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The Impact of Cooperative Learning Methods Grades 6-12

Nathan Jon Anderson
Bethel University

THE IMPACT OF COOPERATIVE LEARNING METHODS IN GRADES 6-12

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Nathan Anderson

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Thesis Advisor: Nathan Elliott, M.A.

Program Director: Lisa Silmser, Ed. D.

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Abstract

Cooperative Learning methods are reviewed compared to traditional teaching methods in grades 6-12. Grades 6-12 present a time when students are beginning to explore careers and understanding their niche in the world of work. The research question centers on does cooperative learning contribute to greater student achievement than traditional learning. Five key student success markers were explored, including: self-efficacy, achievement, cater to diverse learners, collaboration, and promoting critical thinking to answer the research question. Many cooperative learning method experts' methods were looked into including Teams Games Tournaments (TGT), Think Pair Share, (TPS), Student Team Achievement Division (STAD), Collaborative Strategic Reading (CSR), Numbered Heads Together (NHT), Problem Based Learning (PBL), Jigsaw, Co op Co op, Reading-Concept-Map-Timed-Pair-Share (Remap-TmPs) model, Learning Together, Line@, Activity Based, and Collaborative Argumentation. Cooperative Learning methods were analyzed using Analysis of Variance (ANOVA), Analysis of Covariance (ANOVA), and SPSS 15.0 statistical software to determine, in most studies that cooperative learning methods are more effective in student learning than traditional methods. Commonalities were found in researchers focus to provide the reader with a better understanding of why cooperative learning works so well in grades 6-12 across the world.

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CHAPTER I: INTRODUCTION

Cooperative Vs. Traditional Learning Methods in Grades 6-12

Cooperative Learning involves students working together to accomplish shared learning goals (Johnson & Johnson, 2003).A wide range of theoretical perspectives on learning, including behaviorism, socio-cultural theory, humanist psychology, cognitive psychology, social psychology, and Piagetian developmental psychology, have been used to develop and justify cooperative learning approaches (Jacobs, 2008). Cooperative learning is not a new concept for educators in the United States or around the world. For centuries, humans have used the power of cooperation in a broad range of tasks, including education. ancient civilizations have used cooperation to build pyramids and large corporations to help with war efforts and many assembly -line products: automobiles, radios, televisions, refrigerators, and many more. Thousands of studies across the world have been published to study the effects of cooperation at all ages in the school system. Schools could adapt over the years to make changes due to changing economic and political conditions. In the 21st century, educators across the globe continue to search for best practice cooperative learning methods to ensure they are competitive with other educational systems around the world.

The cooperative learning research discussion accelerated in education when Bloom developed taxonomic levels of learning from basic to higher understanding: Remembering, Understanding, Applying, Analyzing, Evaluating, Creating (Bloom, 1956). Best practice now encouraged teachers to challenge students to think at the creating level of the taxonomy. Many cooperative learning methods were invented and developed to achieve high -level learning. along with others, Vygotsky continued educational research and discovered the importance of scaffolding and language in shaping thought (Vygotsky, 1978). Although Vygotsky died at 38, he built on Piaget's work in the 1920s and helped establish opportunities for children to learn with their teacher and skilled peers. Johnson and Johnson (1990) continued to research cooperative learning. They laid out the five basic components of cooperative learning: positive interdependence, individual and group accountability, interpersonal and small group skills, face-to-face promotive interaction, and group processing. Research became plentiful on cooperative learning post -1990 due to Johnson and Johnson establishing an educational framework to learn cooperatively. Cooperative learning is very broad in an educational sense, so the decision was made to focus on the primary benefits this learning mode has on students compared to traditional methods in the secondary education classroom in this literature review. The benefits researched include: self-efficacy, achievement, cater to diverse learners, collaboration, and promoting critical thinking.

Other benefits such as inclusion, preferred student choice, and flexibility in class time are evident but will not be exclusively discussed in this review.

Theoretical Framework/Research Focus

This literature review focuses on if cooperative learning methods are more effective than traditional teaching methods in a sixth through twelfth grade classroom. It is important to note many studies exist among university -aged peers, as students are readily available to be test subjects and research new understandings with peers in a program. Testing on campus is a convenient way for students obtaining a graduate degree to utilize on campus resources. the educational world often benefits when students in an educational program at a university reach out to a school district and conduct studies with school -aged students. Many cooperative learning studies also exist at the elementary school level. This may be due to the critical ages of students for researchers to test methods. At this stage, students are discovering personalities, communication styles, and developing learning habits. Fortunately, the research question was centered around secondary education students (6-12th grades), encompassing a vast amount of research. At this stage, students continue to develop problem -solving skills and navigate the best ways to approach college preparatory work. School systems were founded with traditional learning, and proper implementation of cooperative learning techniques is still a relatively new topic. Quality teachers are constantly looking for better ways to serve their students and increase learning opportunities. Cooperative learning is a best practice tool and contains many effective methods in the classroom. Traditional teaching methods have historically been effective in learning as well, but research continues to show cooperative learning methods to outperform traditional methods. Again, these five beneficial markers for student success in cooperative learning models include: increasing self-efficacy, developing critical thinking skills, student achievement, promoting collaborative learning, and catering to diverse learners. These benefits were chosen in the review because of the need they fill to learners in the classroom when compared to traditional methods. Lecture-based (traditional) instruction is often unsuccessful for many reasons, including poor student attention, simple examples, and overload of the presented material. Cooperative learning is one variety of active learning, which structures students into groups with defined roles for each student and a task for the group to achieve (Keyser, 2000).

Rationale

How can secondary education students learn best? A fair question many middle/high school teachers ponder when planning for the next school year. This problem was addressed in the review of published literature. Traditional techniques are still common in many classrooms today. They come in many forms and include large class questioning, presentation slides, videos, individual labs, and teacher lectures. Students have historically grasped the material and went on to obtain, in many cases, successful careers. Are we missing some learners? Ben Stein's character, Mr. Lorensax, in the 1986 movie Ferris Bueller's Day Off, sums up traditional learning well with this quote, "Anyone, Anyone" (Hughes, 1986). The context is an economics classroom; Mr. Lorensax shuffles through film projector slides and attempts to generate classroom discussion. The camera pans to the horrifyingly bored expressions of most students in the classroom. Most people can think of a similar classroom experience. The teachers we remember fondly were the ones who provided a content -rich environment filled with exciting educational opportunities. Could we be missing a different way to learn? Perhaps, we could devise a way for struggling students to get the help they need while challenging top achieving students to a higher learning level by working cooperatively. This literature review shows how we can fill holes in education to increase self-efficacy, achievement, collaboration, cater to diverse learners and provide a high level of critical thinking while students find learning exciting and worthwhile. Most importantly, the research question will be explored. Are cooperative learning methods more effective for student learning than traditional classroom techniques?

Definition of Terms

As mentioned previously, Cooperative Learning involves students working together to accomplish shared learning goals (Johnson & Johnson, 2003). Cooperative learning has many strategies and accompanied technologies discussed in this literature review, including Teams Games Tournaments (TGT), Problem Based learning (PBL), Numbered Heads Together (NHT), Student Teams Achievement Division (STAD), Collaborative Strategic Reading (CSR), Jigsaw, Co Op-Co Op, Collective Score, Learning Together, Think Pair Share (TPS), Line@, Reading-Concept-Map-Timed-Pair-Share (Remap-TmPs) model, Activity Based, and Collaborative

Argumentation. Strategies listed here will be defined below to increase the reader's understanding of the literature review. The term self-efficacy still may be unclear. Self-efficacy is defined as an individual's confidence in themselves to complete a certain task or assignment successfully (Fauzen, 2013).

