Cooperative-Learning Groups in the High School Science Classroom Facilitate Learning and Maintain the Focus of Learning Disabled Students

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I would like to dedicate this paper to my children, Natalia and Luke, for their patience and understanding.
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Students in New York are now required to complete three science classes during their high school years, with at least two classes at the Regents’ level, one in Living-Environment, and one in Physical Setting. Students must then pass both the New York State Regents level tests. Learning disabled students can be exempt from this requirement through their individual education program (IEP). However, if a learning disabled student is functioning and learning in an inclusive classroom, they often try to take Regents level classes. In this way, they can graduate with a Regent’s diploma versus an IEP diploma.

Historically, special education students struggle in Regent’s based science courses, not necessarily because of the method of instruction, but rather the difficulty with math concepts, the large volume of required prior knowledge and the recollection thereof, the quantity of material, and the speed of delivery. Basically, there is a huge amount of material that needs to be learned in a very short time frame. Constant review and practice of concepts is overwhelming to students that require extra time, scribes, paraprofessionals to read to them, and facts broken down into smaller bites to make connections.

The implications are huge, with over three million students now identified as learning disabled; educating them has become everyone’s responsibility. Federal laws 94-142 The Education of all Handicapped Children’s Act and 105-17 The Individuals with Disabilities Education Act has made teachers put current research into practice.
(Cawley, 2002). Teaching these students combines a variety of techniques, some of which will be discussed further in this paper.

Specifically, cooperative learning research started with Johnson and Johnson in 1991, it has since been studied numerous times by J. Putnam and R. Slavin in 1996, K. Malmgren in 1998, D. Blanksby in 1999, T. Hedeen in 2003, and J. Ulmer, M. Grenier, and C. Siegel in 2005. Research has found that by modifying the methods of instruction, special education students, in American high school settings, do perform better. This paper will recreate cooperative learning research, on a smaller scale, in a New York high school Earth Science Regents classroom.
Literature Review

Students come in all shapes, sizes, with different learning styles, varying prior knowledge, strengths and weaknesses. Education in the last part of the 20th century began to recognize that all students are capable of learning despite the challenges that confront them. The following literature dates from 1991 to the present, specifically encompassing teaching students with a learning disability. The literature does not address one or more types of learning disabilities, but rather how can teachers help all students with learning disabilities in the inclusive classroom.

Subsections include the definition of a learning disability, problems that learning disabled students encounter, how to teach these students, cooperative learning strategies, and group work suggestions for the teacher.

What is a Learning Disability?

The United States Federal governments' definition of a learning disability encompasses three parts (Censabella, 2005): first, a learning disability comes from an intrinsic processing disorder. Some studies have found that children with a learning disability encounter working memory deficits related to the control of information available in memory. They show a failure to inhibit information that is no longer relevant, more information remains in working memory, thereby overloading its capacity, which accounts for the weaker performance of children with a learning disability in working memory tasks (Censabella, 2005). However, other studies conclude that the source of interference comes from exogenous (external factors) versus internal stimuli that are present in the environment or in working memory (Censabella, 2005). Second, this disability is determined by a discrepancy between the students' achievement versus
their intellectual ability. Third, this discrepancy is found within one or more areas, which include, reading skill, reading comprehension, listening comprehension, oral expression, written expression, mathematics calculation, or mathematics reasoning.

Children with a learning disability exhibit two specific patterns or subtypes of behavior: nonverbal learning disabilities (NLD), and basic phonological processing disabilities (BPPD). Young children with a NLD subtype are characterized as hyperactive or inattentive, followed by withdrawal, anxiety, depression, and social skills deficits in adolescence. Their spelling is phonetically accurate. Children with a BPPD subtype cannot spell words phonically accurate, yet do not have difficulties with behavior. Because of this, there is a strong relationship between brain dysfunction and a learning disability (Rourke, 2005).

By using the Federal governments’ definition, many children are typically identified based on an IQ score and a score on an achievement test in one or more areas mentioned above. However, the government does not specify which tests to use or how much of a discrepancy is sufficient. Therefore, wide discrepancies exist between and within states in rates of identification.

Jim Ysseldyke, from the University of Minnesota asked, “What if this is as good as it gets” (2005, p. 125)? He was troubled by the virtual absence of change over time in assessment practices. He said change is difficult and more political than data based...and while change is difficult, change requiring extra work is next to impossible. He went on to say, that the learning-disability identification process is the same as twenty-five years ago, and the outcomes remain the same with little satisfaction that we have identified the “right children,” too many children, and lack of results.
The rates of identification have been increasing over time. Fewer than eight hundred thousand children were identified as learning disabled in 1977, however, today there are over three million. Optimists claim there are better identification procedures. Pessimists attribute it to the politics of the particular society where the child resides. “The current system for identifying and dealing with learning disabilities reflects, to a larger extent, political rather than educational or scientific considerations” (Sternberg, 2001, p.335). Identification reasons may include, the schools financial interests of receiving additional state and federal funding, schools wanting to avoid litigation from parental pressure, and the societies demand for better test scores. If some students are given extra time on nationally standardized tests, the scores in a particular district may rise. Whatever the reason, there are many variables to consider when identifying children as learning disabled.

