learning preference may not be a static characteristic of an individual, instead it is part of the learning context. As a result, any transient preference might not be expected to exert strong influence on achievement. Perhaps the superiority of cooperative or competitive strategies depends on task demands, as was referred to earlier. This may also be the case for different classroom climates. For different types of classes, students may employ different strategies to maximize academic achievement.

Even though there was no significant trend in play again preference, eight out of ten competitive children said they would prefer to play the game again under the competitive conditions, with this result approaching statistical significance. Neither the cooperative or no-preference groups had any distinct play again preference. The equal distribution of the no preference students for the play again preference should be expected. One possible reason why the cooperative students did not prefer the cooperative condition over the competitive may be because of the limited nature of the tasks. When one student was answering the math problem in the competitive task, their partner was asked to be quiet and not to interact. Even in competitive settings there is some interaction between students. Individuals in competition must monitor their competitor's performance in order to know what is necessary to win. This was not always the case for these subjects. Therefore, this might have been perceived as a cooperative task because they had to take turns answering the math problems.

It is also interesting to note that, out of the ten competitive students, five of them kept track of the number right for both partners in the competitive condition. Only one of the no preference subjects did this, and none of the cooperative subjects did this. Although this is anecdotal information, it may indicate a more competitive nature than those individuals that did not 'keep score.'

An important question for future research will be the closer evaluation of competitive students. The results of this study showed that the majority of the students were classified as cooperative, and even those that were classified as competitive were marginally competitive at best. Do schools create a competitive environment that eventually compels students to act competitively? If so, would institutions that use mostly cooperative strategies produce cooperative students? Would this type of environment allow for comparable intellectual development? Additional research is needed to more fully answer these types of questions before any large scale changes are made in schools.

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Table 1

Distributions of Scores on Learning Preference Scales-Students for All Students

Preference	Cooperation	Competition	Individualistic	Total
All				11
M	3.52	3.2	3.5	
SD	(3.83)	(1.58)	(1.87)	
Individualistic				5
M	2.58	2.36	3.58	
SD	(1.48)	(4.56)	(2.58)	
Cooperative & Individualistic				15
M	3.32	2.4	3.48	
SD	(3.42)	(4.3)	(3.11)	
Competitive & Individualistic				1
M	2.4	3.0	3.4	
SD	(0)	(0)	(0)	
Cooperative & Competitive				3
M	3.5	3.23	2.9	
SD	(4.36)	(2.52)	(0)	
Cooperative (Non-Subjects)				7
M	3.5	2.18	2.5	
SD	(3.67)	(5.17)	(2.55)	
Cooperative (Subjects)				20
M	3.58	2.24	2.28	
SD	(2.86)	(3.36)	(4.55)	
Competitive (Subjects)				10
M	2.82	3.16	2.7	
SD	(.447)	(1.81)	(3.08)	
No Preference (Subjects)				8
M	2.72	2.16	2.7	
SD	(2.68)	(4.39)	(2.35)	
				89

Table 2

<u>A Pictoral Representation of the Design.</u>

Learning Preference	Pair Type	FlashCard Conditions: Cooperation	FlashCard Conditions: Competition
Cooperative	Same		
	Mixed		
Competition	Same		
	Mixed		
No Preference	Same		
	Mixed		

Table 3

Mean Number Correct for Task, Condition, and Pair Type

Preference	Pair Type	Condition: Cooperation	Condition: Competition	n
Cooperative				
	Same			16
	M	17.50	15.25	
	SD	1.79	4.47	
	Mixed			4
	M	17.75	16.25	
	SD	2.50	2.75	
Competition				
	Same			6
	M	17.33	14.50	
	SD	2.66	3.39	
	Mixed			4
	M	16.50	17.25	
	SD	2.89	3.59	
No Preference				
	Same			6
	M	17.67	16.17	
	SD	1.37	4.96	
	Mixed			2
	M	19.50	19.50	
	SD	0.71	0.71	