Teams Games Tournaments (TGT) developed by Johnson and Johnson (1990) involves students working in four or five -member heterogeneous groups on assignments. Students play games with members of other teams to add points to their team scores. Student Teams Achievement Division (STAD) is a cooperative learning method developed by Slavin (2010), consisting of a regular cycle of instruction, including teaching, team study, test, and team recognition. In Jigsaw (Aronson et al., 1978), students are assigned to six-member teams to work on academic material that has broken into sections. Members of different teams who have studied the same section in different groups meet to discuss their sections. Team members will then return to the original group and teach their section to group members. Lyman's (1982) Think Pair Share (TPS), explained by Henny and Uyun (2017), involves a teacher asking an open ended question. Students then think quietly about it for a minute or two. Then each student pairs up with a partner, and they discuss the question for two to five minutes. At last, the whole class participates in a discussion where students raise their hands and share all thoughts and ideas they have gathered. Learning Together method is a technique developed by Johnson and Johnson (2002). The most important aspects of this technique are the existence of the group goal, sharing the opinion and materials, division of labor, and the group reward. In Collective Score (Orlick, 1978), students work in small groups, and scores from the activity are added up for a total group score. Sharing ideas and goals is the idea for students to achieve more. Numbered Heads Together (NHT), developed by Slavin (1994), is a cooperative learning strategy that holds each student accountable for learning the material. Students are put into groups, and each person is given a number (from one to the maximum number of groupmates). The teacher poses a question and students "put their heads together" to figure out the answer. Since a random number is called every time, each student must be prepared to answer the question.

While it is unclear who developed Problem Based Learning (PBL), an active learning strategy, PBL is also categorized as cooperative learning when the problem students are tasked to answer, include structured groups. Klingner and Vaughn (1998) developed Collaborative Strategic Reading (CSR) in order to teach students comprehensive strategies while working cooperatively. Student strategies include previewing the text; giving ongoing feedback by deciding "click" (I get it) or "clunk" (I don't get it) at the end of each paragraph. This strategy helps students "get the gist" of what they are reading (Klingner & Vaughn, 1998). Co Op-Co Op was created for the college classrooms (Kagan, 1985). Students take either their own time or class time to research, discuss, and learn the material. They then create a presentation for classmates to teach the assigned aspect of their topic to classmates. All students are then to be held accountable for presented material from their peers. Reading Concept Map Timed-Think Pair Share (Remap-TmPs) is a variation of Lyman's (1982) Think Pair Share activity, where groups individually read a concept and later map out and share ideas with peers. Collaborative Argumentation developed by Andriessen (2006) helps students in learning how to argue and how to argue to learn. The strategy focuses on the learning taking place when students use processes of argumentation and elaborate on processes in class. Line@ created by Byeongmok (2011), is a multi-purpose social messaging app that allows users to message, share stickers, play games, make payments, request for taxis, and shop online. The Line@ technology was used by Physics students in this review to learn complex concepts with a cooperative format.

CHAPTER II: LITERATURE REVIEW

Literature Search Procedures

Chapter II examines the published literature on cooperative learning while focusing on the secondary level (grades 6-12). Cooperative learning appears in many forms and looks different from traditional learning in ways discussed in this review. The studies in this chapter will help determine, Does cooperative learning contribute to greater student achievement when compared to traditional teaching techniques? The literature reviewed in this thesis was found through searches using ERIC, Academic Search Premier, EBSCO, and Google Scholar with dates of publication from 2000-2020. The searches were refined using the following keywords: "cooperative learning secondary education," "self-efficacy," "diverse learners," "student achievement," "critical thinking," "cooperative learning," "collaborative learning," and "mixed learning secondary classrooms."

Benefits of Cooperative Learning

Cooperative learning creates more positive learning opportunities when compared to traditional classroom learning. The following five evidence-based benefits of cooperative learning that are observable in many subject areas will be discussed below: increasing self-efficacy, developing critical thinking skills, student achievement, promoting collaborative learning, and catering to diverse learners.

Increasing Self-Efficacy

Again, Fauzen (2013) refers to self-efficacy as an individual's confidence in themselves to complete a certain task or assignment successfully. Think-Pair-Share, a cooperative learning structure, is used in the following study as a tool that can increase one's level of self-efficacy.

Nugraha et al. (2018) conducted a quasi-experimental design experiment with 25 class VIII (equivalent to United States Grade eight, ages 13-14) SMP Negeri Ajangale students from Indonesia. Participants were selected using a simple random sampling technique. The method for collecting data was implementing a pretest before implementation and a posttest after an intervention. The independent variable in the study was the Think-Pair-Share (TPS) method, while the dependent variable was self-efficacy. Data was then analyzed by a One Way Anova test to determine reliability (Nugraha et al., 2018). The procedure for research consisted of the three stages: 1.) Distribution and filling the scale of self-efficacy to identify the level of self-efficacy before conducting the Think Pair Share method. 2.) Provision of cooperative learning Think-Pair-Share Model to students 3.) Distribution and replenishment of the self-efficacy scale back to students.

Pre- and post-test data show different scores and changes in self-efficacy scores for the students. Students' pre-test data showed a mean of 4,808 for the 25 students completing the pretests. Post-tests of the same 25 students showed a mean score of 6,076. Students' self-efficacy at SMP Negeri 1 Ajangale's school was positively influenced by the cooperative learning model Think-Pair-Share in math subjects. The data was found to be significant in favor of the Think-Pair-Share method, being effective for student's confidence in their abilities.

Fernandez-Rio et al. (2017) conducted a study describing academic self-efficacy as an interaction to help prevent school failure. The study consisted of 2,513 secondary education students (1,308 males and 1,205 females), 12-17 years old, enrolled in 17 different schools belonging to the National Network of Schools on Cooperative Learning in Spain. The main objective of this network was to use cooperative learning methodology daily as one of its pillars. Four hundred and eleven students were considered at risk of academic failure (they had low grades in at least three school subjects), and 71 were immigrants. All had received cooperative learning for a minimum of one school year. Based on the accessibility of their teachers, schools selected different subjects to implement this pedagogical approach. They had to use at least some cooperative learning techniques for a week in their classes; for example, Think-Pair-Share (Kagan, 1992), Collective Score (Orlick 1978), Student-Teams-Achievement-Division (Slavin, 1990), Learning Together (Johnson & Johnson 1987), Co-op (Kagan, 1992) or Jigsaw (Aronson 2010).

This study by Fernandez-Rio et al. (2017) utilized numerous instruments to complete this study. The Cooperative Learning Questionnaire was used as an instrument of measure in the study. It consists of five subscales (four items each): interpersonal and small group skills, group processing, positive interdependence, promotive interaction, and individual accountability (Fernandez-Rio et al., 2017). The Strategies to Control the Study Questionnaire developed by Hernandez and Garcia (1995) was used as an instrument to measure participants' self-regulated learning. This tool uses three subscales: prior to the study period or learning, during the study period or learning task, and after the study period or learning task. The Global Academic Self-Efficacy Questionnaire invented by Torre (2006) was used to measure the self-efficacy of students in the study. The participants were broken down into four clusters based on the two clustering variables, cooperative learning and self-regulation.

Statistically significant differences ($p<0.001$) were found among all groups (clusters) in academic self-efficacy (Fernandez Rio et al., 2017). The largest group of the clusters, cluster four containing 888 students, showed that an individuals' self-efficacy could significantly impact a groups' feeling of collective efficacy. This study also showed, the higher the students' self-regulation, the higher their academic self-efficacy. Previous studies show that learners high on self-regulation, both high and low achieving, tend to exhibit high feelings of effectiveness in their own capabilities (Duckworth et al., 2009). Additionally, teachers may help their students develop self-regulation skills and have a positive impact on their self-efficacy by showing them they must: orient themselves before starting a task, collect relevant resources, integrate different viewpoints, monitor for comprehension, and assess one's own progress (Boekarts & Cascallar, 2006).

Teachers must possess the tools to help all students persist on the class' tasks, to work to overcome the difficulties they face every day, to invest enough effort to find success, and to try increasingly demanding tasks. If teachers focus on these ideas, students will develop self-efficacy (Fernandez-Rio et al., 2017). Cooperative learning, paired with a perceptive teacher trained in this technique, is an effective way to boost a student's self-efficacy and promote the idea that any task is possible.

Develop Critical Thinking Skills

Here in the 21st -century science educators strive to keep up with the changing standards. In the next study, conducted by Valdez et al. (2015), 99 third -year Muslim students were selected and grouped into experimental and control groups based on their respective section assignments. The experimental group participated in an activity-based learning format of cooperative learning. The control group used only chalk and board discussions without hands-on materials. Thirty- two students participated in the control group, while 32 students participated in the experimental group. A pilot group of 35 students was also used in the study. The study used a combined quantitative-qualitative research design with quasi-experimental methods. The instruments used were modules of different activities for hands-on and evaluation tests, which were administered before and after the treatment; observation; interviews; journal logs; and respondents' assessment of the intervention used in the research (Valdez et al., 2015).

