Self and Peer Assessments of Teamwork Skills in an 8th Grade Math Course
Using the Teamwork Skills Inventory

by

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A dissertation submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Educational Psychology, Doctor of Philosophy

Auburn, Alabama
December 11, 2021

Keywords: teamwork skills, adolescent, self and peer assessment

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Abstract

Today's society requires individuals to have effective teamwork skills in order to be successful at work. The researchers in this study felt the need to provide teachers with an opportunity to see the benefits of including teamwork skills assessment in their classroom and the positive effects it can have on students. Specifically, this quantitative study utilized the Teamwork Skills Inventory in an 8th grade math classroom and focused on the following: differences between gender perspectives of teamwork skills, self and peer assessments of teamwork skills, the most identified teamwork skills and the least identified teamwork skills. A formative and summative self and peer assessment was conducted during a recency project wherein deidentified data was analyzed using SPSS v.26. The findings were analyzed according to the four research questions. Research question one did indicate a significant difference between formative and summative findings when comparing and contrasting the self and peer formative and summative data. Research questions two and three identified teamwork skills according to the most and least observed by team members' self and peer perceptions. Through the summation and frequency of the data, the peer formative, peer summative, self formative, self summative, subscale peer formative, subscale peer summative, subscale self formative, and subscale self summative results indicated the most and least occurring teamwork skills for each category. Finally, the findings for research question four did not indicate a difference in gender perspectives on teamwork skills. The implications can assist 8th grade math educators by providing a list of teamwork skills that the majority of students should and should not be able to perform within their class. While the possibilities for future research are vast, a possible correlation study could be conducted to identify the age threshold in which females become more

proficient in teamwork skills than males as this study did not find a significant difference

between gender means.

Acknowledgements

I would like begin by thanking God for loving me and providing me with the most wonderful individuals from whom have provided their unwavering support throughout this journey. To all of my family and friends, you have supported me with your unwavering love, patience, and faith. To my dear husband, Mr. Jeremy Ogletree, I cannot thank you enough for picking up our roots and moving us to Auburn so I could accomplish my dream.

While some have only one set of parents, I have been blessed to have several; to them all I say I love you and thank you. Each of you are the backbone from which I have been able to achieve this journey and dream in my life. Sometimes it takes a village….

I would also like to recognize my forever friends, Alyson Ogletree Zaffina, Crystal Wellborn, Kelly Birchfield and Brandi Howard. Thank you for your love, encouragement, elucidations, and helping me survive Chapter 2. I am truly blessed!

I am also very fortunate to have support and comradeship with my committee members, Dr. Paris Strom, Dr. Chih-hsuan Wang, Dr. Jill Salisbury-Glennon and Dr. Jane Kuehne. I would like to provide a special recognition to my friend and mentor, Dr. Paris Strom for his countless hours of guidance, never-ending patience, believing in me, and allowing me the opportunity to instruct future teachers. I would like to thank you all for your resolute support and countless hours of assistance.

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CHAPTER 1

INTRODUCTION

An educator is not only tasked with instructing students on the required course of study but also life skills that will aid students on their journey to becoming productive members of society. In order for students to be successful in their future jobs, employers expect their employees to have effective teamwork skills. Students can refine their teamwork skills by identifying weak skills through assessment, self-reflection, and having opportunities to practice these skills within a structured cooperative learning environment.

Secondary educators can aid in student's development of teamwork skills by first modeling and establishing norms for effective collaborative group work. During collaborative group work students should encounter active social learning that includes active participation through discussion, discovery, and accountability. "Teaching teamwork skills requires new methods of teaching and changes in the structure of traditional education with support from communities" (Brown, 2010, p. 1). With practice and guidance from teachers and team members, students can target specific teamwork skills to improve upon.

Learning is a social interactive process that is successful when supported by other individuals. Adolescent students learn through discussion, research, and active engagement in these modern times. For example, when a new phone is acquired, they are actively engaging with the new phone, asking their friends for clarity, and concluding an internet search for any issues that arise. This technique should be carried over into the classroom with course of study content. Collaborative group work combined with support from teachers, peers, and family can lead to high student engagement with student comprehension.

Teachers can administer an online performance-based assessment, the Teamwork Skill Inventory (TSI), as a means to evaluate the effectiveness of collaborative group work. This educational tool allows students to honestly and anonymously evaluate themself and group members on their teamwork skill ability. The self and peer assessments are formative and summative within a twelve-week time period. The TSI allows students to refine specific teamwork skills that are identified as a weakness and to set goals.

Statement of the Problem

Today, students are held to higher expectations and standards which include becoming productive members of society, obtaining employment, paying bills, and contributing to the future upbringing of the next generation. This begins with obtaining certain vital skills however these skills are difficult to obtain in a changing world. One of the main issues major employers are struggling with involves their employees having a lack of teamwork skills. "Collaborative teams working together have increased creativity, productivity, and revenue for many companies" (Brown, 2010, p. 4). An educator's job is to ensure that students are able to comprehend the required course of study content as well as prepare them to become productive members of society. This can be accomplished by aiding in the refinement of student's teamwork skills so they can work efficiently within cooperative groups.

The method of instruction in which students learn is another concern that prohibits student comprehension. Prior to the advancement of technology where information is a click away, students were expected to memorize information through repetitive rote techniques wherein the teacher provided the majority of dictation. It is no wonder that there has been a drastic decline in student engagement and comprehension that has led to a decline in student

assessment data. While administrators and political officials' expectations for student

assessment scores have increased, the majority of teachers are still educating their students in a

traditional lecture format. As a means to keep up with the changing times, students must be

instructed using a variety of engaging teaching methods. One effective technique that educators

can utilize is the inclusion of cooperative group work. Through cooperative group work,

students gain a deeper understanding of the content while practicing teamwork skills.

Teamwork skills arise from a broad variety of cooperative learning. When students work

efficiently in cooperative groups they are socially and actively learning. This is accomplished

through a structured environment. Secondary educators who implement cooperative group work

are responsible for ensuring that student's groups are working efficiently. Efficient group work

occurs through daily routine practice with positive reinforcement of students remaining on task,

discussion of the content, discovery, and the inclusion of hands-on learning.

Teamwork skills can be self and peer evaluated through a variety of assessments. The

method selected for this research study included the evaluation of teamwork skills through the

teamwork skills inventory performance-based assessment (TSI). This allowed students to self

and peer evaluate anonymously.

Purpose of the Study

The purpose of this research study was to evaluate students' perception of group work

through an online performance-based assessment instrument, the Teamwork Skills Inventory

(TSI). Six classes of 8th grade students participated in a twelve-week introduction,

implementation, and evaluation of peers in a collaborative group work session (N=91). The data

collected support the following research questions.

1. How do self and peer assessments of teamwork of 8th graders in a math course compare and contrast using the Teamwork Skills Inventory (TSI)?

2. What teamwork skills lend themselves most to teamwork during math learning for 8th graders from the Teamwork Skills Inventory (TSI)?

3. What teamwork skills lend themselves least to teamwork during math learning for 8th grades from the Teamwork Skills Inventory (TSI)?

4. How does gender affect student's perception of teamwork skills using the Teamwork Skills Inventory (TSI)?

These research questions were formulated to work collaboratively with the Teamwork Skills Inventory in a quantitative research study. Formative and summative assessments were given as a means to provide accurate and anonymous feedback from which students could improve on their teamwork skills.

Significance of the Study

The significance of this study was to obtain students' perceptions of self and peer evaluations using the online Teamwork Skills Inventory (TSI) performance-based assessment instrument to aid in identifying teamwork skills that the majority of 8th grade math students should and should not be able to demonstrate. Additionally, the research determined what teamwork skills were most and least effectively demonstrated as identified by adolescent students within cooperative groups. Finally, this study reported any indications as to whether or not gender affects student's perception of teamwork skills. Analysis of the data helped establish student perception of their teamwork skills as well as student perception of their other group

members' teamwork skills. This determined if there was a relationship between gender and teamwork skills.

