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ABSTRACT

Two secondary students with severe disabilities and 28 high school sophomores enrolled in a life sciences class participated in this study. The two students with disabilities also participated in a special education classroom with a community-based instructional program. A cooperative learning intervention was implemented using Johnson and Johnson's Circle of Learning model, which involved heterogeneous grouping, structured interdependence, structured accountability, and teaching collaborative skills. Four adaptations were used to include the two special needs students in the biology class: the amount of work required was changed, materials were enlarged and important information was highlighted, additional time was provided to complete tasks, and student roles were sometimes changed. Three results indicated that cooperative learning increased the opportunity to master content for both students with disabilities and their nondisabled peers: (1) on-task behavior increased for all students; (2) more interactions were related to content (i.e., teaching and helping); and (3) the performance of nondisabled students increased. The disabled students' ability to learn social and communication skills may also improve under cooperative learning conditions. Teacher interaction decreased for students in typical groups and increased for students in integrated groups. (Contains 26 references.) (JDD)

Cooperative Learning to Facilitate the Inclusion of Students with Moderate to Severe Mental Retardation in Secondary Subject-Area Classes

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Cooperative Learning to Facilitate the Inclusion of Students with Moderate to Severe Mental Retardation

Cooperative learning is one of the strategies that can be beneficial for the instruction of students with severe disabilities in inclusive classrooms (Johnson & Johnson, 1989; Sapon-Shevin, 1990; Villa & Thousand, 1992). Cooperative learning refers to a classroom organization where students work together in groups to learn new information, review material, and provide each other feedback on performance. Cooperative learning is recommended to teach students to be cooperative or how to "build and maintain positive relationships with other people" (Johnson & Johnson, 1978). Johnson and Johnson (1987) reviewed research on cooperative learning and found it increased student interaction, built environments of support and trust, and increased student involvement in learning. Cooperative learning also has been shown to promote acceptance of traditionally low status students, both students with disabilities and minority students (Cohen, Lotan & Catanzarite, 1990; Johnson, Johnson, Warring & Maruyama, 1986, Madden & Slavin, 1983; Slavin, Leavey & Madden, 1984). Further research has shown improved social skills both in and out of class when students participated in cooperative learning (Aroson, Blaney, Stephan, Sikes, & Snapp, 1978; Johnson, Johnson, and Maruyama, 1983; Sharan, 1980; Solomon, Watson, Schaps, Battistich & Solomon, 1990). Additionally, cooperative learning may improve student

motivation. Sharan and Shaulov (1990) reported improvement in task perseverance, active involvement in class activities, and effort in homework.

However, when achievement was compared under cooperative, individual, and competitive structures, the results were equivocal (Lloyd, Crowley, Kohler & Strain, 1988; Stevens & Slavin, 1991; Tateyama-Sniezek, 1990). Nonetheless, the use of cooperative learning was no less effective than either of the other structures. Regarding student achievement, one can conclude that although cooperative learning is not consistently significantly more effective than other procedures, it does no harm. Thus, cooperative learning is an appropriate strategy in situations where instructional goals include the improvement of status, social skills, and motivation.

Some arguments for the use of inclusive education for students with severe disabilities are parallel to the outcomes of cooperative learning. Students with severe disabilities are included in classes with typical peers of the same chronological age so that they may develop social skills, communication skills, problem-solving skills, and the ability to get along with others. Such inclusion can benefit students with severe disabilities by providing the opportunity to: (a) learn from appropriate role models; (b) learn to function in the integrated communities they will share as adults; and (c) build a network of friends and acquaintances that will increase the likelihood of success in the community (c.f., Brown, Branston, Hamre-Nietupski, Johnson,

Wilcox, & Gruenwald, 1987; Certo, Haring & York, 1984; Gartner & Lipsky, 1987; Horner, Meyer, & Fredricks, 1986; Stainback, Stainback, & Forest, 1990). Inclusion can also benefit the student in the regular education program. These students have the opportunity to develop problem-solving skills, communication skills, prosocial behaviors, and mastery learning at higher levels when they assist in the instruction of students with special needs.