Another problem with using the seven tested areas previously mentioned is that all the different learning disabilities are lumped together, as if their disabilities were all the same. Children whose learning disabilities are caused primarily by environmental disadvantage or by poor teaching are not supposed to be identified (Spear-Swerling, 1998). At some level, virtually everyone has a learning disability of some kind. Almost all of us do some things well and some things badly (Sternberg, 2001).

Problems Learning-Disabled Students Encounter

The Chicago Institute for Children with Learning disabilities has conducted numerous researches demonstrating that children with learning disabilities are at a high risk for experiencing social problems. Many students with learning disabilities spend their school years depressed and lonely (Bryan, 2005). The areas of high risk include: a)
beliefs and feelings about self; b) social cognition, role taking, communicative competence; c) interpersonal skills, developing and sustaining relationships, and adaptive behavior. Teachers of students with mild disabilities must somehow facilitate the simultaneous attainment of academic and social skills alike, both of which represent significant areas of need for students with learning and behavioral disabilities (Malmgren, 1998). Despite the research, children’s social skills and relationships receive a low priority among teachers and school districts. “When teachers advocate for a child and get to know that child as a person, they often discover what’s beneath the outward manifestations of failure” (Nierstheimer, 2000, p. 34).

The social skills that teachers rate as essential for school success are compliance behaviors that affect classroom management. Tanis Bryan, who was the co-director of the Southwest Institute for Families and Children with Special Needs in Phoenix, Arizona said, “What is important is that the child follows directions, cooperates with peers, and has self-control; that is, does what the teacher wants when she wants it, without disturbing anyone else. Although teachers may endorse strategies that promote cooperative learning and motivation, teachers do not use the motivating strategies they endorse” (Bryan, 2005, p. 119).

Another perspective is that of the parent of a struggling learner. Many parents feel a lack of power and respect. Often times, the ‘Individual Education Program’ (IEP) meetings involve the guidance counselor, school psychologist, teachers, administrators, and the parents; the parents outnumbered and outsiders. The very numeric ratio of professionals to parents tips the power balance in favor of the school. Parents can feel vulnerable and at the mercy of those who were making decisions about their child. When
children are not respected at school and are in a sense disenfranchised from the system, so are their parents (Nierstheimer, 2000).

**Teaching (i.e. Science) Students with Learning Disabilities**

In 1975, Public law 94-142, the Education of all Handicapped Children's Act brought a dramatic change to the education of students with disabilities (Cawley, Hayden, Cade, and Baker-Kroczyński, 2002). Prior to the 1970s, millions of children received inadequate or inappropriate special education services; another one million were excluded from school altogether (US Department of Education, 1995). Many states had laws that specifically excluded children, such as those who were deaf or blind, those with emotional or behavioral problems, and those who were “feeble-minded”. Only after Public Law 94-142 became effective in 1978, and in several states after Federal and State court cases, did ‘education for all’ policies become a fact. This was especially true for children with mental retardation and other severe developmental disabilities, many of whom were institutionalized. Today most of these children can expect to live at home, and receive special education and related services in regular schools (US Department of Education, 2000).

Then, Public Law 105-17, commonly known as the Individuals with Disabilities Education Act (IDEA) Amendments of 1997, fully supported the least restrictive mandate that students with disabilities have access to and make progress in the general education curriculum (Cawley et al. 2002). This act brought about a change in attitude towards disabilities, as the term ‘handicapped children’ now reads ‘children with disabilities’. These changes reflect both the activism of persons with disabilities and their advocates and an increasing public awareness that “disability is a natural part of the human
experience and in no way diminishes the right of individuals to participate in or contribute to society” (US Department of Education, 1995. p.5).

Inclusive practices can result in classes of students with abilities ranging from learning disabled to gifted in any given area of learning. Meeting the diverse educational needs of such a range of students can be viewed as either a daunting or an exciting task, and even perhaps as both. Until this identification process is changed, several strategies assist these students and their peers as well. Curriculum must be taught in a way that values a full range of learning and thinking abilities. Instruction now values students with superior memory and analytical abilities, such as in the verbal and quantitative domains. Instruction should value children equally with creative and practical abilities, abilities that are far more important for job performance and life skills. Educators must capitalize on all students’ strengths, as many students with learning disabilities excel in other areas. For example, they often need to develop their creative thinking skills in order to figure out ways to compensate for their specific learning disabilities (Blanksby, 1999).