To ensure that students became proficient in teamwork skills, formative and summative self and peer assessments were conducted on observed student behaviors during cooperative group work. This signified whether students were meeting their teamwork skill goals, which goals were identified as the least and most occurring, and if there was a difference observed in gender perspective. This led to a better understanding of the student's perception as to how they viewed their teamwork skills and how others viewed their teamwork skills. From this, educators can make informed decisions as to which cooperative group activities could aid in teamwork skill development and ultimately enhance the student's learning capabilities.

Organization of the Study

Chapter I introduces the importance of teamwork skills in modern-day society and the role it plays in future jobs. It also introduces the acknowledgement and importance of recognizing student's perception of teamwork skills which prompted the research questions. Furthermore, this chapter introduces the fact that these skills were performance based through an online self and peer assessment instrument, the Teamwork Skills Inventory. Chapter II contains a substantial literature review; the main components including assessments, cooperative group work, teamwork skills, and the effectiveness of the online performance-based assessment instrument Teamwork Skills Inventory. Chapter III provides the methods utilized throughout the research process including the purpose, implementation, and application of the TSI, discussion of participants, fair assessment, goal setting, and how data were analyzed. Chapter IV includes a thorough discussion of the analyzed data and the designated statistical analysis utilized for each

research question. Finally, Chapter V provides the findings of this research study, including the

conclusions, implications, limitations, and recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

This chapter begins with an overview of the literature on cooperative learning and how teamwork and social skills are essential to student comprehension. Furthermore, the assessment of teamwork skills is discussed to highlight the significance of self and peer evaluations with group member performance. Additional literature is provided regarding gender perspectives on teamwork skills.

Adolescents

Adolescent development is the holistic growth period for individuals between the ages of 10-18 years old that includes the biological, cognitive, and social development occurring within their bodies. This time period is often recognized as a drastic period of change accompanied with care-free behavior. G. Stanley Hall was the first psychologist to deem the term adolescents as a representation of a growth time period later than elementary school but prior to becoming adults (Zimmerman & Schunk, 2003).   Hall signified that adolescence individuals were prone to outburst due to overactive hormones. He identified adolescence as "being a stormy and stressful time that was demonstrated by increased conflict with adults, emotional instability shown by popular mood swings, and the tendency to take unreasonable risks" (Strom & Strom, 2011, p. 4). Adolescents are struggling through a time period of change, emotionally and physically.

When individuals develop knowledge and problem-solving skills, they are developing cognitively from which many theorists have identified stages. Jean Piaget, Erik Erikson, Sigmond Freud, James Marcia, and Lawrence Kohlberg are most recognized for their

development theories. While Piaget's stages of development are cognitively related, Erikson,

Freud, Marcia, and Kohlberg stages focus on individual's psychosocial developmental that

accompanies cognitive development. Psychosocial development is the development of the

individual psychologically given their current social context. Erikson is most often recognized

for his eight stages of psychosocial development, including the identity theory. Erikson provides

a starting point for where an individual is currently within a psychosocial developmental context;

knowing where one is located psychosocially can aid in understanding and where they are

headed developmentally (Marcia & Josselson, 2012). Erikson's eight stages provide a holistic

view of an individual both developmentally and psychosocially.

Social development reflects a period of time when adolescent students become more

reliant on peers than parents for learning societal information, are more autonomous, and testing

boundaries for feelings of certainty. Having a good understanding of adolescents' social

development issues is an important concept for education as these social development needs can

affect a range of classroom issues from assessment scores to classroom behaviors. Since there is

a rapid change occurring in the brain, adolescents are more impressionable. Educators should be

aware of these concepts and understand that the majority of adolescents will respond better to

positive rewards than negative consequences. Kim et al. (2018) highlighted the importance of

social perspective-taking (SPT) skills on academic performance. The SPT skill is the social-

emotional capability of individuals to cognitively "infer, consider, and critically evaluate"

content they are attempting to gain knowledge on (p. 24). They developed a means to evaluate

SPT to aid in measuring developmental performative skills. This is very beneficial to educators

who try to accurately measure what adolescent students understand versus the correct answer

provided. Diazgranados' et al. (2016) research of SPT identified the "functions and levels of

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integration of the SPT acts individuals perform in their attempt to consider resolutions to social problems that involve multiple actors" and provided a recommendation for education programs to support adolescents' social and academic development by offering the students opportunities to practice SPT acts (p. 588-589).

"Another important factor in understanding adolescence is the change in social order that is responsible for assigning purpose and status to segments of the population" (Strom & Strom, 2014, p. 6). This change in social order is found in many theoretical underpinnings such as Erikson's identity stage where the sense of self and independence is prominent. Along with physical and emotional issues, adolescents struggle with finding their place in the world. They attempt to fit in with peers while trying to find their own identity as they are neither children nor adults. Identity formation often involves a time for exploring and testing boundaries followed by making a commitment which is subject to change. "Adolescents are concerned with who they are, how they appear in the eyes of others, and what they will become" (Crain, 2011, p. 293). Identity issues are predominant during late adolescence "because this is when necessary physiological, cognitive, and social expectational factors are present" (Marcia & Josselson, 2012, p. 619). Late adolescence includes middle and high school years where identity is in its developmental phase. This age range is also a time for adolescent students to identify and refine teamwork skills.

<div align="center">Teamwork</div>

Teamwork Defined

"Team denotes a group of two or more people working interdependently in the pursuit of a common goal" (Varela & Mead, 2018, p. 73). As the general saying goes, there is no 'I' in

teamwork; there is no individuality associated with teams or teamwork. For teams to be effective, each team member must work together to accomplish the group goal. When teams work cooperatively, teamwork emerges. "Teamwork is described as a cooperative process that allows ordinary people to achieve extraordinary results" (Scarnati, 2001, p. 5). There is vast research on the exact skills associated with teamwork, and they vary accordingly, but for sure, teamwork is consistently identified as a crucial component of success (Britton et.al., 2017). Ritter et.al (2018) indicated that educators should use a more physically and emotionally engaging teaching method when aiding in developing students' teamwork and collaboration skills. "To develop teamwork skills from the group-based research projects, a method of assessment and feedback is needed" (Wu, 2014, p. 22). For the purpose of this research, the teamwork skills utilized will arise from the 25 Teamwork Skills Inventory and include attention, research, discussion, problem solving abilities, and the ability to work well with other teammates.

Working Effectively in Teams

Teamwork skills do not develop by placing students closely together in a group, with their knees almost touching, and asking them to solve a problem. Instead, students must be guided on how to perform teamwork skills through teacher modeling and consistency in reinforcement of correct procedures. Middle school students have a myriad of obstacles concurrently vying for their attention including biological, emotional, and social matters. Distracted students are not able to process the information being provided by fellow team mates and are more likely to misinterpret the content. Strom and Strom (2011) reported that students struggle to stay focused; their attention is frequently diverted and they are unable to block out

irrelevant distractions. Therefore, keeping students focused and paying attention while minimizing distractions is a constant battle educators face.

Researching information can be as basic as opening a web page and finding a definition. Adolescent students are more than capable of accomplishing this task. One method of learning cooperatively involves a jigsaw method wherein each group member researches information online and then reports back to the group. Then collaboratively they share their findings and join together their information to discover the content being sought. This seeking and sharing information is an important teamwork skill that will continue over into students' future workforce (Strom & Strom, 2018).

Adolescent students are social butterflies and enjoy discussing all topics. Teachers must model appropriate discourse, identify and set high expectations for team members, and remain vigilant in keeping students on topic. While students are familiar with sharing information about new social networks and the current relationship issues among their peers, getting them to discuss appropriate course content while providing support and feedback to each other is a daily challenge. Teachers should monitor and redirect side conversations when they observe students discussing off-topic issues. Especially when groups provide answers without justifying them with explanations (Webb, 2009).