Because both cooperative learning and inclusion can improve social skills, communication skills, and motivation, cooperative learning should be a successful method in classrooms that include students with severe disabilities. However, research on the use of cooperative learning in classes that include students with severe disabilities is limited. Wilcox, Sbardellati, and Nevin (1987) used cooperative learning strategies in a first grade class to increase the interactions of a child with severe disabilities and her peers. Putnam, Rynders, Johnson, and Johnson (1989) used cooperative learning groups to teach science to two fifth grade classes that included students with moderate mental retardation. They compared social interaction in groups that had received instruction in collaborative skills to those who did not receive instruction. The instruction in collaborative skills (e.g., forming a group, managing the group, building an understanding of the information, and communicating rationale behind conclusions) resulted in a significantly increased rate of social behaviors from nondisabled students to

students with disabilities. No special adaptations were used to include the students with severe disabilities in these investigations.

This study further explores the use of cooperative learning to include students with severe disabilities in a secondary science class. Due to the special needs of the students instructional adaptations were also employed. The study addressed the questions of: a) whether cooperative learning increased the opportunities to learn social and content skills for students with disabilities, b) whether the use of cooperative learning increased the opportunity to learn content for their nondisabled peers; and c) whether the inclusion of a students with disabilities in a group negatively affected the group's performance.

Method

Participants and Setting

Two secondary students with severe disabilities and twenty-eight high school sophomores enrolled in a life sciences class participated in the study. Both of the students with disabilities also participated in a special education classroom with a community-based instructional program. When the two boys were not attending mainstreamed classes, their curriculum focused on community and vocational skills. Much of their instruction took place off-campus on job sites and other community locations. The intervention occurred in the life sciences teacher's classroom on a large urban high school campus.

Mark, an 18-year-old with moderate mental retardation, was capable of doing academic tasks at a first grade level. He had good verbal skills and was able to participate in conversations with his peers and master vocabulary in the biology class. During baseline observations, Mark's interactions in biology consisted primarily of placing himself next to other students who were participating in an interaction and watching them. Typically, the peers would not speak directly to or make an effort to include Mark in the conversation.

Carlos had severe mental retardation and some mild physical disabilities caused by Down syndrome. His intelligible vocabulary was limited to approximately 25 words. He attempted sentences, but was not understood by peers. His academic abilities included knowing his name and address and identifying numbers and letters. His community instruction focused on managing money with adaptive devices. His typical social interactions in the classroom consisted of greeting peers with "hi" or a pat or light punch when he walked past them. Carlos spent much of his class time looking at reference materials in an isolated part of the classroom.

Measurement

Three dependent variables were measured in the study, social interaction, on-task behavior, and achievement.

Social interaction. An adaptation of the Educational Assessment of Social Interaction (EASI) (Goetz, Haring, and Anderson, 1983) was developed to measure the following

instructional and social interaction variables: a) whether or not an interaction occurred during the observation interval; b) who initiated the observation, the target student or the interaction partner; c) identification of the interaction partner: a typical student, a student with a disability, the teacher, or another individual; and d) the purpose of interaction, teaching, helping, acknowledgement, social or other. A **teaching** interaction was defined as providing assistance or information in a way that a response or reaction was required. A **helping** interaction also included conveying information, showing a student how to perform a task, or performing a task for the student, but no response was expected or required. An **acknowledgement** was a response to a helping or teaching interaction. **Social** responses were neither helping nor teaching interactions.

On-task behavior. On-task behavior was recorded on the same form as social interaction. **On-task** was defined as the student being either: a) engaged with the assignment through discussion, writing, or manipulation of materials, or b) directed gaze toward materials or a speaker who is discussing assignment. Student behavior was recorded as being either on-task or not on-task.

Observation procedures. Two observers collected data during the study, the author and an advanced undergraduate student in liberal studies. The student was also a part-time teaching assistant in Mark's and Carlos's special education classroom. A partial interval observation procedure was used. The observers

were cued by a tape recorder when to begin each 10 second observation interval and when to begin the 10 second recording interval. The first social exchange during the interval was recorded. If no interaction occurred, the observer recorded no interaction and whether or not the student was on-task during any part of the interval.