Adolescents with a learning disability have a large achievement gap, because they lack the skills and strategies that enable them to process the content information. Learning-disabled student should not be tutored as this reduces their ability to function independently in the content classroom. Content teachers should use instructional routines to present information, and prompt students to apply the strategies learned. An example of a strategy is a graphic organizer, such as the matrix system (charts) and the branched out organizer (which looks like a tree). Diagrams also allow the student to observe relationships among information (Lehman, 1992).
Instruction should be highly intensive. Intensity during instruction is achieved by pacing, frequent question-answer interactions, and frequent activities that require a physical response (pointing, writing, raising hands, repeating). Intensity is also reached through reflective or open-ended questions. Despite these intervention methods, an unacceptably large number of adolescents with a learning disability still drop out of school (Deshler, 2005).

Another way is for educators to design instruction together, by having the general education teacher prepare lessons with the special educational teacher. This can make all the difference in the world, especially if the general education teacher is not receptive to inclusion. Teacher education programs for science educators reflect little concern for preparing science teachers to work with students with disabilities (Cawley, 2002). This fear is understandable if the general education teachers are given little or no support and the special education teachers are unable to contribute effectively to the content classroom. By working together, both teachers can take the Individual Education Program (IEP) goals and their knowledge to adapt curriculum to meet each student’s particular needs (Grenier, 2005). Team-teaching allows students to learn different areas of expertise simultaneously in a cross functional setting (Leon, 2004).

One challenge for general education and special education teachers is to prevent students’ behaviors from interfering with their academic success. Students should monitor their own work completion, by putting the focus on academic performance rather than behavior. This makes the management of behavior addressed through internal versus external controls (Cawley, 2002).
One of the early studies compared learning disabled students in a lecture based textbook approach versus an activity-based approach to learning. Students in the activity based classroom performed higher on unit tests than students using the reading approach. The science class is potentially one of the more promising classes in which to provide an appropriate education in the Least Restrictive Environment (LRE). Science classrooms a) allow students to interact, share and collaborate during their learning experiences; b) promote collaboration between teachers and students during instructional activities; and c) offer a variety of multimedia opportunities for learning and performance (Cawley, 2002).

According to Hogan (2005), before the learning disabled student enters the classroom four pieces of information must be determined.

1. Input skills: How does this student take in information?
2. Responding skills: How does this student tell us what he or she knows?
3. Processing: How efficiently does this student process information?
4. Work habits/behavior: How does this student approach learning tasks?

Comparing the students’ characteristics and classroom factors will facilitate cooperative planning for the students needs during instruction, as well as modifications of materials, assignments, and assessments.

The worst thing a school can do is to lower their expectations and limit their experiences, as this may worsen rather than improve children’s educational prospects (Spear-Swerling, & Sternberg, 1998). Low-achieving students are often found in classrooms that emphasize lower-order skills, basic knowledge, drill and practice, recitation, and deskwork. However, when such students are placed in classrooms that
provide more intense, varied, and authentic instructional experiences, they usually
demonstrate the ability to master more complex and demanding tasks (Lee, 1997).

What is Cooperative – Learning?

Cooperative learning is active learning, sometimes involving friendly
competition, which creates an urgency to energize the classroom. Cooperative learning is
learning through heterogeneous groups, to decipher real world problems, create
discussion, and consider results in a new and creative way (Schmidt, 2004). Cooperative
learning takes the lecture-oriented classroom to a student-centered classroom that
engages students in inquiry (Evans, 2004). Janet L. Gerkin (2004), the Editor of The
Science Teacher Journal said in her notes that it is not necessarily the final product that
makes inquiry successful, but rather the journey that holds the key to real science.

Johnson and Johnson (1991) stated that cooperative learning is organizing
students so they work together to accomplish shared goals. The five important
components of a cooperative learning activity are:

1.) Positive interdependence – This is where students are given a task that they
perceive as being able to complete only if all group members contribute to the
effort. This can be achieved through several design approaches: (i) providing a
group reward for successful interdependence; (ii) having activities in which
resources are shared; or (iii) providing a task that is too difficult for students to do
independently.

2.) Face-to-Face Interaction – Students are given the time and space for meeting with
group members.
3.) Individual Accountability – Students are required to learn the material and demonstrate they have mastered it. The group should facilitate the learning of all group members, but each group member needs to be responsible for demonstrating his or her own learning.

4.) Interpersonal Skills – Students are given opportunities to develop trust, communicate effectively, and handle conflicts. Feedback should be provided to enhance these skills.