Unsurprisingly, the pre-test results were almost equal for the experimental and control groups. However, in the post-test results, the experimental group performed statistically better than the control group. The results shown in this study support that cooperative learning is significantly better at increasing critical thinking skills than the traditional method of teaching (Valdez et al., 2015). The study also showed a level of understanding for the students in the experimental group increased during post-test compared to the control group. Based on the assessment of Valdez et al.'s (2015) study of the intervention, as perceived by the students in the experimental group, the majority believed the activity-based cooperative learning techniques were above average and exciting. Eighty -three percent said the activities made them think deeper, and it was more interesting and exciting. Sixty percent of them believed that it helped clear out their "misconnected ideas" (Valdez et al., 2015, p.140).

Karkdijk and Schee (2019) sought to gain more insight into secondary school students' geographic thinking processes, more specifically, relational thinking. Relational thinking belongs to the core of geographical thinking and offers students a powerful way of thinking (Jackson, 2007). This mode of thinking is a necessary skill for students to build individual capabilities and a core concept of geography in education. Geographic relational thinking refers to the ability to give interrelated, causal explanations for geographic phenomena, like regional change (Karkdijk & Schee, 2019). Twelve experienced geography teachers from six schools and 205 students, aged 15-18 in higher general secondary education, were part of the project. These teachers and students were selected because they responded positively to a call to participate in the research project. The schools were located in different parts of the Netherlands. Two schools were small rural, one in a small city, and two schools in large, densely populated cities. The study was quantitative in nature and used the SOLO taxonomy developed by Bigs and Collis (1982) to analyze differences in relational thinking between groups. The first research question was, how did geographical relational thinking, in terms of the SOLO taxonomy, differ between groups? The second question, how did geographical relational thinking in groups differ between the two mysteries? The last question was: How can differences between groups in geographic relational thinking be explained by the characteristics and collaborative behavior of the groups? (Kardjiik & Schee, 2019). Groups were sorted into three areas based on geography ability. Group one was the highest 30% of the class; group two, the lowest 30%; and group three consisted of a mixed group, one student from the highest 30%, and two from the lowest 30%.

Each participating school followed this design. Students worked on two different mysteries; 35 groups worked on the Rio mystery, while 34 worked on the Jakarta mystery. Groups were tasked to explain their mystery through a concept map and explain causal relationships. Each group worked in separate rooms with a researcher present and were video recorded. SOLO taxonomy was used to analyze differences in relational thinking and ranges from prestructural reasoning all the way to extended abstract thinking. At the conclusion of the activity, no groups were found at the prestructural level. Each group was able to at least find one relevant and correct relationship to explain the mystery. There were 22 groups able to reach the multistructural level, where they used two or more factors but were unable to explain the cross - links to the mystery. Twenty-four groups reached the relational level. they correctly identified four or more factors to the mystery and were able to explain at least one cross-link to these factors. Data suggests these groups were able to come up with an integrated, coherent explanation of the mystery (Kardjiik & Schee, 2019). Only one group was able to reach the extended abstract, final level of SOLO taxonomy. Student's on -task behavior was found to be significant in solving the mysteries. Lower level relational thinkers were able to come up with relevant connections to help explain the mystery. Educators could include activities, such as these mysteries, to boost higher -level thinking skills among their students.

Sulisworo et al. (2018) conducted a study to determine the influence of social media usage, in this case, LINE@, on cooperative learning environments to measure if critical thinking skills were improved with the LINE@ intervention. Line@ is a social media application that can be used on a computer or a smartphone and can be downloaded from the Google Play store. This study is unique because it blends the use of social media and cooperative learning to measure critical thinking skills. A quasi-experimental study was used, and participants included Year 11 (United States equivalent Grade 11) physics students of Yogyakarta, Indonesia. Sulisworo's (2018) study was conducted in Physics class on the topic of Elasticity. The participants came from low to middle -class families. The experimental group was taught using the STAD (student team achievement division) cooperative learning approach and incorporating LINE@. Therefore, learning was group blended with face to face learning in the classroom and enrichment through Line@. The control group used traditional teaching methods and consisted of 31 students, while the experimental group consisted of 32 students. Only the students who attended all learning activities were considered in the study. earning strategies were the independent variable of the study, while critical thinking was the dependent (measurable) variable. The data in Sulisworo's (2018) study was collected by using five essay questions. The essays were scored based on solving a complex problem related to Elasticity. The questions were awarded more points based on the level of Bloom's Taxonomy.

The results in the study were analyzed using Covariance or ANCOVA to find the significance of the results found (Sulisworo et al., 2018). It was discovered that learning activities with LINE@ enabled higher interaction with the teacher and students. The average CTS (Critical Thinking Score) for the treatment group was 66.91, while the average score for the control group was found to be 59.87. There was a significant difference in students using cooperative learning by using LINE@, showing higher critical thinking skills than their peers using the traditional textbook model of learning.

Fung and Howe's (2014) mixed -method study also examined critical thinking, but more specifically, aimed to find if collaborative group work is more effective than whole -class instruction. This study also wanted to know if critical thinking is fostered better in teacher - supported groups or self-directed workgroups. This study took place in Hong Kong in a Liberal Studies class. One hundred forty students participated in the study; a small majority (53%) of the students were boys. Most of the students fell in the category of medium cognitive abilities. Each participating school broke down into three different groups. Group A consisted of a conventional group class. Group B consisted of an experimental self-directed group work class. Group C was the experimental teacher -supported group. Teachers learned about group formation and scaffolding, while students learned team and trust -building, turn -taking, and evidence-based justification for answers, both prior to the intervention. The cooperative learning intervention took place over five phases, including a critical thinking modeling activity, application of critical thinking model, debate and discussion, and presentation and consolidation/conclusion (Fung & Howe, 2014). In the process, two main sources of data were collected to evaluate critical thinking skills: (1) pre-and post-test scores and (2) written work in the form of outlines and plans for the students' independent research projects (using the Test of Critical Thinking Skills for

Primary and Secondary School Students, a TCTS-PS model). Analysis of Variance (ANOVA) was adopted for the analysis of data in this study. ANOVA revealed significant main effects of TCTS-PS scores from pre-test to post -test, overall. The control group, Group A, showed no significant differences. The teacher -directed collaborative group, Group C showed the highest critical thinking gains from pre-test to post-test. The student -directed group, Group B, scored better than the control group, but not as high as Group C.

Researchers found cooperative group work to be most effective in a teacher-directed design and more effective than whole-class instruction in developing student's critical thinking skills (Fung & Howe, 2014). An additional fact to note from the study was, worksheets collected in the control group resulted in no significant progress in student's critical thinking skills. The study shows critical thinking in teacher-directed cooperative groups to be an effective way to boost students' critical thinking skills.

Zubaidah's (2018) study concentrated on a cooperative learning method aimed at increasing student's critical thinking skills in Biology class. The cooperative method chosen was the Reading-Concept-Map-Timed Pair Share (Remap-TmPs) model. Students who participated in this quasi -experimental study were, on average, 16 years old. Four high schools were included in the study in Batu, Indonesia, for a total of 116 students. In Zubaidah's (2018) study, a critical thinking intervention was needed, as students in the Batu, Indonesia region were below average, especially for those who have the low academic ability. The Pretest-Posttest Nonequivalent Control Group Design was used for all 116 participants in the study. Two experimental classes were taught using the intervention Remap-TmPs. Also, two control classes were taught using conventional learning methods. Researchers in Zubaidah's (2018) study aimed to find if TmPs can enhance students' critical thinking skills, if the difference between high and low academic ability affects the student's critical thinking skills and if Remap-TmPs learning model affects students' level of academic ability.

Researchers discovered a significant difference in critical thinking skills between students who were taught using Remap-TmPs learning and those taught using conventional learning. Also, a significant difference was found in critical thinking skills between students who have high academic ability and those who have low academic ability. Lastly, no significant effect was found between the learning model and academic ability towards students' critical thinking skills (Zubaidah, 2018). Low ability students' critical thinking skills improved by Remap-TmPS. therefore they can be at the same level as the high ability students' critical thinking skills using conventional learning. The students' critical thinking skills taught by using Remap-TmPS learning increased at a rate of 265.92%, while students using conventional learning increased at 119.97% (Zubaidah, 2018). Test results were gathered using a critical thinking skills rubric and ANACOVA test. Remap-TmPS cooperative learning model can offer students better critical thinking results than conventional learning. Lower academic ability students can increase their critical thinking skills using the Remap-TmPS learning method.