Four 5-minute observations were conducted during each session. Carlos and Mark were observed for 5 minutes each. The rest of the students were divided into two groups, typical and integrated. Typical groups were those that did not include a student with disabilities. Integrated groups were the two groups that included either Carlos or Mark during the cooperative learning condition. During the independent condition, integrated groups were those students who chose to sit at the same table as Carlos or Mark. When observing integrated and typical groups, a different student was observed during each interval. The first student to be observed was selected randomly, then each student in the group was observed in a pattern established prior to the observation. The order of observations (Mark, Carlos, Typical, Integrated) was also randomly selected.

Achievement. Achievement was measured by teacher grades. The teacher graded assignments using the same criteria that were in effect in other classes and in the participating class prior to implementation. Student scores were compared to determine a) whether achievement differed in the two conditions, and b) whether the achievement of nondisabled peers was affected when

they participated in groups with students with disabilities. A t-test was used to make comparisons.

Instructional Task

The biology teacher utilized a text that included several "investigation" activities in each unit. Students were asked to complete a series of activities such as measuring pulse and respiration following different levels of activities, analyzing data from other studies, examining tissue slides with a microscope, and plotting climate variables of different regions. These activities were followed by a series of discussion questions. The cooperative learning condition was applied only to this type of assignment. Prior to intervention the students completed the investigation assignments individually. During the course of intervention, the students continued to participate in lectures and in other individual assignments (e.g., self-tests, completing study questions) The typical weekly classroom schedule during the study was one investigation lasting one or two class sessions, one independent assignment, and two to three lectures.

Intervention

Cooperative learning. Johnson and Johnson's Circle of Learning Model (Johnson & Johnson, 1987) was used in the cooperative learning condition. This model consists of four components: a) heterogeneous grouping, b) structured interdependence, c) structured accountability, and d) teaching collaborative skills. First, the students were divided into 10 **heterogeneous** groups of three students each. A group size of

three was used because this was the students' first experience with cooperative learning and small groups are easier to manage initially. For grouping, the students were ranked according to their current average in the class at the beginning of the study. Mark and Carlos were ranked as the two lowest students. Students were then grouped according to their scores into a high group, a mid level group, and a low group. The first cooperative group was formed by selecting the student with the highest ranking, the student with the lowest ranking, and a student from the mid-level group. This procedure was repeated with the remaining students until all the students were placed in groups. Additionally, the biology teacher indicated students whom he felt may have difficulty with cooperation. No two of these students were included in the same group or in Mark's or Carlos's group.

The next component of the model was to **structure interdependence**. Interdependence was fostered by providing group rewards and providing incentives for students to assist other team members in completing the assignments. Groups could earn bonus points if: a) every team members' assignment was complete, and b) if a randomly selected team member could explain the activity or an answer to a discussion question. Thus, teams were rewarded for checking that all team members' work was completed and that all team members understood the information well enough to explain it.

The third component was to **structure individual accountability**. This was accomplished by requiring each

individual student to submit his or her own assignment. These assignments were graded independently.

The final component of the Circles of Learning model was to **teach collaborative skills**. This was accomplished by teacher explanation of cooperative behaviors, handouts for students' reference, and ongoing feedback during intervention. The biology teacher introduced the cooperative groups to the class. Students were provided with handouts explaining the rules for earning team and individual points (See Figure 1). Additionally, they were provided with the checklist in Figure 2 for monitoring whether or not they demonstrated cooperative behaviors. Finally, during investigation activities, the author and the biology teacher moved about the room. Whenever they observed the target cooperative behaviors, they awarded bonus points to the students while stating the behavior that had been observed.

Place Figures 1 and 2 about here

Instructional adaptations. Four adaptations were used to include Mark and Carlos in the biology class. The first adaptation was to *change the amount* of work required. Mark and Carlos both assisted their group members to complete one or two sets of materials when other groups completed a set for each student. Carlos was not required to answer any questions for bonus points and Mark's questions were limited to those related to his vocabulary goals. The second adaptation was to *alter the*

materials. This included enlargement and highlighting important information. Also some of the graphing steps were completed for Mark and Carlos prior to class time. A third adaptation was *providing additional time* to complete tasks. Mark and Carlos occasionally worked on a portion of their assignments during their study hall in the special education classroom. The fourth adaptations was *changing student roles*. During particularly difficult investigations, Carlos acted as "group checker." He kept a list of all teams and was responsible for marking a group off the list when every one in the group had completed all of the tasks. The teacher used the list to award extra points.