Table 4

ANOVA Performed on Total Number Correct for Math Flashcard Performance

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif of F
Between Subjects					
Preference	22.42	2	11.21	0.82	.450
Pair	31.20	1	31.20	2.28	.140
Pref x Pair	7.97	2	3.99	0.29	.749
Error	437.70	32	13.67		
Within Subjects					
Treatment Cond	24.87	1	24.87	3.42	.073
Treatment x Pref	2.58	2	1.29	0.18	.838
Treatment x Pair	8.37	1	8.37	1.15	.291
Cond x Pref x Pair	2.31	2	1.15	0.16	.854
Residual	232.54	32	7.27		
Total	769.96	75			

Table 5

Frequency Distributions for the Play-Again Responses

	Condition	
Preference	Cooperation	Competition
Cooperative	12	8
Competition	2	8
No Preference	4	4

Table 6

Mean Responses and Standard Deviation on "How Much Did You Like To Play" for Task and Preference

	Condition	
Preference	Cooperation	Competition
Cooperative		
M	3.75	3.80
SD	.716	.696
Competition		
M	3.90	4.00
SD	.316	0.00
No Preference		
M	3.25	3.50
SD	1.39	1.07

Appendix A

Permission Form
First Grader's Preference for Interactive Style and the Interaction with Type of Task

The faculty and graduate students in the Developmental Area of the Department of Psychology at Virginia Tech are interested in the behavioral development of children. This particular research project investigates young children's preference for learning style. We are seeking to understand how this preference interacts with the type of learning setting they are placed in.

If you and your child agree to participate, he or she will be asked to rate several sentences on how well it describes their preferences. Once that is done, your child will be paired with another child and be asked to play a math flashcard game on the computer. The game will only use simple addition problems. The pair of children will play the game both competitively and cooperatively. At the end of the game, we will ask your child if they were to play the game again, would they like to play it competitively or cooperatively. This whole procedure will take approximately 30 minutes that will be spread out over three days.

A record of each children's performance will be recorded by subject number only. This information will be coded and entered into the computer for statistical analysis. Your child's name will not be entered into the computer. The record of your child's individual performance will be kept anonymous and confidential

You will receive a report of the results of the study . If you would like, we will give you your child's scores on the Learning Preference Scale, and the scores from both flashcard games.

Appendix A (Con't)

Permission Form

This research has been reviewed and approved by the Human Subjects Research Committee and the Institutional Review Board of Virginia Polytechnic Institute and State University. If you have any questions about the project, please call any of the following individuals: Professor Robin Cooper at 231-5938; Professor Joseph J. Franchina, chair of the Human Subjects Committee, at 231-5664; Dr. Janet Johnson, chair of the Institutional Review Board, at 231-6077 or Chris O'Connell at 953-2746. If you would like a copy of permission form, please notify the researcher.

I have read and understood the research project described on the first page. I understand that my child does not have to participate in the study if he or she does not wish to do so. I also understand my child can stop participating in the study at any time. I know I can call Dr. Cooper or Chris O'Connell at any time if I have any questions. I hereby agree voluntarily to allow my child, ____________________ , to participate at ____________(school) in the research project described above and under the conditions described above.

Signed_________________________ Date__________

Child's Date of Birth _____/_____/_____

We would appreciate your returning this form even if you decide not to participate. Please check the appropriate box

[] Yes, I have agreed to allow my child to participate.

[] No, I have not agreed to allow my child to participate.

Appendix B

Child Consent Form

I, ______________________ (Name of witness) witnessed the explanation to ________________________ (name of subject) of the procedures used in the study of children's learning style preference conducted at ______________________________(name of school) by Chris O'Connell. The child agreed [ ] disagreed [ ] to participate voluntarily and was informed that he/she could stop participating at any time. The child appeared to understand the Instructions.