5.) Group Processing – students are given time and space to reflect on their goals. The focus is to learn about group dynamics for future situations (Johnson et al. 1991).

The type of learning that takes place varies from activity to activity. Examples of learning are information sharing, mastery of concepts, or to increase thinking. Each activity or strategy can encompass one or more types or modes of learning. Several varieties of cooperative learning strategies, suggested by different authors are highlighted below.

A) One Stray / Three Stay – Students number off, one student takes turns going to different teams and reporting the information back to their teams (Cracolice, & Deming, 1991).

B) Numbered Heads Together – Students number off, each student on the team has a different number. Teacher asks a question, everyone works on the answer, teacher calls a number at random, and that student answers (Cracolice et al. 1991).
C) Teammates Consult – All members of team put their pens in the center. One student reads a question from the worksheet; students discuss the answer, but individuals write the answer on their own paper, they then pass the question sheet to the next student and continue. This activity promotes discussion and changes a traditional worksheet to one that requires more thinking (Cracolice et al.).

D) Peer-Led Team Learning – This model organizes students from various grade levels into workshop groups that meet regularly to solve problems and reinforce science concepts without teacher intervention. Each team has a student leader who recently completed the course, showed evidence of learning, and demonstrated leadership potential with strong interpersonal skills. Traditional cooperative learning is a switch to less telling and more asking, but when used alone it is lacking because students do not function as a team. In effect, teams need leaders (Cracolice et al.).

E) Jig-Saw – This involves two different sets of small groups, one is called the expert group, and the other is their home base group. Students learn the material in their expert group, then change to form their home base groups to reteach the concept learned. The jigsaw is meant to bring about student comprehension of material (Hedeen, 2003).

F) Reverse Jig-Saw - This learning strategy is used to promote understanding of interpretations and perceptions, but still employs two
small groups. Students in the first mixed group are given different case studies with a complex question. Students then discuss their individual topic. Every student then returns to their topic group so that all students on the same topic are together. Students share the highlights of their mixed group discussions to identify a common theme, prepare a visual report and short oral presentation (Hedeen, 2003).

G) Small Group Discussion – According to Rice-Snow and Fluegeman (2004) small group discussion is a good way to integrate science with other disciplines. Each group has a specific question to answer, and since they do not know which group will be called on, each group must be prepared to speak. Ideas include evaluating an author’s argument, applying a previously discussed model to a new situation, summarize the evaluation of an issue, propose a new international policy, allot a budget, or choose a goal.

H) Problem-Based Learning – In this cooperative learning strategy students actively explore an open-ended problem with more than one solution. Students assume a particular role in the problem (a doctor, or counselor) simulating a professional in the field. This has the potential to immerse students in learning science content and the nature of science; it makes learning more relevant (Goodnough, & Cahsion, 2003).

Balancing the social needs of the student with his or her physical abilities and academic needs, is a goal that should be identified in the learning disabled students IEP.
National education standards five and six relate directly to social skill development and outcomes associated with cooperative learning behaviors, therefore, they should be factored into every child’s educational programming (Grenier, Dyson, & Yeaton, 2005). Students are more likely to honestly express their ideas, both scientifically valid conceptions and misconceptions, in a peer group, since they have no fear of looking stupid in front of a teacher who will be issuing grades (Cracolice, 2001).

Educators should remember it is unhealthy to use cooperative learning and competitive methods exclusively. Rather the artful use of cooperative learning is a powerful tool. Students that work in groups learn to value diversity, utilize it for creative problem solving, and develop an ability to work effectively with diverse peers (Ulmer, & Cramer, 2005).

**Overcoming Student Resistance to Group Work**

At the mention of group work, many students grunt and groan, and why shouldn’t they? Students have had experience working in groups, and they know exactly what it can be like: one person doing all the work, friction among group members, and trouble staying on-task during meetings. The problem for these students is that they have not been trained how to function and interact in a small group setting and teachers do not understand their role in cooperative learning. According to Butts (2000) students can overcome this negative attitude by employing several techniques that work. Students need to brainstorm reasons why they do not like working in groups or previous problems they have encountered. The teacher writes the problems on the board, discussing them honestly to make students feel relaxed and understood. Direct instruction on how to work in groups is next, learning effective communication skills, negating group conflicts,
and how to be effective; practical information that can readily applied. Finally, discussion ensues by proposing solutions and strategies to working in groups, then when a strategy is student recognized the original problem is erased from the board. Sample problems and solutions are stated below.

1.) Problem: One person doing all the work.

   Solution: because each member has a role, the work is divided up. Each member receives an individual grade and a group evaluation grade.

2.) Problem: Friction among group members.

   Solution: incorporate rules based on the student’s age. For example, younger students need to be reminded to use inside voices, and no put-downs.