Results

Reliability

Reliability observations were conducted on 23% of the observations. Both observers wore headphones connected to the same cuing device, and were positioned so that they could observe the same students but not the other observer's data collection sheet. Reliability for agreement was calculated by dividing the number of intervals on which the observers agreed by the total number of intervals in the observation. Reliability for individual categories (i.e., interaction occurred, on-task, who initiated the interaction, the interaction partner, and the type of interaction) each session ranged from 60 to 100% and averages for each category ranged from 79 to 92%. The average reliability for all categories across observations was 90%.

Observations

A total of 12 observations were conducted, six under the independent condition and six under the cooperative condition. Mark and Carlos were both frequently absent and thus were not included in as many observations as their peers. Mark was observed during three independent sessions and four cooperative sessions. Carlos was observed during two independent sessions and one session of cooperative learning. The integrated groups were observed for a total of five sessions under cooperative group conditions.

On-task Behavior

Student on-task behavior is charted in Figure 3. Both groups of students showed a remarkable increase in on-task behavior under the cooperative learning condition. The students in typical groups increased from 46% to 90% intervals on-task, students in integrated groups increased from 56% to 96%, and Mark and Carlos increased from 8% to 84% and 11% to 90% respectively. The implementation of cooperative learning in this class appeared to enhance on-task behavior significantly for all students.

Place Figure 3 approximately here.

The frequency of occurrence of interaction and the type of the interaction is illustrated in Figure 4. The number of interactions actually decreased under the cooperative learning conditions for all participants except Carlos. The proportion of

types of interactions also changed under the different conditions. Teaching and helping interactions increased and social interactions decreased. This change in type of interaction parallels the increase in on-task behavior. These results indicate that cooperative learning may increase the opportunity for all students to learn content because more of their interaction appeared to be related to the subject area.

Place Figure 4 approximately here.

Figure 5 illustrates the percent of interactions with peers and teacher. Under the independent condition, all of the students had the most interactions with nondisabled peers. The students in the integrated groups greatly increased the amount of interaction with the students with disabilities (from 8% to 57%). Under the cooperative learning condition, the students in typical groups and Mark had more interactions with each other and less with the teacher, Carlos had more interactions with the teacher and less with peers, and the nondisabled students in the integrated groups had more interactions with both students and the teacher. The use of cooperative learning appeared to increase interactions with students with disabilities among students in the integrated groups and decrease interactions with the teacher for students in the typical groups. The influence of

cooperative learning on the interaction partners for students with disabilities was ambiguous.

Place Figure 5 approximately here.

Achievement

The first question addressed by the achievement data was: Did student achievement improve when cooperative learning was implemented? A one-tailed *t*-test compared student grades on investigations completed independently to investigations completed cooperatively. As the data reported in Table 1 indicates, students performed significantly better under the cooperative group condition than under the independent condition.

The second question addressed by this data was: Did participation in groups with students with severe disabilities affect the performance of typical students? Since the students assigned to integrated groups were either in the top third of the class or the top of the second third, their performance was compared to only the top third of the students in the all typical student groups. Table 2 shows the results of the two-tailed *t*-test. The inclusion of a student with severe disabilities in a cooperative group appeared to make no difference in typical student performance of the academic task.

Place Tables 1 and 2 approximately here.

Discussion

One major purpose for inclusive education is to increase student opportunities to learn communication skills and to increase content knowledge. The results of this study indicate that cooperative learning is a successful strategy to facilitate the opportunity to achieve these goals. Three results indicated that cooperative learning increased the opportunity to master content for both students with disabilities and their nondisabled peers. First, on-task behavior increased for all students in the study. Secondly, more interactions were related to content (i.e., teaching and helping). Thirdly, the performance of nondisabled students increased under the cooperative learning condition.

The ability to learn social and communication skills for students with disabilities may also improve under cooperative learning conditions. The increase in social and helping interactions indicated that Mark and Carlos had more appropriate communication models for the classroom environment and their behavior changed accordingly. Mark who had been withdrawn during baseline observations showed marked increase in interactions. However, the number of Carlos's interactions with peers actually decreased. One explanation for the decrease is that much of Carlos's pre-intervention interactions were inappropriate for a classroom (i.e., wandering around the room tapping or poking peers) and his interaction, though less frequent during intervention, was more appropriate. Thus it appears that

cooperative learning may increase the opportunity to model and practice appropriate interactions in the classroom.