Signed _______________________ (Signature of Witness)

Date:______________

Appendix C

Statements from The Learning Preference Scale- Students

<u>Cooperative sub-scale</u>

It is helpful that the teacher gets to know students by having them work together in groups.
It is helpful to combine everyone's ideas when making a decision.
Working in a group scares me. (Inverse)
I like to be in a group which people know is good.
I like to work in a group at school.
I like to be able to use the ideas of other people as well as my own.
We get the work done faster if we all work together.
I like to help other people do well in a group.
Working in a group now helps me work with other people later.
I do not like working with other people. (Inverse)

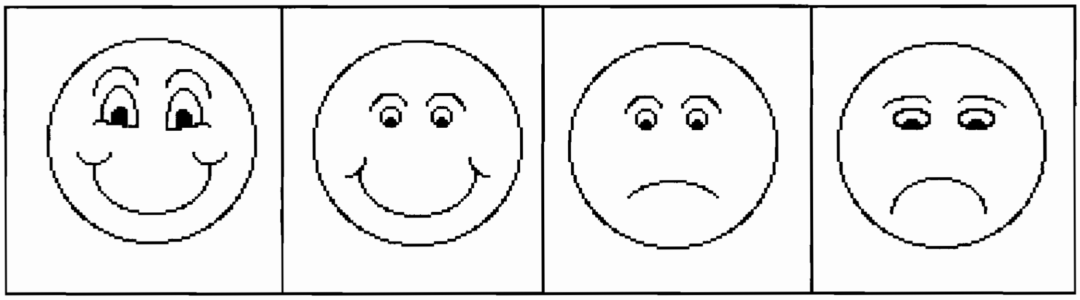
<u>Competitive sub-scale</u>

Trying to be better than others in schoolwork helps me be successful later.
I would like to be the best at something.
Other people's ideas are not usually as good as mine.
I learn faster if I'm trying to do better than others.
I do not mind if I get the lowest marks. (Inverse)
Other people get a lot out of trying to be better than me.
Trying to be better than others makes me work well.
My work is not so good when I'm thinking mostly about doing better than other people. (Inverse)
I do not like always trying to be better than someone else. (Inverse)
I like to try to be better than other students.

<u>Individualistic sub-scale</u>

I prefer to work by myself so I can go as fast as I like.
I do not like working by myself.(Inverse)
If I work by myself most of the time, I become lonely and unhappy. (Inverse)
I do better work by myself.
If I work by myself now I will manage better later.
I work badly when I know I have to do it all by myself. (Inverse)
I like my work best if I do it myself without anyone's help.
I like to keep by ideas to myself.
I like to work on my own without paying attention to other people.
I make good decisions when I listen only to the advice I give myself.

Appendix D



Appendix E

Instructions - LPSS

Have each student seated at the same table, but not on top of each other. Give each one a LPSS rating scale opened to the first page of faces. Make sure you have a copy of the faces to explain what each face means.

Introduce yourself I am interested in learning how first graders think about school. I would like you to help me by telling me how you like to work. There are no wrong answers, and not everyone will like the same things so don't worry about anyone else's answers.

Now I will read you some sentences. Please listen, and if you don't understand, I will be happy to explain it for you. After each sentence I would like you to decide which face shows how you feel about the sentence.

For the first few, I will explain exactly what each face means. After that I will explain when you want me to. To chose the face you want, mark it with your pencil. (make an x or Check mark). Do you have any questions so far? Are you ready?

The happiest face means you agree with the sentence. For example: I like to work slowly. This face would mean, "Yes I always like to work slowly."

The happy face means you sometime would agree. It would mean "I sometimes like to work slowly."

The sad face means you wouldn't usually agree. So if you think "No I don't usually like to work slowly" you'd mark this face.

The saddest face would mean you would never agree with the sentence. So you would mark this face if you thought "no I never like to work slowly."

Do you have any questions?

Now we will begin. Stop me if you have any questions. If you don't understand what each face means for the sentence, let me know and I will tell you.

Read each sentence two times. The students may answer before you've read it a second time, that's o.k..
Explain all the inverse statements.
Make sure the students don't skip over any row of faces.
Every once in a while say we're now on number __ just to check.
If they look confused, or take a while to answer you might explain what the faces would mean for that statement.
Try not to let them drag this on.

Appendix F

Instructions- Flashcard

The program should be running before the students arrive.
When they come in enter their subject numbers.
Seat the students side by side in front of the computer so that they both can reach the keyboard.
Ask them if they can see the screen clearly.

Introduce yourself. I am trying to learn how first graders like to work. To do this, I am going to have you play a flashcard game. First I am going to explain what will happen, and then I will let you practice answering the questions.