   Designation of a group leader helps in arbitration.

3.) Problem: Trouble staying on-task during meetings.

   Solution: the group leader is evaluated by the group for their leadership responsibilities. The secretary takes notes, and records times; knowing that group sessions will be recorded helps students to stay on-task. Instructor circulation among groups helps as well.

   With these methods, student attitudes about working in groups change (Butts, 2000).

**Positive Aspects of Group Work**

Students learn best when they are actively involved in the process. Regardless of the subject matter, students in small groups tend to learn more of what is being taught and retain it longer than when the same content is presented in other instructional formats. Students who work in collaborative groups also appear to be more satisfied with their classes (Hedeen, 2003).
A team learning approach in the classroom can greatly enhance any science curriculum. Working in teams not only improves students' understanding of the coursework but also prepares them for the modern workplace where corporations embrace the teamwork strategy for optimizing the management of their employees. According to Kelvin Cooper, senior executive director at Pfizer Research in Groton, Connecticut, teams are the only way to succeed in today's environment (Cracolice, 2001).

Teachers in inclusive environments typically choose interventions that are not only effective, but efficient as well. Cooperative learning is an efficient solution to individualize education to students with learning and behavior problems in general education settings. It can increase instructional time and provide students with opportunities to actively respond. Teachers can easily vary assignments or instructions within the larger group. According to Vygotsky, working in a heterogeneous group of peers promotes learning for low achievers because their higher achieving peers are modeling behaviors more advanced than the low achievers could achieve on their own, but still within their zone of proximal development (Malmgren, 1998).

Excessive reliance on whole-group instruction and individual seatwork sets the stage for off-task behavior by students who, to be productive, need instructional guidance. Some students who have been exposed to the content do not have the time to increase their knowledge base, while others who operate at a rudimentary level can get lost during whole-group instruction (Malmgren, 1998). Further more, high achievers gain from cooperative learning, relative to high achievers in traditional classes, just as much as do low and average achievers (Slavin, 1996).
It is far more common that adolescent peer norms denigrate academic excellence and favor sports and social success. More ominously, adolescent peer norms usually value independence from adult authority, which can lead adolescents into oppositional behavior such as skipping school, defying teachers, drug use or vandalism. The structure of the traditional classroom is highly inconsistent with adolescent development and peer norms. Research has long shown that when socially interacting peers are placed in individual competition with each other, they discourage each other from working hard. In schools, students try to reduce each other’s academic efforts to make success easier for themselves, by calling hard workers nerds, geeks, or teacher’s pets. This is a contrast to sports where peer excellence is strongly valued by peer norms. In sports, one person’s success helps an entire team to succeed. In academics, one person’s success makes success for others more difficult. Further, traditional schools treat adolescents as children, rarely giving them authority, responsibility, or even opportunities for active participation. In fact, adolescents crave responsibility and hate playing a passive role.

Cooperative learning can capitalize on the development characteristics of adolescents in order to harness peer orientation, enthusiasm, activity, and craving independence within a safe structure (Slavin, 1996).

Several studies for cooperative learning have determined the following positive conclusions: a.) students have more self-esteem and positive feelings about themselves, b.) they liked school more, and found they had more control over their own academic fate, c.) had better school attendance, less detentions, d.) fewer contacts with police, and e.) gained more educational aspirations (Slavin, 1996).
One study concluded that there was a significantly more positive change in desire to work with a learning disabled classmate between October and May in the cooperative setting versus the competitive setting. In the cooperative setting, twenty-seven percent of the special education students were perceived differently in May than they were in October; this change was significant (Putnam, Markovchick, Johnson, & Johnson, 1996). The following results were tabulated. Seventy-four percent of the special education students liked working in the cooperative setting. Seventy-two percent believe they learned better in cooperative situations than in competitive or individualized situations. Ninety-six percent thought their classmates treated them well. Eighty-seven percent believed the regular-education students had been friendlier that year than in the past. Seventy-four reported that they had made new friends who were regular education students, and ninety-six believed their behavior had improved during the year. When implemented in the context of cooperative learning, inclusion tended to encourage positive relationships between regular and special education students: thus, cooperative learning may be a necessary component of inclusion (Putnam et al. 1996).

Shortcomings to Learning Groups

Considerable risk is involved when students with learning disabilities and students without learning disabilities share a classroom. Possible outcomes include a) prejudice, stereotyping, b) teasing, harassment, or c) acceptance, support, d) caring and friendship, depending on the structure of the interaction between the two groups (Putnam et al. 1996). One of several hypotheses why students with learning disabilities are rejected by their peers is because they are perceived as being low in intelligence and are unable to do academic work. Another hypothesis is that special education students are rejected
because their behavior disrupts others’ learning. Little support exists for either hypothesis (Putnam et al. 1996).