Some arguments made against the use of inclusive education include concerns about teacher time being taken away from nondisabled students and the disruption of learning for nondisabled peers because they are helping or waiting for the students with disabilities. The results of this study clearly indicated that the inclusion of students with disabilities does not adversely affect the academic performance of nondisabled students. However, the effect of inclusion on teacher time is not clear from this study. Teacher interaction decreased for students in typical groups and increased for students in integrated groups. Results were also equivocal for students with disabilities, increasing for Carlos and decreasing for Mark. It is possible that the change in typical groups is explained by group membership and rewards for cooperation. Each group was structured so that students who had demonstrated some mastery were available to assist other students. Additionally, students were rewarded for assisting each other increasing the likelihood that students received help from peers and did not need teacher assistance. The students in the integrated groups may have needed more teacher interaction because they needed to make certain the less able classmates demonstrated achievement in the cooperative condition. The differences in teacher interactions with Mark and Carlos may be explained by their different roles. Carlos was responsible for checking group work in addition to

adapted participation in his cooperative learning group. This role as "group checker" may have required him to interact more frequently with the teacher.

The results of this study are limited because it was a pilot study. Implementation was conducted during the final quarter of the school year, with observations collected on 12 days. Additionally, Mark and Carlos were both absent on some of the observation days. The limited number of observations and the time of the school year may have influenced the results of the study. However, the dramatic changes in on-task behavior and the types of interactions that occurred support continued use of cooperative learning groups.

Both of the participating teachers believed the changes in the class were meaningful. The biology teacher reported that he plans to use the strategy in all his classes next year, not just the inclusive classes. He was surprised that some of the typical students who had never shown an interest in their peers were willing to assist classmates. The special education teacher is planning to use similar strategies in blended classes.

The results of this study, though tentative, suggest that cooperative learning is an effective strategy to increase communication and content learning opportunities for all students. Additionally, it can increase the appropriate inclusion of students with disabilities. Finally, the results of

using cooperative learning are meaningful to teachers and are easy enough to implement that participating teachers were willing to expand the use of the methodology.

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Table 1

The Effect of Classroom Organization on Achievement

Condition	N	$\bar{X}$	*t*	*p*
Independent	65	86.6	-2.14	.017
Cooperative	72	92.0		

Table 2

The Effect of Inclusion on Typical Student Performance

Condition	N	$\bar{X}$	*t*	*p*
Integrated Group	12	96.0	.36	.723
All Typical Student Group	22	95.7		

Group Rules and Conditions

1. *Individual notebooks will be graded as before.*

2. *Each group can earn bonus points if:*
   a. *every team member's notebook is complete.*
   b. *a randomly selected team member can answer a question.*

3. *Still more bonus points can be earned if the teacher or observer catches you:*
   a. *answering questions for a teammate.*
   b. *encouraging or praising a teammate*
   c. *being cooperative.*

4. *You may decide whether or not you want to assign tasks within your group to share the work.*

5. *You may be asked to report on how you accomplished your tasks or to rate your cooperativeness.*

Figure 1: This handout was given to students following the teacher's discussion of cooperative learning conditions.

Am I a Cooperative Team Member?

	yes	no
1. Did I complete my assignments?		
2. Did I contribute ideas to my group?		
3. Did I encourage my teammates to get their work done?		
4. Did I ask questions when I did not understand?		
5. Did I listen to my teammates without interrupting?		
6. Did I answer my teammates' questions when I could?		
7. Did I criticize ideas and not people when I disagreed?		
8. Did I give reasons for my answers and for my criticisms?		

Figure 2: These checklists were given to students to remind them of cooperative behaviors.