The ability to solve problems and think critically is another teamwork skill that should be practiced while working in cooperative groups. Teachers should model their problem-solving skills by expressing in words how to approach a problem to ensure that students are able to navigate problem-solving techniques. This allows students to observe their teachers problem-solving techniques. This will aid in the student's perspective of how to approach a problem to

begin to solve it. This technique combined with their own critical thinking skills and support from team members can foster a discovery for the task at hand.

The ability to work well with other teammates is essential to teamwork success as well as future job requirements. The basis of this collaborative ability is the Social Interdependence Theory. Strom and Strom (2011) discussed the outcome from a meta-analysis research study in which "students from classrooms with cooperative learning goals where teams worked together were more accurate on test outcomes and earned higher problem-solving scores for reasoning and critical thinking tasks compared to classes where the focus was on competitive or individualistic learning" (p. 240). This is due to the support from fellow team mates as they worked together to achieve the common goal. The inferences that can be made are those teachers that encourage and support cooperative learning can expect to see an increase in academic and social development achievement.

Teamwork Skills Within an Adolescent Math Classroom

The need for teamwork skills is evident in the workforce. "Students need to be made aware of the importance and usefulness of mathematics to themselves both now and in the future" (Steinback & Gwizdala, 1995, p. 40). A 2018 Bloomberg Next and Workday survey was administered to hundreds of corporate and academia employees, 40% of corporate and nearly 50% of academia indicated that soft skills such as teamwork, analytical reasoning, complex problem-solving, agility, adaptability and ethical judgment were little to non-existent in new hires (p. 2). Given this decline in soft skills, students must be taught how to work together to accomplish a goal. This begins with teachers being able to adequately prepare their students for their future jobs; they must restructure the way students obtain course content. "Teachers arrange

cooperative learning to provide opportunities for students to practice teamwork skills needed for employment" (Strom & Strom, 2016, p. 141).

Many students enrolling in a math class have a tenuous idea that they are about to have a dreadful experience and cringe at the thought. This can be partly due to a snowball effect of skill regression which leads to low math self-efficacy. Once students enter middle school, their math classes build on prior knowledge on a daily basis. Those students who do not master previous concepts are quick to fall further behind, thus creating a snowball effect. With the inability to complete the math coursework, feelings of inadequacy are quick to develop. Two case studies were conducted on the effect of including collaborative group work in a mathematics classroom by Qaisar et. al. (2015); they concluded that by working collaboratively in groups, students' attitudes changed to a more positive outlook in math.

Through research and relationships with students, teachers can help their students have a more positive outlook towards math. If teachers have an established relationship with their students they can recognize when students are struggling and act quickly. One method to combat skill regression is to utilize cooperative learning wherein fellow classmates can aid and support student comprehension. "Students enrolled in developmental mathematics courses will benefit from positive interdependence because promotive interaction can be achieved" (Rivera p. 14). Once students become more comfortable with the math concepts, math self-efficacy will increase along with their ability to self-regulate their learning. "Empirically, self-efficacy is known to be a positive predictor of individual performance related behaviors and explains one's capabilities to accomplish specific tasks and goals in a domain" (Chatterji & Lin, 2018, p. 74). Another method to aid in increasing student self-efficacy is to engage students in self-reflecting. This pedagogical approach has been shown to support math learning (Choi et.al., 2017).

Most math teachers in the United States are familiar with the National Council of Teachers of Mathematics (NCTM). This is "the world's largest professional organization dedicated to improving mathematics education for each and every student" (Policies, 2021). NCTM (2021) supports teachers by providing resources and guidance to implement research-informed and high-quality teaching structured approach to teaching mathematics. With this support network in place teachers are better able to provide students with research-based techniques in cooperative learning to enhance their teamwork skills.

Another well-established support organization for mathematics teachers is the Alabama Math, Science, and Technology Initiative (AMSTI) which has been named by the Fortune 500 as one of the 35 "programs that work" across the nation. "The AMSTI Math program deepens teacher content knowledge in mathematics and pedagogy to produce student mastery of standards in the Alabama Course of Study: Mathematics" (AMSTI, February 23). Along with NCTM, AMSTI also provides research-proven support, modeling opportunities from AMSTI specialists, and invaluable supplies to mathematics, science, and STEM teachers. These supplies are priceless, especially to a Title 1 school where supplies are limited and often provided by teachers from their personal accounts. Through AMSTI, teachers are better able to enhance students experiences with teamwork on math content.

Teamwork Skills in Fine Arts

Teamwork skills are essential to learning and working successfully with others. Teamwork skill assessments are not singularly for adolescent math classes. They can also be assessed and used in the fine arts such as music, art, and choir. "All fine art forms are part of a system or means of communication" that are comprised of a social, political, cultural and critical

context (Corner, 2005 p. 33). This communication and synthesis of cohesiveness in the aforementioned forms are indicative of embedded teamwork skills within fine arts.

Choir within the fine arts can also have beneficial results when teamwork skills are applied during collaborative and cooperative team building opportunities. While there is little empirical literature on effective teamwork in choir-based performing teams, the "Big Five" model of teamwork skills were applied by Kirrane et al, 2017 in their research of established models on team performances for choir analysis. They discovered that by including the big five model, the function and components of effective teamwork were clearly evident.

Haning (2021) encouraged teachers to implement cooperative, collaborative, and student-directed learning strategies to encourage more student engagement and ultimately student-led learning within choral music which was assessed through observation and self-reflection. Furthermore, this research provided evidence that students were able to experience a more student-led learning atmosphere when given opportunities to work together. Self-reflection provided the students with an opportunity to self-asses their teamwork skill performance as working cooperatively with their choir group members. "Several students indicated that they enjoyed receiving feedback from a variety of sources and having the opportunity to express their own opinions during the learning process" (Haning, 2021, p. 18-19). This research study highlights the importance of allowing students the opportunity to have a voice and the ability to work with a team to enhance their teamwork skills. Sweet (2010) found similar results when eighth grade male students were allowed to work collaboratively within teams. These research studies highlight the importance of including cooperative learning with choral music.

Music ensemble is another faucet of fine art that can benefit from student cooperative learning. Hedgecoth (2018) indicated that numerous authors "suggested that promulgating an

environment where students have an equal voice and opportunity in decision-making would enhance their musical experience" (p. 2). Essentially, his research focused on student led rehearsals that were accomplished through group collaboration wherein the data was obtained through surveying student perceptions and modifying learning outcomes (Hedgecoth, 2018). Cronenberg (2016) found comparable results during the exploration of teaching practices and perspectives. Specifically, one music teacher focused on aiding students' musical performance skills by providing the students with opportunities to self-assess their collaborative abilities such as communication, contribution, and the ability to express themselves (Cronenberg, 2016). The aforementioned research studies contribute to the understanding that with the inclusion of cooperative learning and ultimately teamwork skills, students can achieve many goals in the fine arts.

Teamwork in the Real World

Betta (2016) researched the historical roots of the study of teamwork and found that it began around 1950's when Marschak (1955) attempted a scientific understanding of team performance. Prior to this initiative, companies worked with an individual perspective; however, teamwork is now a requirement in the real world. Major corporations expect new hires to have teamwork skills in order to be able to work collaboratively with others and are evaluated on their group performances. This demand for teamwork skills rests heavily upon the shoulders of teachers. Without prior experience in secondary education, students will be at a loss to perfect their teamwork abilities. Major corporations expect employees to be self-sufficient; able to plan, organize, schedule, monitor, and control job issues that arise with other team members. If teamwork is utilized efficiently corporations can increase their productivity. "General Electric's

plant in Wilmington, North Carolina used teamwork to increase its productivity by 250% as compared to other GE plants not using teams" (Brown, 2010, p. 14). Given this increase in productivity through teamwork, other major corporations changed their expectations for new hires to include the ability to work collaboratively with others. Along with teamwork skills, employees must also be able to work cooperatively with different generations, the opposite gender, various religions and cultural backgrounds (Brown, 2010).