Some teachers still believe lecturing is more effective. Lectures are easier to prepare and provide the teacher with a sense of control and importance. Some teachers lecture because they do not believe students working together can learn as much or more from each other than they can from passively listening to the expert (James, 2005).

Developing cooperative learning lessons is a time consuming task, and teachers understand that many students need to be taught social skills required for peer support (Grenier, Dyson, & Yeaton, 2005). One teacher in Taiwan stated, “This kind of instruction (cooperative learning) is beneficial for students in terms of enhancing their thinking skills and interaction; however, implementing it requires more efforts in terms of classroom management and materials preparations” (Chang, & Mao, 1999, p. 378).

Suppose you have several groups working on a problem. Some groups are working productively, while others are not. When do you intervene? How should you intervene? What kinds of interventions are likely to improve students’ problem solving? Simply putting students in a group does not ensure successful cooperative learning. Even in a well planned cooperative learning lesson, students sometimes have difficulties and need help from their teacher. Teacher interventions are effective if used to improve student behaviors. In a study in China, researchers found students stayed on topic, cooperated better, made more inferences, and justifications when the teacher listened in on the group. However, the students produced fewer new ideas in the teacher’s presence than in her absence (Chiu, 2004).
Assessment of Group Work

Many studies have used the dual assessment approach to assess group work. The first measure of assessment is a rubric for team performance, indicating the quality of the project, and achievement of learning objectives and standards. The other measure of assessment is a student survey that evaluates how well each individual student achieved the objectives and participated to the group project (Leon, & Lawrence, 2004). From this perspective, a grade remains a mark of success of the individual member, which is directly related to the quality of the overall group effort (King, & Behnke, 2005). Still for many students, it is not the group work that is distasteful; it is the prospect of being evaluated as a group or by a group that engages this adverse reaction (King, 2005). An assessment strategy to avoid is assigning a single grade to attempt to represent the performance of a group of students. This technique fosters unhealthy interpersonal relationships.

A variety of good assessment strategies and suggestions from the literature include:

a.) Have students assign a grade or portion of a grade. Then the instructor can assign a grade to the entire group that is modified by the individual members rating (Schmidt, 2004).

b.) Students either privately or publicly provide feedback on the other members’ performance directly to the instructor who then assigns a grade (Schmidt, 2004).

c.) Group members can achieve bonus points based on the overall quality of the final project, which can then be awarded equally or unequally according to predetermined rules or criteria (Ulmer, & Cramer, 2005).
d.) Reporting groups could divide an assigned topic into several areas of responsibility then reported on by individual members. The individuals work is then graded and integrated into the overall group product (Ulmer, 2005).

e.) Group projects can be used for foundation work while individual tests/reports only contribute to a summative assessment. Not all classroom activities need be graded; sometimes such activities permit freedom of expression that might otherwise be impossible when grading (Ulmer, 2005).

f.) Require all group members to put their names on written work (Ulmer, 2005).

g.) When a student presents an oral report concerning a specific role, the social pressure to appear prepared reduces free riding. Randomly examining students orally by calling on one student to present the group’s work to teacher (in the presence of the group) or to the entire class (Ulmer, 2005).

h.) Monitor attendance and make that a part of the grade so other members need not be concerned about negative reactions from absent members (James, 2005).

i.) Provide group quizzes – Students will discuss rules and concepts, debating and problem-solving to select an answer. Many students are less stressed with this type of testing situation (James, 2005).

j.) Student assessment items such as concept maps and quizzes based on newly developed constructs at the completion of a laboratory activity provide the best opportunity to retain scientific information. Discussion session following laboratory sessions stimulate thought processes and should include time for peer questioning (St. Omer, 2002).
k.) Journal writing / K.W.L. chart (what the student Knows, what they Want to learn, then what they have Learned) (Evans, 2004)

l.) Instructors should monitor and observe each group, recording the frequency in which each member contributes (Evans, 2004).

m.) Student should complete a self-evaluation form (Evans, 2004).
Methodology

Two separate trials of lesson study were used as a tool for action research to determine the impact of cooperative learning on the education of adolescent special education students.

Participants

The inclusive classroom under study consisted of twenty-nine ninth grade students, thirteen boys, and fourteen girls, completing Earth Science. All of the students were Caucasian. A special education teacher coordinated the eleven special education students in the classroom, eight of which are boys, and three are girls. Therefore, two teachers were in the room, one for Earth Science content and one for the special education modifications. The special education students had the following classifications: learning disabled, emotionally disturbed, and other health impaired.