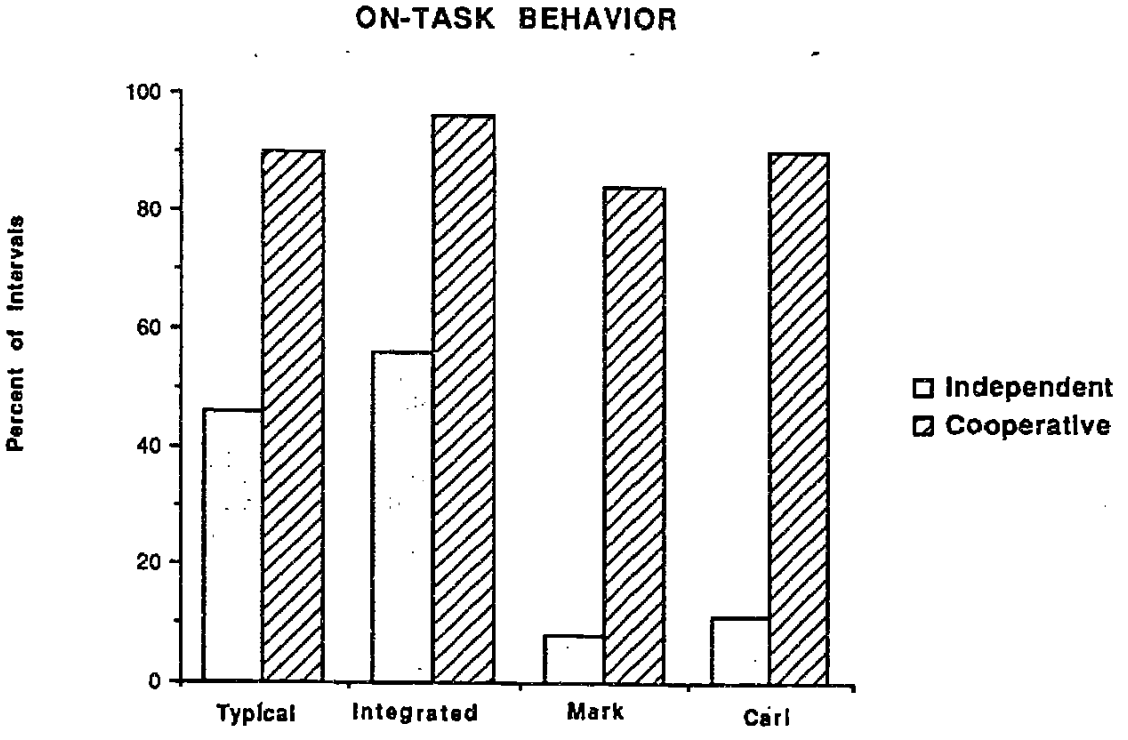


Figure 3: This graph compares the percent of observation intervals that the students were on-task during independent activities and during cooperative learning activities.