Instructional Evolution

Historically, direct instruction was the preferred method for main delivery of course content in secondary education. It is often in the form of lecture as the main method for providing content information. This method is teacher-led with little to no student interaction. In this approach, the students have no engagement and are passive; they are viewed as little sponges by the instructor with the hopes that they will magically soak up all of the information. This may have been an effective technique prior to technology, however in today's society information is a click away and rote memorization of information is irrelevant.

The challenge for teachers is how to educate their students on developing and nurturing their teamwork skills. When teachers attend universities to obtain their teaching certificate, they are often encouraged to teach using the current trend; whether that is a behavioral perspective, constructivist approach, or various other methods. The fact is that generational teachers were instructed in different teaching methods. Ultimately, all teachers must evolve and adapt their methods of instruction from their collegiate experiences to accommodate the changing culture.

Today's society demands for new hires to have the ability to work collaboratively with others. This can be accomplished within a secondary education classroom by students identifying

and targeting weak or nonexistent teamwork skills from which to improve upon. This will result in students' increasing their ability to work efficiently within cooperative; a necessity for future employers. "All groups share two fundamental purposes; to engage students actively in their own learning and to do so in a supportive and challenging social context" (Barkley, Cross, & Major, 2005, p. 9). Since direct instruction is not an effective exclusive teaching method, students should work together in teams. Teachers should select the team members with a mixture of student skill levels, this is known as heterogeneous grouping. "Many authorities on cooperative learning recommend that students be placed in heterogeneous groups" (Jacobs, Lee & Ball, 1997, p. 55). Although working in heterogeneous grouping has been established as the best method for selecting teams, Want et.al. (2020) discovered that adolescents who were able to work in a group with their best friends decreased peer group aggressive characteristics. Learning cooperatively allows the students to take an active role in their quest for knowledge. Students must be actively engaged to complete a task, have a structured social interaction with fellow teammates, and have time for discussion and discovery. Gillies (2008) researched the effects of a structured cooperative group versus a nonstructured cooperative group. They determined that students in a structured cooperating group demonstrated more cooperative skills and helping behaviors than their peers in the unstructured groups as well as developing a sense of group cohesion (Gillies, 2008; Gillies, 2003). By utilizing cooperative groups, the method of instruction changes from teacher-led to student-led. The teacher's role then becomes a facilitator, an observer who guides and scaffolds the groups towards their goals.

Cooperative Learning

Cooperative Learning Defined

"Cooperative learning involves working together to accomplish your goals that are beneficial to individuals in the group" (Adams & Hamm, p. 3). Furthermore, it is also acknowledged as a gathering of a small group of individuals who utilize their teamwork skills in a structured environment to accomplish a goal. Peters and Woodley (2015) determined that through support and a structured environment where rules, guidelines, norms, and boundaries were established, students were able to earn higher grades. In cooperative learning, either the entire group achieves success or it does not. This is why the ability to work effectively together is a vital skill for students to master before they enter the real world. Azizan et.al. (2018) determined that students who participated in cooperative learning increased their comprehension and empowered their teamwork skills among team members. In order to prepare students for today's workforce, teachers need to provide students with an opportunity to work in cooperative groups and refine their teamwork skill abilities. Cooperative learning procedures should be designed to engage students actively throughout the learning process and include inquiry with discussion of fellow group members (Davidson & Worsham, 1992, xi).

Cooperative Learning Essential Elements to Success

Johnson, Johnson, and Smith (1991) identified five basic elements to a successful cooperative team. These cooperative teams must include the following skills positive interdependence, individual accountability, face-to-face promotive interaction, interpersonal and small group skills, and finally group processing (Johnson, Johnson, & Smith, 1991).

Through positive interdependence, team members work collaboratively to accomplish the group's goals (Johnson, Johnson, & Smith, 1991). Each member of the group is relied upon by the others and encouraged to fulfill their tasks. Educators play an important role in that they

foster positive interdependence by establishing mutual goals for group members to accomplish; this can be in the form of joint rewards, shared resources, and assigned roles (Johnson, Johnson, & Smith, 1991). "Through the careful design of cooperative learning activities, which will encourage and support positive interdependence among group members, students will benefit from collective knowledge between group members" (Rivera, 2013, p. 9). "It is widely acknowledged that the capacity of an individual to contribute positively to a team is a transferable skill that is highly valued by employers (Bourke, 20166, p. 243). When students do not work collaboratively to achieve a group goal, instead working competitively and focusing on individual tasks alone, they are exhibiting negative interdependence (Tran, 2013). When an individual works alone, they lack the social support from other group members, resources, and perspectives of problem-solving strategies and skills. When group members work together, individual accountability is upheld. Johnson, Johnson, and Smith (1991) stated that individual accountability is "assessing the quality and quantity of each member's contributions and giving the results to the group and the individual" (p. 7). When students are held accountable, they are more motivated to work productively towards the common group task. During cooperative group work, members are supported through face-to-face promotive interaction; wherein members help, share, explain, encourage, and teach other members in the group (Johnson, Johnson, & Smith, 1991). Social skills are critical to effective group functions and include decision-making, trust building, communication and conflict management skills, and instructorship (Johnson, Johnson, & Smith, 1991). The final element that Johnson, Johnson, and Smith (1991) identified was group processing. This is the time students need to digest, analyze, and discuss whether their group processes are leading them towards their desired goals. If students are allowed to pause and reflect on their processes, they can adjust their group paths to reach their group goals.

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Varying student ability skill levels can have an effect on how they learn within the group. Kagan and Kagan (2009) noted that as high achievers teach, they learn more versus working independently. Ross (1995) acknowledged that while cooperative groups are efficient for most students, those students with lower academic skill levels might be reluctant to participate. She outlined a few factors that could inhibit their participation such as frequent changes in teaching strategies, past failures with group work, pressure from other group members (Bandura, 1993; Good et.al., 1987; Ross & Cousins, 1995). Some potential obstacles that students may encounter while working in groups include personal responsibilities such as each student completing their share of the work, minimizing distractions, staying focused and on task, remaining positive while encouraging others, listening to teammates, and ensuring that everyone is treated equally (Strom et.al., 2019).

Kagan et al. (2000) identified six keys to successful cooperative learning within adolescent classrooms. The first is to provide ways to structure on how students should interact and how teachers should interact with the students during cooperative group work. The second is for teachers to utilize four basic principles; positive interdependence, individual accountability, equal participation and simultaneous interaction which will aid in students reaching high academic standards (Kagan et.al., 2000). "Positive goal interdependence (i.e., cooperation) exists when individuals perceive that they can reach their goals if and only if the other individuals with whom they are positively linked also reach their goals" (Johnson et al., 2014, p. 622). The third key item is teambuilding techniques which aim to create a positive atmosphere within the teams and the environment. The fourth key element is the ability to establish teams that will remain together for longer periods of time; this will promote compassion, understanding, and expectations from team members. Management is the next key element,

"many teachers report that their management problems decrease dramatically once they switch to cooperative learning" (Kagan et al., 2000, p. 45). The final key element is social skills; the ability to communicate one's perspective and ask questions is crucial to any group work skills.

Underlying Theoretical Perspectives

Cooperative learning has foundational roots within Social Interdependence Theory, Cognitive Development/Constructivist Learning, and the Social Learning Theory (Tran, 2013). These theories reinforce and provide justification for the inclusion of cooperative learning. Furthermore, these lines of research and theories presented will help to identify the need for self and peer evaluation amongst group members within the cooperative learning environment.