The accommodations included, separate location for testing, one and a half to three time extension on tests, spelling exempt, simplify language, and a scribe on state assessments. Materials used were a group work assessment rubric (see Appendix A), and group evaluation forms (see Appendix B) for the students to complete.

Procedure

The action research for this paper consisted of two lesson studies. Students were placed into heterogeneous groupings based on recommendations from both teachers in the room. Each group contained only one special education student.

Lesson Study 1: This activity consisted of a cooperative learning activity called a Jigsaw. In a jigsaw, there are two groups; one group is called the learning group, the other home base. Students learn a new concept in the learning group, and then return to
home base to teach that new concept. During lesson study one, students’ drew isolines through group work practice, then returned to their original group to teach others how to draw them correctly. Isolines are lines that connect equal points of value, such as topographic map elevation. The belief is that eventually everyone learns through his or her peers.

Lesson Study 2: Lesson Study two involved organized groups of four where everyone had an assigned role, and participated in group work training. Assigned roles were as follows: one scribe, two researchers, and one reader. All work was completed in class and assessment stressed individual accountability. Group work training started by having students’ take one minute to look at various diagrams on the overhead screen. The overhead was then turned off, and students, individually, had one minute to write down their observations, testing their visual memory. Afterwards, students were then able to talk in their assigned groups, discussing with each other what they observed.

The group work required an informational reading about the pros and cons of drilling in the Alaskan National Wildlife Refuge. Because of time constraints, groups were assigned as either environmentalists or the oil industry to eliminate indecisiveness. Their assignment was to analyze the reading, choose a reason to defend their position, and then compose a paragraph discussing their results. The paragraphs were read out loud the next day, and then group evaluations followed.

Lesson Plan Assessment

In lesson study one, students’ had to hand in their isoline practice sheet from the jigsaw activity. Assessment concluded with an isoline drawing quiz (see student sample in Appendix C). In lesson study two, assessment consisted of three parts, the group work
training sheet, the paragraph with the reasons initialed (see student samples in Appendix D), and a group evaluation (student samples in Appendix E).
Results

The first lesson study was moderately successful. Despite the unplanned, seemingly unproductive practice session, all the special education students passed the Isoline quiz. The students that did poorly were the ones that require a controlled atmosphere, with minimal distractions, and a predictable lesson with clearly defined objectives. Those students could not focus on the lesson at hand, and therefore, had no short term knowledge to pull from during testing. Ninety percent of the class passed the quiz with 85% mastery, 100% of the special education students passed; all the special education students had extended time, and a separate location for testing.

Therefore, a second lesson study was planned, but this time the lesson study started with group work training. The lesson was broken down into timed segments, and all the work was completed on time. The paragraphs contained all the required components, were well written, cohesive, and supported the decision with valid arguments. The paragraphs’ were read the next day, and everyone was polite and listened patiently. Grades included the results from a group work evaluation form. Everyone gave out positive opinions of their teammates work except two special education students. In retrospect, I realized that there was one group that contained two special education students, despite all my efforts to separate them. They criticized each others work ethic, and gave each other negative comments. None of the regular education students gave a negative comment to a special education student.
Discussion

In the initial learning group, students were reluctant to work with others, and preferred to involve the instructor. Students wanted the answers and showed impatience at working with others to achieve a common goal. It seemed as if some students were afraid to make mistakes, in the interest of learning from those mistakes. When students returned to their home base groups, most were reluctant to teach their mini lesson, even though they were in small groups of four. Students passed their sheets around allowing others to copy the results. It made the teaching component take much longer, and many students were off-task because of the down time.

When the type of student who requires a controlled environment is placed into a group, with their chair turned towards another student, they believe it is time to socialize. Without a group leader, it can be difficult to bring that student back on task. Separating those students is possible, monitoring all of them simultaneously, is exhausting. That is why I stated that lesson study one was moderately successful. Re-teaching was necessary for the three regular education students that failed the quiz.

What constituted an improvement, the second time around, was there was less down time, less socializing, less moving around, and less questions. Because there were minimal distractions, I could monitor larger groups of students, hear discussions better, and facilitate rather than frustrate. The literature reiterated that cooperative learning enhances students thinking skills, but requires more effort in terms of classroom management and materials preparation. I found this to be true, but necessary. In lesson study two, the group work training made a huge difference by eliminating confusion, complaining, and instructor re-teaching. Most students completed a much longer list of
observations by working in a group. This led to the understanding that two heads are better than one.