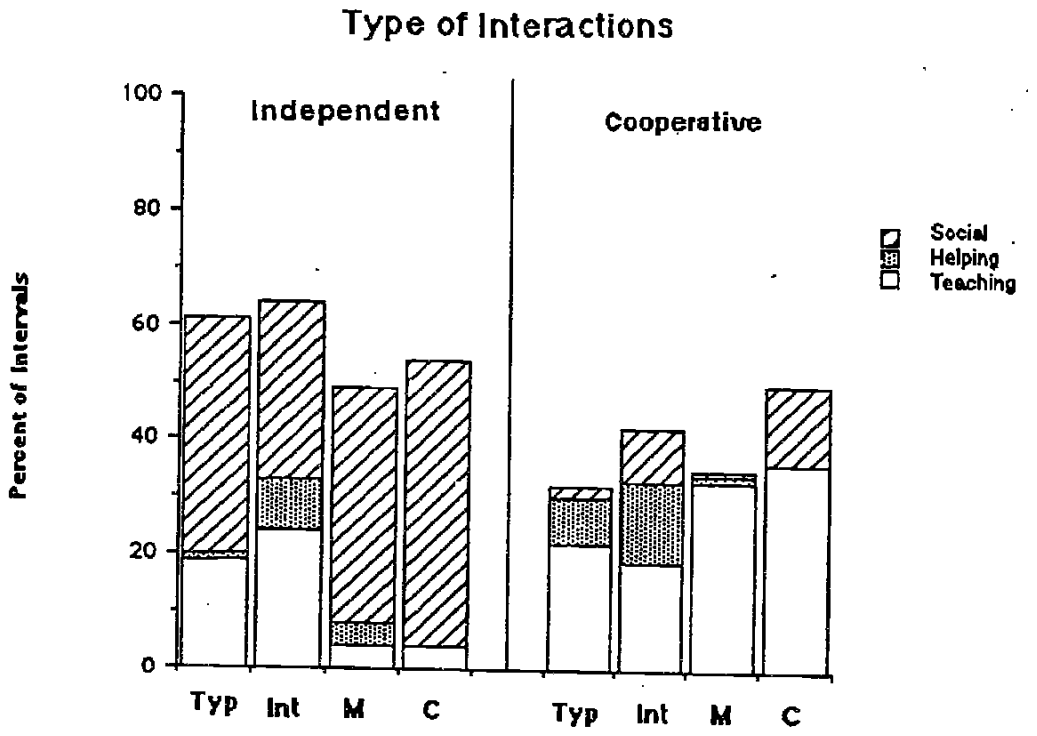
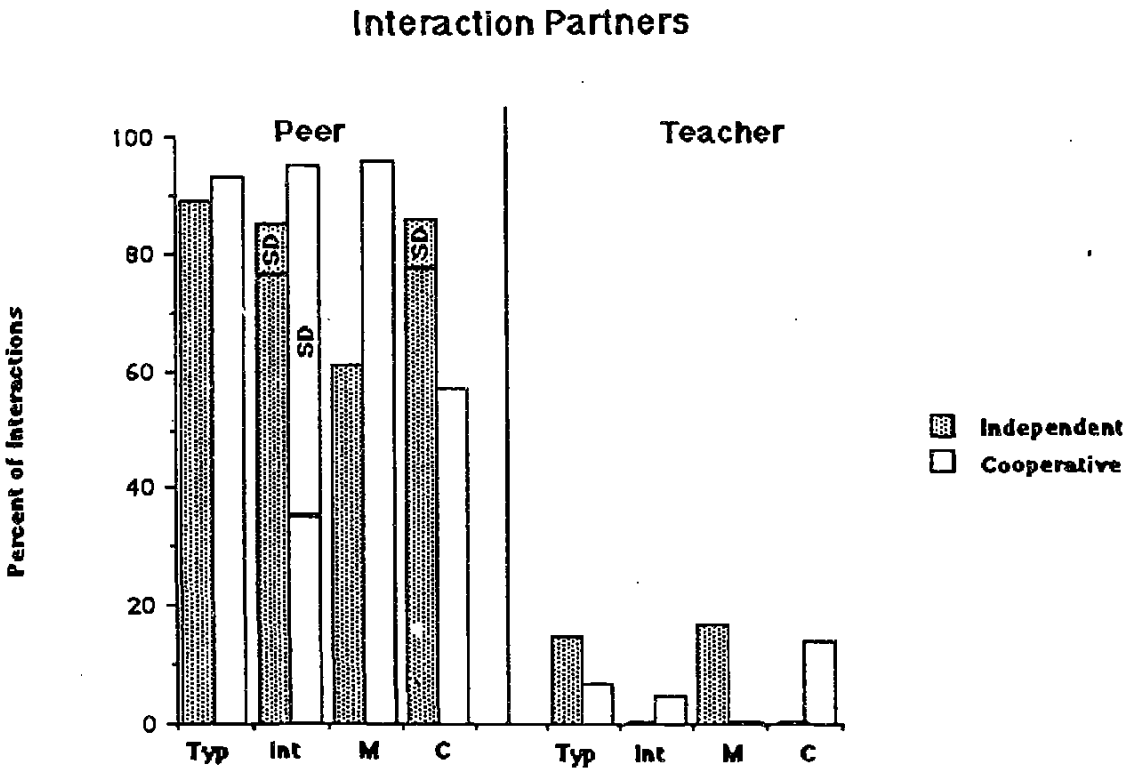


Figure 4: This graph shows the percent of intervals during which interactions occured and the proportion of the interactions that were teaching, helping, or social.

Key:

Typ: Students in the all typical student groups
Int: Typical students in the integrated groups
M: Mike
C: Carlos



Key:

Typ: Students in the all typical student groups
Int: Typical students in the integrated groups
M: Mike
C: Carlos
SD: Students with Disabilities

Figure 5: This graph ilustrates the percent of interactions that occured with peers and with the teacher during independent learning conditions and during cooperative learning conditions. The area marked with "SD" shows the proportion of interactions with either Mark or Carl, the students with disabilities.