According to Johnson and Johnson (2005), the social interdependence theory describes how goals are accomplished through group members actions. Essentially students are influenced to complete a goal or task by another students' influence; this makes a revolving circle of either achieving a group goal (positive interdependence) or not (negative interdependence). Although Morton Deutsch finalized social interdependence theory, it actually began in formation from a Gestalt psychologist Kurt Koffka and was later expanded on by Kurt Lewin (Cobb 2016; Rivera 2013). Morton Deutsch contributed to this theory by investigating interactions between individuals and group processes that emerged as a consequence of the cooperative or competitive social situation (Gillies & Ashman, 2003, p. 4). Through positive interdependence, students are encouraged and motivated by each other in a cyclical pattern to accomplish the group goals. This is beneficial to any classroom as having the drive to successfully complete tasks and understand course content is the goal all educators wish upon their students.

The cognitive development and constructivist theory arose from combined theorists, Jean Piaget and Lev Vygotsky who determined that children learn through an active student-led social interaction (Tran, 2013). These theories combined establish the essence of cooperative learning; student-led active engagement with cognitive development occurring through social interactions. Specifically, Vygotsky (1978) stated that through social interaction with others knowledge is attained and then comprehension follows. While Piaget (1926) indicates that knowledge is obtained at predetermined developmental levels he does recognize that social interaction is a requirement for comprehension.

Vygotsky (1978) indicated that along with social interaction, children needed to have attainable goals within boundaries. Thus, the zone of proximal development (ZPD) was established; where the ZPD "is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, p86). Within cooperative groups, students receive scaffolded support from group members to reach their ZPD of knowledge attainment and ultimately group goal achievement. Since new knowledge is based upon prior knowledge through active learning in social situations.

Jean Piaget (1971) and Lev Vygotsky (1978) both indicated that new knowledge is based upon prior knowledge within an active, social learning environment. Piaget (1971) called this cyclical pattern of old information being replaced with new information, assimilation and accommodation. The point in which this information is created and cognitive development is at rest, equilibrium occurs (Piaget, 1971). When new information is acquired the brain assimilates it and makes accommodations to the old information where it is broken down, thus equilibrium

occurs and waits expectantly for the cycle to begin again. This circular pattern of cognitive development is effective when social interaction is present (Piaget, 1971). Both Vygotsky and Piaget have established that learning occurs best when working together in an active social environment essentially working in a cooperative group.

"Learning is a process that takes place in a participation framework, not in an individual mind" (Lave & Wenger, 1991, p. 15). Most children are told to watch their parents perform a task and then encouraged to replicate such as a means of learning. This is the foundation of the social learning theory wherein information is obtained by observing, modeling, and imitating (Schunk, 2007; Tran 2013). Albert Bandura (1971) acknowledged this processing of information via replicating observation as the social learning theory. As this replicating observation continues, behaviors develop such as attitudes, strategies, beliefs, and knowledge which in turn affect how the students interact within their environment (Tran 2013). Wenger (1998) implied that a social theory of learning must integrate components such as meaning, practice, community, and identity that are necessary to characterize social participation of learning and of knowing. Bandura (1997) proposed that the environmental actions that affect one's behavior will ultimately affect how learners perceive their abilities to learn or one's self-efficacy beliefs and furthermore students learn through revolving cognitive processes that are imitated. Essentially, within cooperative groups students replicate observed behaviors and interact with group members to successfully accomplish the group goals; this in turn will increase the student's self-esteem and provide deeper understanding about the content being taught. With this increase in comprehension comes an increase in achievement motivation which leads to a spinning circle of positivity; with themselves and with other group members (Johnson & Johnson, 2005). Students will begin to have higher motivation and put forth more effort in an attempt to please other group

members as well as themselves. This internal behavior regulation, occurs when students engage in self and performance observation according to their own internal standards and goals (Crain, 2011).

The aforementioned theories combined provide the validation and empirical evidence to support the inclusion of cooperative learning within a classroom as a means to provide the students with a holistic learning opportunity and prepare them for future employment. These theoretical perspectives allow for students in cooperative groups the ability to learn more through active constructivism of their own knowledge while receiving scaffolded support from their group members and teacher (Tran, 2013).

Cooperative Learning Issues

While cooperative learning is an established and effective method of educating students and "offering learners at all educational levels a voice, and an outlet for using that voice" (Harrison, 2015, p. 87), it can have several potential issues that can have an outcome on self and peer assessments. These challenges include: teacher reluctancy, time constraints, content, and teacher/student training with cooperative learning. Oftentimes, teachers are not provided with education from their collegiate degrees on the benefits of cooperative learning within their classroom; therefore, they are often reluctant to try new teaching techniques to reinforce the content being taught. Another potential issue with cooperative learning is time constraints which can hinder cooperative learning as state course of studies have increased in rigor and expectations thereby reducing time in the classroom for reinforcing the content. For an effective cooperative group to be successful, students need to practice effective group working skills.

Students must to be taught by their teachers how to work together in groups. This can only be accomplished if the teacher has knowledge of effective group techniques.

Assessments

Assessment Defined

Traditionally, an assessment is a form of evaluation from an educator's perspective on the ability or skill level of a student. Assessments can be formative, summative, peer, or self-assessed. "For assessment to be formative it must provide sufficient information upon which to base decision making and at improving a student's learning" (Fernandez-Ruiz, 2020, p. 311-312). "Summative assessments are usually applied at the end of a period of instruction to measure the outcome of student learning" (Kibble, 2016, p. 110). "Self and peer assessments are more student-centered, allowing students to participate in the evaluation and also providing them with rich opportunities for observation and modeling" (Sung et.al., 2010, p. 136). A self-assessment is an opportunity for students to rate their teamwork skills accordingly without peer or teacher judgment. The evaluation results are to be an honest evaluation of the behaviors and attitudes observed from their team members. "The practice of having students assess how well each member of the group has contributed to the work, of the group is known as peer assessment" (Michaelsen, Knight & Fink, 2004, p. 18). In the education world today, peer and self-assessment should be included whenever cooperative learning occurs within a classroom. While assessments in the classroom can accompany kindergarten to collegiate level, for this research adolescent age assessment will be the primary focus. "Ross (1995) found that when seventh grade students assessed their own performance in cooperative learning groups, they made significant improvements in the frequency and quality of asking for and giving help and in

general had an improved attitude towards asking for help" (Thompson, 2008, p. 24-25). Kagan (1992) also indicated that adolescents can self-assess just as they can peer assess. While it is true that adolescents are holistically in a constant state of change and their assessments may not be reliable, the teacher's established relationship with the students can aid in determining whether or not the student's assessment is reliable. An effective teacher will build a relationship with each student at the beginning of school. Teachers will be able to identify when students are upset, struggling, or mentally absent. This shows that teachers are one of the most essential elements in the learning process because "teachers may provide a more effective learning environment by helping their learners become aware of self-review and peer feedback in a digital environment" (Kayacan & Razi, 2017, p. 573). This connection allows for peer and self-assessment results to be verified.