The literature stated three recurring problems associated with overcoming resistance to group work, students need to know that everyone will be held accountable, friction between members will be eliminated, and the group will stay on-task. Lesson study two addressed all three issues, and the cooperative learning process when smoother. Students bought into the process, knew what to do, and how to do it. In lesson study two, there was more time for content and less time for the process.
Conclusion

The action research, specifically lesson study two, achieved positive interdependence, face-to-face interaction, individual accountability, group processing, and the development of interpersonal skills. Therefore, it met the cooperative learning criteria, developed by Johnson and Johnson in 1991. A modification of assessments was successful as well. By having individual accountability, all students were on-task. Everyone was observing, making lists, discussing what they saw, reading the paper, and finding a reason to defend their position. The paragraphs were read the next day, by someone other than the scribe. Therefore, everyone pulled their weight, fulfilled their roles, some more than others, and everyone achieved mastery of the lesson.

In conclusion, almost the entire group evaluations came back positive, which led to an encouraging outcome for cooperative learning in an inclusive classroom for the teacher involved in this research. In the future, smaller groups should be made to allow all the special education students to be only one to a group. I would definitely use group work training to overcome student resistance, have a rubric prepared, and require evaluations at the end. The goals of education are to promote academic, as well as the social development of students; cooperative learning is an integral part of learning in the inclusive classroom. Future cooperative learning research should address the Regents review process and statistically look at the exit outcomes for special education students.
References


Appendix A: Rubric Lesson Study 2

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<tr>
<th>Skill</th>
<th>Zero points</th>
<th>One point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason stated from the reading (why should we drill / why shouldn't we drill?)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student signature next to the reason stated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paragraph completed / read to class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group work evaluation completed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer assessment: What was the groups opinion of your work ethic?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total points</td>
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<td></td>
</tr>
</tbody>
</table>

(Barnsbee, 2006)
Appendix B: Group Work Evaluation

Regents Earth Science
Group Work Evaluation

Name ____________________
Period ___

1.) Overall progress of your group? (circle)  Very well,  Good,  Fair

2.) Was a member of your team distracting others?

3.) Did someone not pull their weight or do the work?

4.) Did someone take over in a negative way? (bossy?)

5.) What are your thoughts this time around?

6.) Team members names ___________________ , ___________________,
____________________

(Barnsbee, 2006)
Appendix C: Isoline Quiz (Student Sample)

Regents Earth Science
Isoline quiz

Name ____________________________
Period __________________________

Construct the following isolines (5, 10, 15, 20, 25, 30). 6 points

List 3 rules for drawing lines of equal value.

1. Lines never cross.
2. Always go to the edges.
3. Interval has to be the same.
   (2, 4, 6...)           (5, 10, 15...)
Appendix D: Paragraph (student samples)

The oil companies are affecting the wildlife in Alaska. One place for conservation is the Arctic National Wildlife Refuge, which spans for about 1.5 million acres, which was established to protect wide varieties of animals and plants. The oil company would also destroy wildlife by building factories and taking up land. Alaska would have many sicknesses with diseases from water contamination and toxic chemicals. Oil has been a problem in the past and now it was brought up again.

There are many important reasons why drilling should be avoided. Oil is a fossil fuel that is a energy resource from ancient material of once living plants and animals. If there wasn't oil, our economy would have changed. If we didn't have oil then we wouldn't have resources in yet fossil fuels like coal, wood, plastics and finally gas. The total land area needed to produce oil is less than that of a typical large airport.
Appendix E: Evaluation (student samples)

Regents Earth Science
Groupwork Evaluation

1. Overall progress of your group?  **Very Well**, Good, Fair (circle answer)
2. Was a member of your team distracting others? **No**
3. Did someone not pull their weight? **No** everyone did their part
4. Did someone take over in a negative way? **No** (bossy)
5. Your thoughts this time around? **I had an awesome group!**
6. Team Members names?

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Regents Earth Science
Groupwork Evaluation

1. Overall progress of your group? **Very Well**, Good, Fair (circle answer)
2. Was a member of your team distracting others? **No**
3. Did someone not pull their weight? **We all did our share**
4. Did someone take over in a negative way? **No** (bossy)
5. Your thoughts this time around? **It was fun but twisty I was**
6. Team Members names? **, , ,**
Regents Earth Science
Groupwork Evaluation

1. Overall progress of your group? (Very Well) Good, Fair (circle answer)
2. Was a member of your team distracting others? No.
3. Did someone not pull their weight? (do the work) Some of the kids didn't do much work, but that wasn't helped too much.
4. Did someone take over in a negative way? No (bossy)
5. Your thoughts this time around? I think that working with the group was good and we worked well. I would like to have helped more.
6. Team Members names?

Regents Earth Science
Groupwork Evaluation

1. Overall progress of your group? Very Well, Good, Fair (circle answer)
2. Was a member of your team distracting others? No.
3. Did someone not pull their weight? (do the work)
4. Did someone take over in a negative way? No (bossy)
5. Your thoughts this time around?
6. Team Members names?