Students Achieve More with Cooperative Learning

Higher achievement is often the aim of teachers in today's educational landscape. Ezeobi's (2016) study sought to find if students can achieve more academically with cooperative learning vs. a traditional approach; a t-test was used to determine the reliability of the data. The study took place in Anambra State, Nigeria, in a high school Biology class. Ezeobi describes how students learn best as active rather than passive learners. Therefore, there is a need for lessons to be taught in a variety of ways, including play -acting, visual aids, hands -on activities, technology, and cooperative groups (Ezeobi, 2016). The primary research question was designed to determine whether there is a statistically significant difference in Biology achievement between students taught Biology using TGT (Teams Games Tournaments) cooperative method versus students taught Biology using traditional lecture methods. Collecting data on perceptions of students exposed to TGT learning was also a study goal.

The study used a quasi-experimental research design consisting of treatment and control groups. Two intact classes were used, one for each group, a total of 71 senior secondary students out of 377 possible students. The study included 35 participants for the experimental group and 36 for the control group. The Treatment group was exposed to TGT, while the control group used traditional lectures. The Biology Achievement Test (BAT), and a questionnaire to measure student's perceptions of cooperative learning, were used as instruments of measure in the study.

The results showed pretests to have a mean of 10.75 in the experimental group and a 10.85 in the control group. The differences were not statistically significant; consequently, it was possible to assess the difference between groups on the post -test. Post -test scores showed a mean of 56.24 in the experimental group and 45.15 in the control group, with a t-test showing a statistically significant difference in the mean of Biology achievement of students across the experimental group and control group. It can be concluded that students taught through TGT cooperative learning achieve higher than students using traditional instruction (Ezeobi, 2016).

A possibility for this finding, according to Ezeobi (2016), is when students explain and receive explanations from each other in the group and from their peers, they retain the new concepts much longer in their memory than with traditional learning. Teams, Games, Tournaments (TGT) is a fun way for students to achieve high and find a passion for Biology cooperatively while playing a game with peers.

Salako (2013) also studied the effects of cooperative learning on achievement. This study focused on the middle school level student population. One hundred and twenty -six participants were involved. The study was carried out among junior high secondary school students of Gateway Secondary School and Olumo High School, both in south-west Nigeria. The guiding question focused on the effect of treatment (cooperative learning) on students' achievement. The treatment used was the cooperative learning method, the Jigsaw technique. Using the Jigsaw technique, the students were trained to become active learners because new perspectives are shared constantly within groups as a collective whole.

Salako's (2013) study showed a significant effect on the treatment group (those using cooperative learning) on students' achievement. The treatment group averaged a 24.96 mean score on the ATSS (Social Studies) achievement test, while the control group averaged a 17.65. These findings show the benefits of cooperative learning on student achievement.

Gillies (2008) studied the effects of cooperative learning on junior high students during a science-based learning activity in Brisbane, Australia, using a mixed -methods design. The importance of this study lies in the benefits of structuring cooperative learning. It is only when groups are structured, so students understand how they are expected to cooperate that the potential for cooperative learning is maximized (Johnson & Johnson, 1990). Gillies's (2008) study examined structured vs. unstructured groups and their effect on achievement. Gillies chose 164 grade students and placed 77 students into structured cooperative learning groups, while the other 87 students were placed in unstructured learning groups. Six high schools were chosen to participate in the study with no significant differences between the schools involved. The students were videotaped as they worked in groups of three to four, mixed-gender, and ability students. One measure used to evaluate the effectiveness of structured groups was behavioral observations. Information was gathered on students' behavior during small group sessions to focus on task -oriented group behavior, socially engaged in the group task, listening to others, noncooperative behavior, individual task behavior, and individual non -task behavior. For verbal interactions, nine variables were studied. Cognitive language strategies were measured and focused on six components. Lastly, a science probe questionnaire was used consisting of six levels of questions based on Bloom (1956) taxonomy and written to determine how the students construct knowledge between what they had been learning in their science lessons in class and the classification activity they had discussed in their small groups when videotaped. Students were assigned a score of one through six, depending on the highest level of response they were able to generate that was correct. For example, if a student was able to answer a question that required them to apply the information correctly, but they were unable to answer questions at a higher or more difficult level, then a score of 3 (indicating the third level of response) was assigned (Gillies, 2008, p.337).

The Behavior analysis using MANOVA was significant, showing that the children in the structured cooperative learning environment displayed more cooperative behaviors and less non - cooperative individual task-oriented (working by self) and individual non-task behaviors than their peers in the non-structured environment. The Verbal analysis again used MANOVA, and again structured groups resulted significantly better than the unstructured groups. The MANOVA for Cognitive language strategies was significant as well, indicating that students in structured cooperative learning groups perform at higher cognitive levels and have higher achievement levels than those in the unstructured groups. The Science probe questionnaire was analyzed using ANOVA. The results were significant for the structured groups achieving higher outcomes than the unstructured groups. However, the interpretation of all these results is limited by the sample sizes of the significant variables (Gilles, 2008). Evaluative talk in groups, as shown in this study, contributes to more product-related talk, which is a significant predictor of learning and achievement of group members (Abram et al., 2002). Additionally, when students engage in critical and constructive talk with each other, it serves as an effective tool in enhancing their problem-solving skills, both collectively and individually (Rojas-Drummond et al., 2003). The results of the science probe showed students in the structured groups demonstrated more complex and higher -order thinking in responding to specific problem-solving questions than peers in unstructured groups (Gillies, 2008). In order for students to achieve at the highest level possible using cooperative learning, the study suggests teachers should be trained in establishing cooperative learning activities in their curricula, and students should have access to participate in these activities on a regular basis.

Ari and Sadi's (2019) study in Turkey also researched a cooperative learning strategy, Student Achievement Design Teams (STAD), and the implementation of the strategy's effect on student achievement in a high school genetics unit. The study utilized a quasi-experimental design approach, where experimental and control groups are randomly assigned to both groups. The sample group consisted of 126 tenth grade students in four different classes within an Anatolian High School in an urban area in Turkey. Samples included 73 girls and 53 boys, ages ranging from 15-17. Two classes were randomly selected as the experimental group, as well as two classes for the control group. The control group used traditional teaching methods, while the experimental group used the STAD cooperative teacher -centered learning model (Ari & Sadi, 2019). To determine the effects of two different teaching models, the General Principles of Genetics Achievement Test (GPGAT) was used to assess students' achievement in Biology. The study lasted ten weeks and, in accordance with the STAD cooperative learning model, students were required to engage in group works, discussion, study leaves, and quizzes. Lesson plans, according to the STAD technique, were prepared for teachers. STAD's main purpose is to promote all students' achievement and consists of the five stages; whole -class presentation, group work, quizzes, individual development scores, and group identification. The achievement test and scales were analyzed by using SPSS 15.0 statistical software. Researchers found the STAD technique of cooperative learning affected 10th -grade students' achievement in a positive way, compared to traditional methods. Average pretest/posttest values of the GPGAT in the experimental group rose from 15.45 to 21.23, while in the control group, the pretest average was 14.48 and the post-test average was 19.07 (Ari & Sadi, 2019). While increases were large in both groups, the experimental group experienced a larger increase in achievement. Students in the experimental group actively participated in the learning process by communicating with each other and sharing information and ideas while taking responsibility for their learning. Students in these STAD groups achieved learning in an exploratory and effective learning environment (Ari & Sadi, 2019). It is worth considering that cooperative learning methods, such as STAD, can lead to a student's growth in Genetics subject matter. The study also found students preferred the learning process of STAD, compared to traditional teaching. Furthermore, students with low motivation for learning increased motivation with the STAD technique. Students took ownership of their learning using STAD and, therefore, increased achievement as well.