Assessing Teamwork in the Real World

Strom and Strom (2011) identified three conditions that link conditions in the classroom to conditions in the employment sector. They are individual contributions to team effort, peer assessment of group members, and self-assessment comparison to peer assessment. When students are held accountable for their own team performance and know they will be evaluated accordingly, then they are more willing to ask for support from their team members to ensure that the task is completed. This in turn will increase their teamwork abilities for the classroom as well as their future employers. Teachers are not always observant to every group at every minute; therefore, peer assessment is useful as it provides an evaluation of a group members performance from the perspective of a fellow group member (Mayfield & Tombaugh, 2019; Loughry, et al., 2007). "Evaluation by team members frees teachers from relying on their own

limited observation of groups as a basis for recording, judging, and reporting individual

progress" (Strom & Strom, 2011, p. 235). While peer assessment is important, it is equally worth

noting that not all peer assessments will be answered honestly. Teachers must have an

established level of expectations in place with regards to their students in order to be able to take

into account the peer assessment responses they receive. Students should be able to review the

feedback from their peer assessment. "By giving each other feedback, students can reflect on

their own processes" (Lin, 2018, p. 451). This will heighten student's awareness of their actions

within the group and therefore, they can self-regulate their own learning. This active engagement

of self-regulation can be a beneficial tool when students take a self-assessment on their group

performance. "Besides learning to accurately judge themselves, students should learn to fairly

evaluate teammate contributions to group work and report their views in an anonymous way"

(Strom & Strom, 2011, p. 234). Ultimately the peer and self-assessment will cause a revolving

action wherein the students work together for a period of time, are assessed, and then improvise

their teamwork skills for the next team task. This revolution can increase student teamwork skills

as well as their motivation for completing group tasks.

Assessing Teamwork within Cooperative Learning

Strom (1997) identified six learning schemes that will help assess cooperative learning;

the need for the skill, a clear and concise identification of the skill and how students should

interact with them, student motivation to apply the skill, the ability to process and discuss the

skills with their group members, repetitive practice of the skills till autonomy is consistent, and

finally positive reinforcement of appropriate group behaviors. Using these guidelines students

can participate in peer assessment on the known skills and also provide a self-assessment. Self-

assessment is defined as the ability for students to make judgments on their performance of educational tasks and the outcomes they receive (Boyd & Falchikov 1989, Nugteren et al. 2018), whereas peer assessment is the ability for students to make evaluation judgments on educational tasks for each member of their cooperative group. Secondary students lack skills in which to adequately access themselves (e.g., Brown et al. 2015; Panadero et al. 2016); therefore, teachers' guidance prior to the administering an assessment tool is critical. Andrade (2010) and Panadera et.al. (2013) conducted studies regarding student assessment and they determined that student self-assessment skills can be improved through teacher guidance. As an educator who frequently utilizes cooperative groups, there are certain basic skills to assess which include the ability of students to stay focused and on task, ability to follow directions, share resources, monitor voice levels, support group members, and maintain a positive environment. Possible ways in which these skills can be assessed include observation by team mates and self.

Evaluating self and peer performance is beneficial to adolescents in secondary education, as this is a time when students are beginning to craft teamwork skills that will be applicable towards the real world. Brock (2017) identified four assessment tools that measure team skills; Acumen Team Skills, Myers-Briggs Type Indicator (MBTI), Fundamental Interpersonal Relations Orientation (FIRO), and Thomas-Kilmann Conflict Mode (TKI). Another online self and peer assessment tool is SPARK however Delaney (2013) found this to be disappointing because it would not capture a student's perception of his or her contributions and experiences relative to their team. While the aforementioned assessments are equally just, one instrument is more established and an applicable tool for this research. The peer and self-assessment tool selected for this research is the Teamwork Skills Inventory (TSI) created by Dr. Robert Strom and Dr. Paris Strom. This instrument has been providing reliable and valid results since 1999

when it was first launched as the Peer and Self-Evaluation System and then renamed the

Interpersonal Intelligence Inventory (III). Although the name has evolved to reflect the current

verbiage trends, the reliability and validity have remained the same. At commencement, this

assessment tool began as a paper and pencil handout and has evolved into an online anonymous

tool. "Adolescents prefer an environment that allows involvement with internet-based

communication and digital media" (Strom & Strom, 2016, p. 91). Anonymity is often regarded

as an important aspect when giving an honest and true perspective; this can be especially true for

adolescent students as they often do not wish to be viewed as not fitting in with the others.

"Peers provide powerful models of appropriate and inappropriate behaviour"[sic] (Johnson &

Johnson, 2017, p. 289). Throughout the school years, students will be confronted with peer

pressure; this can express a great magnitude and susceptibility on all students but is especially

prominent in adolescent students. Over the past decade, I have observed the magnitude and

susceptibility of peer pressure on secondary adolescent students on a daily basis. The fear of not

fitting in, along with the desire to have certain friends can mold adolescent students into

conformity from which peer pressure becomes inevitable. Peer pressure can vastly affect a

students' response on a peer assessment; therefore, through anonymity a student can provide a

more accurate representation of their peers. While peer pressure has been proven to be an

important factor on student behavior, Bouchey & Harter (2005) discovered that students were

affected more by what adults thought of them than what peers did within a math and science

classroom. Vanderhoven, E., et.al. (2012), conducted a study on peer evaluation where two

different groups of secondary students were observed. One group assessed their peers

anonymously while the other group assessed their peers in a face-to-face manner. Their findings

indicated that the anonymous group felt less peer pressure, less of a fear of failure, and had a more positive attitude towards peer assessment.

The TSI instrument addressed several aspects of teamwork skills within cooperative learning groups anonymously. Students were able to evaluate themselves and their peer's behaviors within groups in an anonymous online format. "Managing the feedback exchange process on a digital platform is advantageous especially as it enabled anonymity, through which it is possible to exchange peer feedback more objectively" (Kayacan & Razi, 2017, p573). Zamora A., et al. (2018) determined that by the including error detection self-assessment activities, students were more likely to have an improvement in their student performance. Once assessments were complete, each student within the group was able to view the anonymous feedback. Feedback is vital information that can aid in increasing student performance. This indicated the strengths and weakness of the individual student. I frequently tell my adolescent students that no one is perfect and mistakes are opportunities for learning. As such, students should use feedback obtained to determine areas that need improving and should use this information as an opportunity to improve teamwork skills. "The greatest value of any method of assessment is its ability to direct growth and improvement" (Brown, 2011, p. 25).

Gender in Assessments

Researchers often speculate on whether or not there is a gender difference in their research endeavors. A myriad of results can be found when conducting this study. One of the more common myths regarding gender in the classrooms is that males are more proficient in math or science than females which originated over 100 years ago (Hyde, 2008). Hyde et al. (1990) conducted a research study to determine if there was any evidence to support that males

performed better in mathematics classes than females. They found little to support this myth and concluded that both are equally talented in mathematical classes. Most individuals would indicate that males are expected to perform better than females with the majority of classes. Tucker (2014) researched the possibility of gender bias in team assignments through self and peer assessments. They determined that there was not any gender bias in six case studies, in fact they observed that women received higher scores than males. Zakaria et.al. (2010) studied the effect of cooperative learning on math achievement scores and attitudes. They determined that the cooperative learning approach resulted in higher achievement than traditional teaching. Hossain and Tarmizi (2012) conducted a study to determine if there was a gender related performance between conventional student learning and group learning in a 9th grade math classroom. The group learning students significantly improved their mathematics achievement in comparison to the conventional students; specifically, female students outperformed the male students (Hossain & Tarmizi, 2012). The findings presented indicate that more research is needed to provide gender perceptions in research studies wherein this research study can provide an additional piece of the gender perceptions puzzle as relating to 8th grade math students.

CHAPTER 3

METHODS

<u>Introduction</u>

This chapter will provide the introduction, justification, and structure of the Teamwork Skills Inventory (TSI) in this quantitative study. The design and implementation of the TSI are discussed along with participant selection. Finally, data collection methods, including student interpretation and goals are highlighted.

<u>Participants</u>

The population is a rural middle school within a Title 1 district with a total of 415 seventh and eighth grade students (NCES, 2021). Title 1 schools receive financial assistance due to the "high numbers or high percentages of children from low-income families to help ensure that all children meet challenging state academic standards" (Improving et.al., February 23). The results of the sample can be used to generalize information about the entire population of the school. These data were collected during the 2018-2019 school year during a climate improvement initiative. The study focused on a sample of ninety-one eighth grade students. The sample size divided according to gender includes 48% females and 52% males. The ethnicity of participating students is composed of 42% white, 51% blacks, and 7% other that included Hispanic and Asian. The black demographics include 27.5% males and 23% females. The white demographics include 22% males and 20% females. The other demographics include 2% males and 5.5% females. Table 1 provides visual clarity for the distribution and percentage for the population by gender. Table 2 provides visual clarity for the distribution and percentage of the sample by gender and ethnicity.