Cooperative Condition:

First a "GO" screen will appear. When you are ready, press the white key in the middle of the keyboard. Then you will see an addition problem on the screen like 3+2. I want you to work together to help each other figure out the answer. You may count out loud or on your fingers. When you both have decided on the answer, you may press the numbers on the keyboard. After you have given your answer, the correct answer will appear on the screen. Then another "GO" screen will appear. Again, when you are ready press the white key, and you will see another addition problem. You will do the same thing again, until no more appear. Do you have any questions so far? I want you to work together and help each other answer all the math problems.

Lets start the practice.

Do you have any questions?

Now we will begin.

*After they have completed the experiment four faces will appear on the screen with numbers below them. Ask the students **(in proper subject order)** to rate how much they liked playing the game.*
How much did you like playing the flashcard game.
4-A lot
3-A little
2-Not much
1-Not at all

<u>Competitive Conditions:</u>

For this game, you will take turns answering math problems and we'll see who can get the most right. (*Decide who will go first*) First a "GO" screen will appear. Then when you are ready, press the green key on your side of the keyboard. Then you will see an addition problem on the screen like 3+2. I want you work alone to figure out the answer. You may count out loud or on your fingers. When you have decided on the answer, you may press the numbers on the keyboard. After you have given your answer, the correct answer will appear on the screen. Then another "GO" screen will appear. Now it is your turn (*TO the other student*) to press the green key on your side of the keyboard. Then you will see an addition problem on the screen like 5+1. I want you work alone to figure out the answer. You may count out loud or on your fingers. When you have decided on the answer, you may press the numbers on the keyboard. After you have given your answer, the correct answer will appear on the screen. You will continue to alternate answering the problems until no more appear.

Now when one person is answering, I don't want the other to help in any way. It would be best if you could be as quiet as possible, so that the person answering can concentrate. Let's see who can get the most math problems right.

Do you have any questions so far?

Lets start the practice.

Do you have any questions?

Now we will begin.

After they have completed the experiment four faces will appear on the screen with numbers below them. Ask the students ***(in proper subject order)*** *to rate how much they liked playing the game.*
How much did you like playing the flashcard game.
4-A lot
3-A little
2-Not much
1-Not at all

Appendix F (Con't)

After the students have been administered both conditions we will need to ask their "Play-again" preference.

Ask the students individually "If you were to play this flashcard game again, would you like to take turns answering the questions to see who can get the most right, or would you like to work together on the answers?"

Mark their answers on Chart 3 'Play-Again Preference'.

CURRICULUM VITA

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BIRTH DATE AND PLACE

August 22, 1969; Kittery Maine

Educational Background

Virginia Polytechnic Institute and State University, M.A. Psychology, May 1993

Skidmore College, B.A. Psychology, May 1991

Academic Awards & Honors

Collaborative Student Faculty Research Fellowship, Summer 1990, Skidmore College

Dean's List (Fall 1988-Spring 1991)

Psi Chi member

Kraweck Scholar, 1991

Periclean Honor Society, 1991

Research Activities

Conference Presentations

Thomas Blickle & Christine O'Connell
"The Nature of Attention in Letter Recognition." Human Factors Conference; Orlando Fla. Oct. 1990.

Thomas Blickle & Christine O'Connell
"The Nature of Attention and Feature Analysis in Letter Matching" Psychological Association Conference, Spring 1991.

Senior Thesis

"The Nature of Attention in Word Recognition." When words are presented on the periphery, are they recognized differently than when they are presented on the fovea? May 1991

Research Training

Research Assistant in Perception Lab, Fall 1989-Spring 1991.

Training in Techniques of Observational Data Collecting as part of course requirement in Education.

Teaching Activities/Experience

Introduction to Psychology Lab Instructor (8/91-12/91, 1/93- to 5/93)

Teaching Assistant for Cognition (1/92-5/92)

Teaching Assistant for Advanced Developmental Psychology (1/92-5/92).

Teaching Assistant for Developmental Psychology (8/93-12/93).

Introduction to Psychology Lecture Teaching Assistant (8/92- to 5/93).

Christine M. O'Connell