Cooperative learning is not limited to core subject areas, and achievement is proven to increase in elective classes, as well. Cooperative learning was shown to boost achievement in Obabiyi and Adeneye's (2019) study in a senior secondary woodworking class in Lagos, Nigeria. The study consisted of 250 students (126 males and 124 females), in year two of a woodworking class, in the Lagos, Nigerian region. The researchers arbitrarily chose three schools to use the cooperative learning technique with 120 students (59 males and 61 females). The remaining 130 students (67 males and 63 females) used the conventional teaching method. The Average ages of students in the study were 15.55 years. The research design was quasi -experimental, and researchers sought to find if the effect of treatment (cooperative learning strategy vs. conventional teaching method) influenced students' achievement. Researchers were also curious if gender had an affect on students' achievement (Olabiyi & Adeneye, 2019). The collected data in the study was inputted into the SPSS version 17 software system for analysis. ANCOVA was used to test if data were significant. Two sets of lessons were created by researchers, each set containing eight lesson plans that were taught in eight weeks (80 minute periods). The first set was written by researchers, embedded with cooperative learning strategies, while the second set followed conventional teaching design. Each group took a pre-test before the lessons and a post-test to follow.

Researchers found students had greater gains in the experimental learning groups. Students in the experimental (cooperative) learning groups had a woodworking pretest mean score of 32.51 and posttest mean score of 48.33. The control group had a pretest mean score of 32.33 and posttest mean score of 34.96. ANCOVA found a significant difference in the experimental groups (cooperative learning) vs. the conventional groups. In reference to the gender research question, female students performed slightly better than male students, but there was no significant difference in relation to males and females using cooperative learning vs. conventional learning in this study. Students found the cooperative learning strategies created more interesting lessons and were easier to form friendships. Researchers recommended that cooperative learning strategies be used as a close substitute to conventional learning to increase student achievement in woodworking classes in Nigeria.

Cooperative Learning promotes Collaboration

As demonstrated by Gillies (2008), in the previous section in the science classroom, cooperative learning is best performed in a structured and guided cooperative setting. Hsu et al. (2015) investigated the effect of teacher guidance on the quality of collaborative argumentation in middle -level classrooms. It is critical for middle -level students to build high -quality argumentation skills in all academic areas to be successful in school and participate as productive citizens. Early adolescence is where these skills develop (Belland et al., 2011; Felton & Kuhn, 2001; Kuhn, 2010). Researchers have looked at the role of teachers in promoting students' collaborative argumentation skills (Asterhan et al., 2012; Chin & Osborne, 2010; Gillies & Boyle, 2010; Webb, 2009). Studies show that when teachers focus on providing direct instruction (giving the correct or incorrect answers) students show less elaborate responses and raise fewer questions for their peers (Gillies et al., 2012; Van Drie & Dekker, 2013). On the contrary, when the teacher questioned the students' thinking process, the students showed more reasoning with explanations and posed high -level discussion questions to peers.

With the earlier studies mentioned, researchers often focused on individual students instead of focusing on the collaborative argumentation in a larger group at the adolescence level. Hsu et al.'s (2015) study focused on group dynamics under teacher guidance while taking a closer look at collaborative argumentation. Collaborative argumentation is a method for arriving at an agreed-upon position among members of a group (Andriessen, 2006). Hsu et al. (2015) conducted a quasi-experimental study with six classes of seventh -grade students (N=126) in a suburban Chicago school. The science teacher chosen in the study taught all six classes. Approximately half of the students were from middle -class Caucasian families, 25% middle class Asian American families, and the remaining 25% were from middle -class African

American or Hispanic American families. The classes were 56% male and 44% female. Students were chosen at random for controlled or experimental conditions. The classes assigned to control conditions engaged in whole-class verbal collaborative argumentation with a low amount of teacher guidance. The classes assigned to experimental conditions were given a 10-question teacher script, including questions that required consideration, thought, and critical thinking. Jonassen and Kim (2010) stress the importance of successfully developing argumentation skills; they are essential to creating an open-ended learning environment where legitimate alternatives that can be argued exist. Researchers recorded the verbal collaborative argumentation in the classroom with a digital camcorder for the control and experimental groups. The research question searched whether the intervention group differed from the control group on the depth of their collaborative argumentation.

The study found a significant difference between the means in the depth of argumentation in the two groups. The study also showed teacher guidance that included characteristics of argumentative scripts could increase the depth of collaborative arguments in a large group setting. Additionally, the experimental groups displayed more elaborated reasoning than the control group and had a firm grasp on the material, compared to peers in the control group. Experimental groups showed counterarguments, rebuttals, and the ability to provide evidence for their arguments. The teacher guidance in this study was a form of scaffolding as the students were given a script of 10 questions, and support was way more extensive than control conditions. The Hsu et al. (2015) study provides evidence that structured collaboration can achieve a higher level of learning and also be effective in enhancing middle -level students who are in different cognitive development stages. In the ever-changing middle school landscape, a ten-question script using collaborative argumentation can be a great strategy to scaffold learning for students at varying stages of development in the classroom.

Bandiera and Bruno (2006) also researched active and collaborative learning strategies effects on students. The aim of the study was to help alleviate some of the most worrying deficiencies in current scientific teaching. The study consisted of 144 students, ranging from ages 16-19, from ten classes in six upper secondary schools in Rome. A teaching lesson plan on genetically modified organisms (GMOs), including; diagnostic tools, problem -based learning, concept cartoons, and laboratory activities, was implemented. (Bandiera & Bruno, 2006). At the start of the activity, students who had already studied molecular genetics still showed a small familiarity with GMOs. Students initially were asked to cite examples of GMO's, and 120/144 students were unable to do so. 138/144 were unable to specify the nature of the modification to an organism. Overall, students were able only to cite the meaning of the acronym GMO. Also, at the beginning of the study, students mostly did not refer to scientific knowledge or data and made use of poor and inaccurate scientific knowledge.

After students engaged in Bandiera and Bruno's (2006) lesson/demonstration using group debate as the finale, they were able to evaluate five statements about the cultivation of pyralide-resistant modified maize (corn). Students were challenged to independently document and complete the information garnered in the lesson into a group debate. The Likert scale (1-5) was used for recording responses. For example, a Likert Scale grade of 4.0 would be given for a substantial agreement to statement B, "The appearance in the long run of toxin-resistant pyralides represent a problem" (Bandiero & Bruno, 2006, p.2). Three factors were considered when assigning students a score. The first was the absence of a right answer, the second being the recourse to information or data, and lastly, the expression of personal, unsupported opinions.

Students showed greater involvement and evident exercised skill in discussions stimulated by a concept cartoon based on a newspaper article. The post -lesson discussions were so lively; it was impossible to gather reliable data from the recordings. Since debates were so systemically rich, researchers were able to test a positive result on the evaluation of the teaching activity in reference to the broad use of scientific terminology. Pre-study students' knowledge appeared to be based on stereotypes and definitions (they were not used to supporting their opinions regarding scientific issues). Post-study students were able to find new and pertinent information to support their opinions by using newly acquired data. The researcher conducting the activity and other teachers involved in the study considered the cooperative intervention to promote collaboration and be fully effective in scientific understanding, as well as social maturity (Bandiero & Bruno, 2006). The researchers found the students to be so engaged in this cooperative learning intervention that they all nearly neglected other subject matter while completing this activity, at school and at home. In today's educational landscape, scholastic equipment and teacher preparation do not currently allow the widespread practice of teaching activities that require up-to-date scientific expertise and availability of laboratory materials. This problem could be helped by dedicating the activity to topics that do not require a mastery of experimental procedures or by making an agreement with university facilities or research institutions (Bandiero & Bruno, 2006).

Another study was performed in a heterogeneous American History classroom in a small, rural Midwest state performed by Slagle (2009), which further examined the effects of a cooperative learning strategy that promotes student collaboration. The strategy implemented in Stagle's (2009) study was STAD (Student Teams-Achievement Division). The instruments used to collect data in the study included five researcher-designed quizzes and one researcher designed test, and 46 students participated in the study. Students in the second quarter of the school year did not participate in the STAD intervention and scored a mean of 70.6 on their chapter test. Students in quarter three who participated in the STAD intervention scored a mean of 73.22 on their chapter test. The data confirmed that academic achievement, based on chapter test grades, increased while students were working in cooperative groups. When students join academic achievement teams, morale, and excitement grow, and all students benefit. Collaboration is a key component in complex thinking processes for secondary level students (Slagle, 2009).