Table 1

Distribution and Percentage of Population by Gender

Gender	(N)	%
Male	198	48
Female	217	52
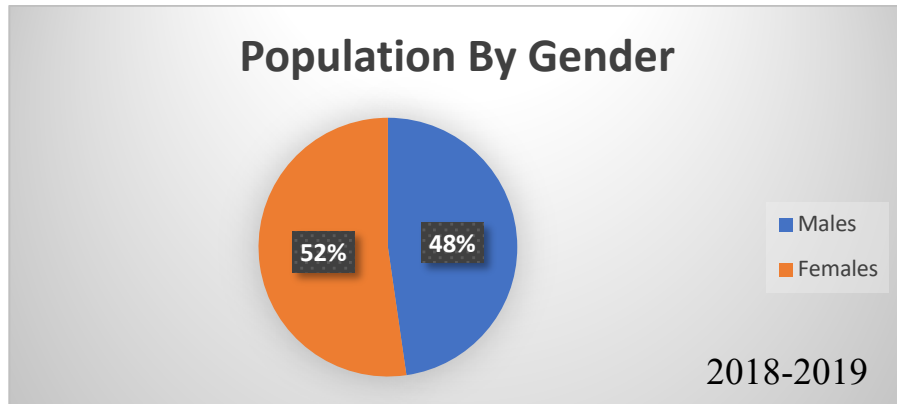
Table 2

Distribution and Percentage of Sample by Gender

Gender	Black	White	Other	(N)	%
Males	25	20	2	47	51.6
Females	21	18	5	44	48.4
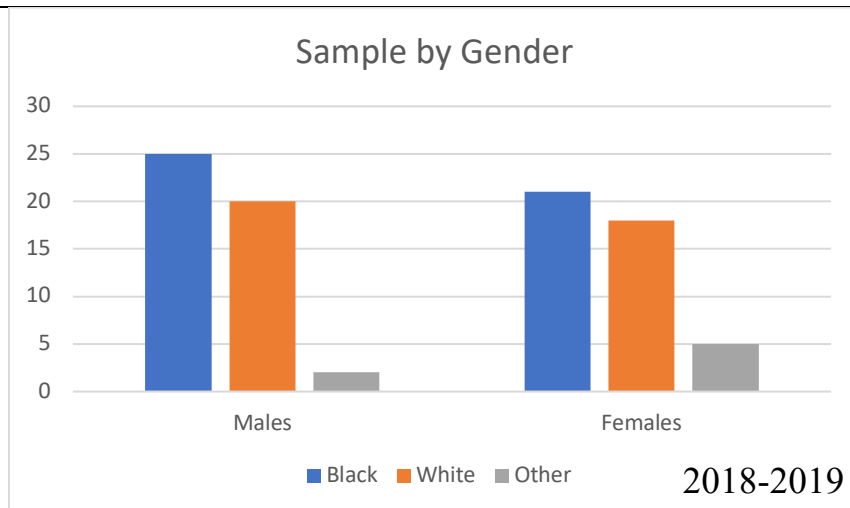
<u>Purpose</u>

The purpose of this study was to determine how self and peer assessments compare and contrast while using the Teamwork Skills Inventory. Furthermore, it aimed to identify which teamwork skills are the most and least effective. Finally, this study attempted to ascertain whether gender had an effect on student's perception of teamwork skills.

In today's workforce working efficiently in teams is a necessary skill and should be assessed accordingly within the classroom. Since most schools today have access to some form of technology, whether this is through a school computer lab or assigned a one-on-one device, students are able to answer assessments in an online format. DeCarlo and Cooper (2014) acknowledge that "classroom assessment techniques in the online environment are effective in measuring course outcomes" (p. 15). Adolescent students are more comfortable online making this environment more beneficial to the students. "The Teamwork Skills Inventory is a multi-rater self and peer evaluation system designed for students in secondary school through graduate school" (Strom & Strom, 2018). The TSI measures adolescents' social interactions and teamwork skills that have been exhibited during cooperative learning in an anonymous online format. This is a free online assessment tool that is available to all schools and researchers with approval from Dr. Paris Strom (Appendix B). With approval to utilize the TSI, teachers will have access to the online inventory tool, guided teacher instructions, and ready-made student instructions with guided video demonstrations for visual learners (Strom & Strom, 2018).

The Teamwork Skills Inventory can provide teachers with an organized and easy to read portfolio that highlights individual students' social skills and group ability skills (Appendix B). This can aid teachers with identifying specific skills that students need help refining in-order to be able to work more effectively with group members. With this information, teachers can

develop a deeper understanding of group productivity, dynamics, and potential social or academic complications. Group member perceptions of individual accountability are the basis from which feedback is generated. This feedback is based upon the constant interaction with other teammates rather than a snapshot observation from a teacher; therefore, this provides a good foundation for reliability. "Relying on perceptions of students can improve teacher awareness of teamwork skills as well as deficits for individuals, teams, and classes as a basis for planning further instruction and shaping interventions" (Strom & Strom, 2019, p. 5).

"Unlike assessment of the group product where individual effort cannot be detected, the TSI holds individuals responsible for their own development and contribution to the team but not for the behaviors of teammates" (Brown, 2010, p. 27). When students are held accountable for their group work, they are more apt to effectively participate while remaining on task, creating individual student motivation. Aiding in student motivation is a valuable component to the TSI. Student motivation is produced by student's self-reflection after comparing their self-assessment to their peers. An important aspect of performing well within a group is the student's ability to self-reflect. With self-reflection, students are able to evaluate their strengths and weaknesses to improve teamwork skills. Self-reflection can be accomplished through repetitive rehearsal and teacher direction. Motivation is not only beneficial to student psychological aspects but also to their academic aspects. Through motivation, students develop an innate desire to accomplish and understand the group tasks or content being discovered. Teachers can observe this increase in motivation through a student's more positive and collaborative efforts while in groups. When students are motivated and take responsibility for their learning, knowledge of content increases.

Specifically outlined by the TSI inventors, Strom and Strom (2018), the purpose of the TSI can be summated as follows:

- The TSI identifies teamwork skills from each individual within the group.

- It provides profiles on individual and team performance from anonymous feedback.

- The TSI provides comparable self and peer perceptions profile page.

- The feedback received will identify strengths of teamwork skills that can be tied to motivation.

- The feedback received will highlight weaknesses in teamwork skills.

- The feedback can provide acknowledgement for the hard workers of the group as well as the slackers.

- The feedback provides each student with an individual portfolio that is organized with easy-to-read results.

Implementation

The introduction of teamwork skills can be accomplished by teachers demonstrating and modeling appropriate group interactions. Through verbal and hands-on techniques, a teacher can show students how to interact, respond to, and solve tasks aloud. The results obtained from students' perspectives can be obtained through formative and summative assessment. The formative results, can help students improvise and improve their teamwork skills while remaining in their selected heterogeneous teams. Specifically, the formative feedback can identify how many team members indicated an observed behavior or not. Teachers are provided with verbatim phrases to help students easily understand the feedback obtained. The summative results should indicate an increase in teamwork skills from the formative results collected previously. These formative and summative assessments are techniques that future employers

will require; therefore, being able to rehearse these skills within a safe, structured environment is beneficial to all students.

The intended functions and features of the TSI as identified by Strom (1997) and Strom and Strom (2018) include the following:

- An emphasis on teamwork skills during a given time period from which group processes can be assessed at least once during a semester.

- The outcomes are provided digitally for formative and summative purposes in individual student's profile and can also be viewed within each group name.