Belland et al. (2019) aimed to investigate how high school credit recovery students working in small groups with computer-based scaffolds could conduct a scientific inquiry in a problem-based learning unit on water quality. The research questions centered around the use of computer-based scaffolds to conduct scientific inquiry and evaluate information. The setting was a summer credit recovery environmental science high school class in the Intermountain West (USA). Twenty -seven percent of the students involved in the study received free or reduced lunch, while ten of the students failed at least one high school science class the previous year. In this mixed -method study, pre and post -interview questions were conducted to determine science interest, scaffold use, an inquiry approach. Data reduction, data display, and conclusion drawing and verification were used as qualitative measures. Exploratory data analysis, including the creation of descriptive statistics, was used as a quantitative measure. For the activity, students gathered scientific data from a stream using Connection Log software and collaborating with peers. On the last day of the study, students created essays to measure their understanding of the process. Post-interviews were conducted on the last day (Belland et al., 2019).

The groups that succeeded the best -used Connection Log tools to promote collaboration and helped to integrate socially isolated students into their group's work. The Connection Log helped students think about water quality in a different way, as they discussed findings with their peers. They were able to transition their thinking from believing there was no problem at all with the water to realize the water was deteriorating as it proceeded through the valley. This type of thinking not only involved thinking of the water but also considering other variables of change downstream. According to a meta-analysis of this study, problem-based learning was significant in comparison to lecture-based learning in student achievement (Belland et al., 2019). In this study, high school students found success using argumentation scaffolding as they participated in a Problem Based Learning environmental science credit recovery course. Students displayed the ability to link evidence to a claim because of the intervention, where the majority were unable to before. Students also showed a higher ability to independently think about science topics post - intervention. The study shows promise as students use scientific software like Connection Log in order to increase collaboration and achieve more.

Cooperative Learning Works for Diverse Learners

Often students slip through the cracks in the classroom today. This could be due to run - ins with the law, disabilities, ethnicity, or learning gaps. Educators try to develop or adapt the curriculum to fit the needs of these learners. Cooperative learning is often the place to turn to accommodate these learners. Hanghoj et al. (2018) study examined if cooperative video games could encourage social and motivational inclusion for at-risk students. The guiding questions for the study were based on student's inclusion and wellbeing improving, students displaying larger positive changes than their peers, and students' engagement and performance in Danish and Mathematics. The study spanned eight classes from four different schools. Students ranged from ages 9-12 and 190 students total participated in the study. The selection of at-risk students was identified through a mix of teacher interviews conducted by researchers prior to the intervention and observations of the eight classrooms before interventions. Observations focused on students who showed limited social and disciplinary participation in the classroom. The cooperative video game Torchlight II and analogue gamification fostered a significant rise in social participation reported over time for at-risk students. However, participation increased for Danish class but not mathematics. The games showed positive effects on at-risk students' well-being and reduced experiences of external regulation to participate in Mathematics and Danish. The games gave the students a different paradigm in the educational world. Further research is needed on the effectiveness of games on learning. It is universally known that most students like games; however, the educational world does not always offer many games the students will play and enjoy as an educational tool.

O'Brien and Wood (2011) used video modeling of cooperative discussion group behaviors with students who have learning disabilities in a secondary content-area classroom. They set out to find the effect of video modeling training on the use of cooperative discussion behaviors by students with learning disabilities in a high school social studies discussion group. Additionally, the researchers wanted to know if video modeling training on the use of higher-level group discussion promotes content understanding by students with learning disabilities in a high school social studies discussion group. Lastly, the perceptions of effectiveness and efficiency of a video modeling training procedure in a high school social studies classroom by the participating students and teachers were examined through a quasi-experimental study. Nine students (ages 17-18) who were enrolled in a Grade 12 Social Studies class focused on topics of American government and history were used in the study.

All participating students increased his or her level of discussion when video modeling was introduced; however, the performance was variable during the maintenance and startup phase. Each student felt video modeling made discussions and speaking their mind. While the sample size was small, O'Brien and Wood's (2011) study shows yet another example we can offer our special education students. The video promoted a higher level of content-oriented group discussion when using a peer-mediated instructional strategy. A video is a contained, visual learning tool that can be watched as many times as a student needs to get the required information. Also, it can be watched in a lower noise environment or even at home to get ready for the next school day. Video modeling offers students, who normally struggle working with peers in groups, a chance to jump into the group and thrive academically (O'Brien & Wood, 2011).

School can be an uncomfortable place, at times, for students. Alcalá et al.'s (2018) study focused on assessing the effects of an intervention program based on cooperative learning and including an entire school community. The study was qualitative in nature and examined the emotional and social evolution of a student who had endured cyberbullying. The study was unique and focused on only one participant, Sonia (pseudonym), a 13 -year-old girl who suffered cyberbullying in a ninth -grade course. Sonia had a class of 28 students (17 girls and 11 boys). Ten students (five boys and five girls) agreed to participate in a discussion group. The students were not the ones who had cyberbullied Sonia. These students were chosen based on voluntariness and participation in the intervention program. The school where the project took place was in a medium-sized state capitol of Spain. The qualitative study used sets of questions for each participant group to obtain results and answer the research question. The Physical

Education teacher made it clear that, although it was not easy to start the program, the students' involvement and their socialization in the program was high.

At the beginning of the program, Sonia did not want to go to school and lost most academic motivation. As students became comfortable with the question sets and grew more comfortable working together through the cooperative learning process, Sonia told researchers how all the teachers had a greater influence on the patterns of respect and tolerance in her classes. Sonia also discussed the benefit of learning more about the telephone and social network components of her classes. This again reminds educators of the importance of emphasizing respect for others and disciplinary consequences for being disrespectful in cooperative learning groups. The researchers also excitedly shared about the recovery of spontaneity and loss of Sonia's fear of speaking in public because of the cooperative learning intervention. Seeing how the other students were involved with the study and rallied to help, Sonia encouraged other teachers in the school and the PE department to teach cooperative learning practices to their students. The study helped ease parental frustration and helplessness at home by knowing their daughter was building healthy and strong relationships with peers at school. While there is no quantitative data to support any claims, the intervention was anecdotally found to boost self-esteem and provide a positive way for Sonia to integrate into the curriculum once again. The cooperative group work provided a platform for mutual respect and understanding amongst students (Alcalá et al., 2018).

These federal laws: Individuals with Disabilities Education Improvement Act [IDEA], 2004; No Child Left Behind [NCLB], 2002 mandate teachers to accommodate students with diverse academic and behavioral needs to be included in the general education settings. Numbered Heads Together (NHT) is an effective Tier 1 cooperative learning intervention that can be used to improve special education students' performance in the classroom. NHT is one of over 100 cooperative learning structures developed by Kagan and research associates (Kagan & Kagan, 2009). Kagan's model is based on four basic components; (1) positive interdependence, (2) individual accountability, (3) equal participation, and (4) simultaneous interaction. With the traditional hand -raising model used in many classes around the world, the achievement gap widens. NHT was designed to engage all students simultaneously in response to questions posed by the teacher. Additionally, for NHT to be effective; (1) small heterogeneous groups are used, (2) structured roles within teams are established, (3) interdependent group dynamics, and (4) recognition for collective student effort. Teams are formed systemically and heterogeneous with gender, ethnicity, and achievement (usually with a high, middle, and low performer in each group) (Kagan & Kagan, 2009). For example, a teacher may ask a question, and each member will write their response down and flip -down their boards. Then, students put their heads together to come up with a group response. Groups are randomly selected by the teacher for a response. With this model, students should be challenged to solve problems, compare and contrast phenomena, provide applications, analyze/summarize knowledge, and move well beyond factual knowledge.

Maheady et al. (2002) studied a sixth-grade science teacher who used NHT compared to hand raising and response cards. Twenty-one sixth grade students were involved in the study. Students ranged from 11 to 13 years old. The students involved were primarily Hispanic (71%), and the others were Caucasian (19%) and African American (10%). Four individuals were identified as special needs learners, and four others were receiving remedial reading instruction. Two students were English Language Learners (ELL). The research question for the study was, "What effect will each instructional strategy have upon pupils' academic performance" (Manheady et al., 2002, p.7)?

This mixed -method study found pupil quiz scores were always higher using Response Cards or NHT instructional environments. In fact, student mean scores averaged 81.6% for NHT, and a range from 68 to 87, in the first phase. Students' scores averaged 81.5% for RC, and a range from 54 to 94 again, in the first phase. For the second phase of instruction, both NHT and RC scores averaged 86%. Only four students were found to have higher averages using traditional methods. Additionally, almost half of the class (48%) received A's, and failure rates were cut in half (Manheady et al., 2002). Hayden et al. (2010) and Hunter and Haydon (2013) also used NHT in self-contained special education classes and showed higher on-task rates and language arts quiz scores with and without behavioral incentives. Hunter and Haydon (2013) went on to study the effects of NHT with behavioral incentives with Emotional Behavioral Disorder (EBD) students. He found this multitiered intervention to show a 94% on task rate amongst students and math quiz scores average of 80%. This was significantly higher than the initial scores of 76% on task and 26% accuracy on the math test. NHT intervention is an effective change for the special education population and works well mixed in a general education classroom.

Students with disabilities are an important diverse learning group to accommodate in education. Boardman et al. (2014) conducted a study that examines how fidelity of implementing Collaborative Reading Strategies (CSR) is associated with reading outcomes for students with mild to moderate disabilities. The aim of the research is to answer if higher CSR instructional quality is associated with increased student outcomes for adolescents in treatment classrooms and for a subgroup of students with disabilities. The research additionally set out to answer if a definition of fidelity that includes both the amount of CSR instruction delivered by teachers and the quality of implementation (Boardman et al., 2014). The research took place in two separate studies and settings. Study one took place in nine low -income middle schools in the metropolitan areas of Denver, Colorado and Austin, TX. This first study included 20 middle school teachers and 41 sections of language arts or reading classes. Most students in this study were Latino (73%), and 10% received special education services. The second study was conducted in three middle schools located in the same large, urban district of Colorado. Just over half (51%) of the students were Latino, and 12% received special education services.

Both Boardman et al.'s studies (2014) used the same process where teachers first introduced each CSR strategy to the whole class using explicit instruction, modeling, think alouds, and guided practice. Once students had the strategies down, they worked in cooperative groups and read content area text with peers. For study one, CSR was used once a week for 50 minutes, and in the study, two CSR was used in two separate classes twice a week for 50 mins each session. Quantitative analysis was used to measure minutes of CSR time and student progress. A Significant positive interaction effect was found between the quality of student work and posttest scores for students with disabilities, compared to initial scores (Boardman et al., 2014). Both studies found higher quality CSR instruction is linked with higher student outcomes for students in special education. Further research is needed to determine the possible explanations for these results. It can be concluded that working with peers in a structured reading format can greatly help students with disabilities read content at a higher level.

Surr et al. (2018) examined a sample of 892 students, 138 students, and 30 classrooms to determine if high -quality cooperative techniques were associated with positive classroom experiences and mind-set dispositional outcomes among schools with diverse learners. Public comprehensive, charter, and magnet schools were sampled in the Southeast, Midwest, and New England regions of the United States. Surr et al. (2018) researched Black vs. White students and the preferences and outcomes of using high -quality collaborative techniques. Mixed methods, including quantitative and qualitative data collections, were implemented in the study. Teacher interviews and student focus groups were chosen for qualitative data collection. For quantitative measures, student and teacher surveys, student grades, demographics, and attendance data were employed. For classroom observations, descriptives (e.g., averages/ranges) and ANCOVA (Analysis of CoVariance) were used to analyze data (Surr et al., 2018).

The first research question Surr et al. (2018) sought to answer was if Black students' reports of collaborative and classroom experiences differed from other students' reports in key areas? The next question was if high -quality collaboration was positively associated with grades for Black students, regardless of academic performance? Lastly, if the ways in which high-quality collaboration, classroom experiences, and outcomes were linked differed between Black and White Students? Addressing question number one, the researchers found high -quality collaboration was associated strongly and positively with Black students' classroom experiences, mindset, and dispositional outcomes. Data backed the claim, Black students' classroom experiences differed from other students' reports in key areas, particularly in collaboration and perception. Black students participating in all-Black focus groups were more likely to report events of exclusion and lower support from teachers. They were less likely to feel that collaborative activities were important to their lives. Excerpts from Black student focus groups helped show the ways these students felt that race affected their group selection and level of comfort in the classroom (Surr et al., 2018). Looking at research question two, partial support was found to support the claim High-quality collaboration was positively associated with grades for Black students, regardless of their prior academic performance. Strong, positive relationships were found between Black students' ratings of high-quality collaboration and their classroom experiences, as well as mindset. However, the strength of these relationships was similar to what was found for all students. Researchers suggest that opportunities for high-quality collaboration could be among the classroom choices that help develop positive changes in the academic path of Black students (Surr et al., 2018). Research findings partially support question number three, the ways in which high-quality collaboration, classroom experiences, and outcomes differ between Black and White students. Relationships, overall, were not a stronger factor for Black students vs. White students. However, several ways in which the experiences, outcomes, and relationships, among other factors, differed between Black and White students were discovered. High -quality collaboration was clearer for White students in the study, and further research is needed to discover clearer links for Black students. Findings suggest that, for Black students, having a chance to participate in high-quality collaborative activities may "help boost academic success" (Surr et al., 2018, p.67). Teachers and schools interested in addressing equity issues should consider expanding opportunities for high-quality collaboration as a possible strategy for maximizing success for students of diverse backgrounds.

CHAPTER III: DISCUSSION AND CONCLUSION

Summary of Literature

Does cooperative learning contribute to greater student achievement in comparison to traditional teaching techniques? The answer became clear when researching these five beneficial markers for student success in measuring effectiveness of cooperative learning, including self-efficacy, critical thinking skills, student achievement, collaboration, and ability to reach diverse learners. This section will address the research question stated above and subcomponents uncovered in research to show cooperative learning's benefit over traditional classroom practices.

These researchers found collaborative learning opportunities to increase self-efficacy in the classroom; (Boekarts & Cascallar, 2006; Fernandez-Rio et al., 2017; Nugraha, 2018). Two researchers, (Nugraha et al., 2018; Fernandez-Rio et al., 2017) studied how Think Pair Share (TPS) cooperative learning strategy could increase student's self-efficacy. Student pretest scores were significantly lower than posttest (after TPS intervention)), in both studies. Fernandez- Rio et al. (2017) conducted other similar studies aimed at students finding confidence through many other cooperative learning approaches. The team implemented TPS, Jigsaw, Learning Together, Collective Score, STAD, and Co-op as cooperative learning approaches to increase self-efficacy. The study had a much larger sample size than Boekarts and Cascallar, (2006); Nugraha (2018) and comprised of 2,513 students in Spain. The type of strategy did not matter in the study as statistically significant self-efficacy values ($p<.01$) were found among all groups, using all strategies listed in the study. Boekarts and Cascallar (2006) added the importance of student's orienting themselves before starting a task and assessing one's progress in their research. These studies are pertinent to other researchers in education because of the large sample size and flexibility of cooperative strategy to bolster student's confidence in their abilities.

The following researchers studied cooperative learning by measuring the growth of student's critical thinking skills (Fung & Howe, 2014; Karkdijk & Schee, 2019; Sulisworo, 2018; Valdez et al., 2015; Zubaidah, 2018). Fung and Howe's (2014) study focused on the benefits of a teacher structuring cooperative learning activities. The learning group with teacher facilitation performed the best in their study. Karkdijk and Schee (2019); Valdez et al. (2015) and Zubaidah (2018) focused on the thinking process and all found critical thinking skills to have increased significantly with cooperative learning activities when compared to traditional classroom teaching.

The next six research studies were focused primarily on student achievement with a cooperative learning intervention in place (Ari & Sadi, 2019; Ezeobi, 2016; Gillies, 2008; Obabiyi & Adeneye, 2019; Rojas-Drummond et al., 2003; Salako, 2013). Ari and Sadi (2019), as well as Ezeobi (2016), used student team formats to gauge student achievement. Ari and Sadi (2019) also implemented Student Achievement Design Teams (STAD), while Ezeobi (2016) employed Teams Games Tournaments (TGT). Both researchers found significant results when comparing cooperative learning vs. traditional teaching methods. Gillies (2008) applied structured vs. unstructured groups to measure student achievement and discovered the structured groups significantly higher achieving. Obabiyi and Adeneye (2019) studied a woodworking class and provided a framework for students to communicate more often than traditional classroom methods. Learning was measured to be significant as well in experimental (cooperative learning classes) compared to traditional groups. Rojas-Drummond et al. (2003) contributed information about students achieving more when engaged in critical and constructive talk with each other.

Collaboration is embedded in all cooperative learning studies, but these researchers focused on the benefits of collaboration in the process (Alcalá et al., 2018; Andriessen, 2006; Bandiero & Bruno, 2006; Belland et al., 2019; Hsu et al., 2015; Slagle, 2009). Alcalá et al. (2018), Bandiero and Bruno (2006), Belland et al. (2019) found greater collaboration in instances where participation is often low. Alcalá et al.'s (2018) study focused on peer involvement following a cyberbullying incident, with a cooperative learning framework in place. The student involved and other students performed well with intervention. Bandiero and Bruno (2006) discovered an abundance of collaboration in their science class on a Genetically Modified Organisms (GMO) project. Belland et al. (2019) were also able to garner student's interest and collaboration in science with a credit recovery course. Hsu et al. (2015) and Slagle (2009) were able to use structured groups in core subject classrooms to generate collaboration and higher test scores.

Diverse learners often are forgotten in modern classrooms, however (Boardman et al. 2014; Hanghoj et al. (2018); Manheady et al. (2002), O'Brien and Wood (2011); Surr et al. (2018) all focused their studies on diverse students. Boardman et al. (2014); Manheady et al. (2002); Surr et al. (2018) used basic cooperative learning structures designed to build skills to measure student growth for diverse learners. Boardman et al. (2014) and Manheady et al. (2002) executed Collaborative Response Teams (CSR) and Numbered Heads together (NHT), respectively, to increase outcomes with primarily Hispanic populations (>70% in both studies). Both researchers found significant success in academic scores.

Limitations of the Research

This cooperative learning literature review was limited to grades 6^{th}-12^{th} (students aged 11-18). Research reviewed was found using ERIC, Academic Search Premier, EBSCO, and

Google Scholar with dates of publication ranging from 2000-2020. Some earlier researchers were cited who started the cooperative learning conversation, but the studies used in this review were between 2000-2020. To find peer -reviewed studies, keywords such as "cooperative learning secondary education" and "mixed learning middle/high school" were used to generate results. While searching electronic databases, keywords were used, including elements of the research question as follows; "self-efficacy," "Critical Thinking," "Student Achievement," "collaborative learning," and "diverse learners." These keywords were entered in tandem with "secondary education" to find desired studies.

Even with these search efforts, research queries generated mostly elementary level studies. A great amount of information sifting was required to find the secondary education level studies for this literature review. This may be due to the willingness of elementary-aged students to work collaboratively in a critical stage of cognitive development. Post-secondary education studies may be abundant because of the availability of university resources and the willingness of college -aged participants. The Research was often broad and not peer -reviewed at the secondary education level. Also, many studies had small pools of participants at this level. Sources from all over the world were compiled to find enough studies relating to the research question. In many cases, studies were located and read -only to find they were at the wrong school level, had limited participants, or included only qualitative data. More research, preferably a large sample size (>500), is needed to examine the positive effects of a cooperative learning approach.

Implications for Future Research

Research shows cooperative learning promotes success in the secondary education classroom in many ways, but the research does lack depth in a few key areas. Studies were predominately found in the subject areas of mathematics and science. More research is needed for elective subject areas, particularly in physical education, music, foreign languages, art, and industrial technology. If these elective areas were studied more, many more teachers would have the opportunity to employ strategies, such as Jigsaw, Student Team Achievement Division, Collaborative Student Response, Numbered Heads Together, and many more, in a larger effort to increase student achievement.

There is a lack of studies focused on using social media in the classroom. Social media has become a major part of the lives of secondary education students. Whether Facebook, Instagram, Twitter, Reddit, or Snapchat, students are spending hours per day using these platforms. Yet as studies were searched, not one was found at the secondary level for implementing social media as a cooperative learning strategy. As educators, these preferred platforms for students should be investigated for a possible collaborative learning opportunity, mostly outside of the classroom (homework aid).

Another gap noticed in the research was the duration time. Most studies took four to twelve-weeks for implementation and result phases. More long-term studies are needed to observe how a student can grow in a cooperative learning setting over time. It seems as grant funds diminish or student teachers complete these studies to achieve a degree, research often stops. To create more study opportunities, states and universities could offer stipends for teachers willing to conduct cooperative learning studies at the secondary level.

Implications for Professional Application

As a science educator in Minnesota, I need to use cooperative learning more extensively to promote self- efficacy, student achievement, cater to diverse learners, promote criticalthinking, and develop more collaborative opportunities for students. I aim to develop self-confident and creative thinkers in my classroom. Based on my experience, I feel other educators should use cooperative learning more extensively in the classroom. According to the research analyzed in this literature review, textbook learning and traditional slide presentation methods have become ineffective for increasing student growth. Education is a dynamic system that has changed over time to help fill workplace needs. The need today is to create students who can work collaboratively and be innovative. The Next Generation Science Standards [NGSS] (2013) were adopted this year (2020) in Minnesota, and many other subject areas are rethinking the way students are taught. Students are becoming more diverse every day, and as instructors, we need to be well -practiced in implementing the research-based strategies that help our changing students.

I teach in a diverse setting, at Pines School in Circle Pines, Minnesota, within the Centennial School District. I chose to study secondary education level students in this thesis because this is the age range of my students (ages 11-18). My science students are in an Anoka County correctional facility campus, and there are students with high behavioral and emotional needs. Additionally, many students have large academic gaps. Research has shown that teacher structured cooperative learning strategies can add motivation to the learner, as well as academic achievement. This would be a great opportunity for me and others to give struggling students a chance at success in the classroom.

Quality and quantity of professional development opportunities seem to be a major struggle for teachers to implement quality cooperative learning opportunities. Many studies in this literature review indicated how having an expert present can help ease the transition for teachers to change from conventional learning to a cooperative learning focus. Too often, students are tasked with group work, and they are unsure how to split the workload and work as a cohesive group. It seems schools could increase their professional development budget to bring in cooperative learning experts who have experience conducting studies in school and training teachers in these strategies. I have noticed most professional development at my school includes group conversations on a focused topic. We need to transition toward investigating a particular cooperative learning strategy and showing teachers step by step how to lesson plan for that strategy.

All teachers benefit from cooperative learning in the classroom when it is done with structure. Student growth and development in all areas is our goal as teachers, and cooperative learning is a possible solution to help students achieve the goal. While we do see student growth in some areas with traditional learning, we must stretch outside the comfort zone and find a way to make cooperative learning a routine in our classrooms in order to see greater student growth in many areas. Cooperation of people is essential in the workplace; when solving problems like global warming, the great pacific garbage patch, racial injustices, and pandemics, we need to work together to find solutions. Ignoring problems does not help them go away, and as teachers, we have the responsibility to inform and discuss these critical issues with students. In my experience, school is the only place of structure and safety for many of my students; I need to use this time in the best possible way. I plan on employing multiple cooperative learning strategies and continuing to research how to best employ these strategies. I will also perform a professional development presentation to colleagues, highlighting the findings of this literature review.

Conclusion

Does cooperative learning contribute to greater student achievement when compared to traditional teaching techniques? Various researchers discussed in the review answered this research question and found cooperative learning to increase self-efficacy, develop critical thinking skills, greatly increase student achievement, promote collaborative learning, and cater to diverse learners (special education students, minorities). Multiple cooperative learning strategies, including Numbered Heads together (NHT), Collaborative Student Response (CSR), Problem Based Learning (PBL), Jigsaw, Reading-Concept-Map-Timed Pair Share (Remap-TmPs), Think-Pair-Share (TPS), were statistically significant in student growth in increasing self-efficacy, developing critical thinking skills, increasing student achievement, promoting collaborative learning and catering to the needs of diverse learners. A theme in the research shows that students succeed when teachers structure cooperative learning opportunities. Researchers also found students to think deeper about complex subject matter when embedded with a cooperative learning strategy. Cooperative learning is continuing to evolve, and we as educators should continue to investigate and employ strategies to serve students best.

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