- Teachers are provided with orientation materials to serve as a means to introduce students to the teamwork skills they will be evaluated on.

- Verbatim phrasing and step-by-step directions are provided so the teacher help students navigate the TSI.

- The results obtained from students' perspectives are obtained anonymously.

- Each student is expected to provide an accurate and trustworthy observations for reliable results. This observation should occur over a time period of at least 4 weeks with weekly cooperative group work opportunities. Students can then obtain a general baseline of normal student behaviors within their group. "Observing team work under authentic conditions is also a way to ensure a reliable database" (Strom, 1997, p. 43).

There are 25 targeted teamwork skills in which the TSI can measure that are user friendly and easy for adolescents to comprehend. If students do not understand the definition for any of the items, they can click the line they are confused on and a pop-up will appear with a description of the skill. These 25 skills are broken down into five different categories; ability to

attend to teamwork, seeks and shares information, communicates with teammates, thinks critically and creatively, and the ability to get along with others (Strom & Strom, 2018). These skills are necessary to future employers. They should be measured and implemented within a secondary classroom so adolescents can self-reflect. This will aid in the refinement of teamwork skills. A list of measurable skills assessed through the TSI are shown in Appendix B.

Responses are monitored by the TSI instrument as students evaluated self and peer assessments. Students that appeared to click rapidly or give team members the highest rating of 20 to 25, triggered a pop-up box. This box acted as a pause and reflect opportunity for the student to deliberate on the ratings they provided and if the ratings are an accurate representation of their observation. Students were not able to continue the assessment until they replied to the question in the box on the sureness of their selected rating. This is intended to return their focus to the assessment and ensure responses are accurate representations. "This reminder is intended to prevent deceptive evaluation that can keep others from finding out their assets, shortcomings, and how to improve" (Strom & Strom, 2018). When students rated other team members excessively high it appeared on their profile as an inflation index; this can be a useful teaching opportunity to redirect students on effective assessment techniques. "The index also serves as an indicator of progress as a student moves from inflationary ratings to becoming realistic in performing peer and self-appraisal" (Strom & Strom, 2018, TSI Teacher Guide, p. 9). The opposite of inflation ratings are "revenge ratings" as identified by Brown (2010) which involves providing very low scores to team members. Revenge ratings mainly occur due to team members not performing well within the group however on occasion it could result due to extreme dislike of another team member. Teachers are responsible for ensuring that students evaluate team members to the best of their ability and without judgment. Students who obtain low to

nonexistent teamwork skills should conference with the teacher to discuss their perspective regarding the feedback received from team members. The teacher can then conference with the evaluator(s) to determine if the feedback received was an accurate interpretation of the students' performance within the group. Indubitably there are times when adolescent team members will refuse or provide little participation while working in cooperative learning groups. While the perception of the team member who does not participate may be viewed as apathetic or lazy, the remaining team members should motivate, support, and encourage them to complete the group task because the refusal to participate may be due to lack of skill or emotional issues. Most of the time it is better to offer positive reinforcement than negative consequences.

Once responses from the students on self and peer reflection have been submitted, scores are tallied and available for review by the teacher. Each student had their own individual profile. They examined their self-perspective and team members perspective of group behaviors observed. The feedback report contained two columns of data along with the 25 teamwork skills listed. In one column are the collected percentages of behaviors observed from team members and the second column contains the self-assessment indicated by checkmarks. If a skill has a 100% rating, then the student is proficient in this skill. A skill rating of 20%-80% would indicate that students need to improve on that teamwork skill (Brown, 2010). Skills that receive 0% ratings would indicate that team members did not observe this behavior or this rating could be a revenge rating. Teachers should ensure that the 0% ratings given by the evaluating students are an accurate reliability of behaviors observed. In general, the feedback obtained can be applied to identifying teamwork skills that students are demonstrating proficiently or in need of strengthening. This can aid in students changing their behaviors and setting personal goals before the next TSI assessment. The feedback can also be used by teachers to recognize "student assets,

progress, learning needs and opportunities to arrange practice for teamwork skills yet to be acquired, and be the focus for teacher in-service education" (Strom & Strom. 2018)

Fair Assessment

The first day of school should be viewed as an opportunity to begin building meaningful relationships between teachers and students. Traditionally, teachers place students in alphabetical order to memorize the name of each student. This is helpful as teachers can make a connection by routinely practicing the students' name; making this connection early on has proven to be valuable with teaching adolescents. The relationship that builds between teachers and students can help teachers recognize student's normal behaviors as well as not normal behaviors. Adolescents have physical and emotional changes occurring throughout their body on a daily basis, so it is not uncommon for adolescents to have rollercoaster days. Given time, teachers can identify which students would work well with others based on student's classroom attitudes and behaviors. A good teacher, based upon student behaviors and relationships, can identify if a student can or cannot work well with other selected team members. A teacher can also identify the high, low, and medium skill level students from exams and observations. Taking all of this into account, teachers can then establish heterogeneous cooperative groups based on student relationships with others. This is an important task to accomplish before the TSI lessons and evaluation are implemented. The reasoning behind this efficient group determination is that you want groups to have the best opportunity to be successful given their current situation.

The educational relationship that develops between teachers and students are usually lifelong and built on trust. Teachers must trust their students, to an extent, to make fair and equitable decisions while working in groups. They are still adolescents who do not have the full

functional ability of their prefrontal cortex and are often known for making an irrational

decision. This trust is essential towards the development of teamwork skills as students are

expected to adequately judge others on observed behaviors within the group. Students are rarely

given opportunities of trust as most are viewed as irrational. Students need this opportunity to

prove their judgment skills are reliable and trustworthy, as this is a required skill for future

employment. As with all things, practicing a skill with guidance from a teacher can aid in skill

development. Without the ability to practice and develop trustworthy decisions, students will

struggle in their workplace with adequately assessing teamwork skills. "Teachers who continue

to make decisions for and deprive students of opportunities to evaluate can never fully trust that

their students have developed the ability to draw conclusions and make decisions" (Brown, 2010,

p. 30).

Along with trusting in adolescent's judgment of teamwork skills, teachers must also trust

that the responses they develop for the group members are an accurate representation of

behaviors or skills observed. Team members can learn from this useful information. If inaccurate

or overinflated feedback is given, then students are not able to learn from their mistakes. The

goal for any teacher is to instruct and provide support for all students to learn from their mistakes

so they can become productive members of society.

Application and Assessment

The Teamwork Skills Inventory, Version 2019 by Strom and Strom (2018) is augmented

with of a guided step-by-step five lesson guided curriculum (Appendix B). The teacher and

student guides provided precise and easy to follow directions on completing the five lessons. The

lessons were established to provide students with an orientation to teamwork skills. Time

completion for the lessons range between twenty-five minutes to ten minutes for a total of 100 minutes total class time over the expanse of a twelve-week time period.

Research indicates the most effective type of grouping of students is heterogeneous grouping. This type of student grouping allows for a varying type of skill level abilities. "Because most employers value cooperation and teamwork, heterogeneous teams provide opportunities to prepare for or to reinforce practices that will be needed in the workplace" (Millis & Cottell, 1998, p. 13). Once students are allocated into their respective teams, teachers should give students specific roles within their cooperative groups. Strom and Strom (2014) identified cooperative learning exercises and roles (CLEAR) to be used along with the TSI; some examples include organizer, discussant, reviewer, summarizer, challenger, evaluator, improvisor, and storyteller. By including roles within cooperative group work students are being held accountable for a particular task where everyone has a job to perform and ultimately are taking ownership in their learning. Schellens et.al. (2007) concluded that group roles aid in knowledge comprehension and stressed "the importance of clearly defining and explaining the roles to the students" (p. 243). It is also important to note that student roles should rotate within the same group to prevent boredom and loss of participation from team members. By giving each student an equal opportunity to practice the different role's, students are able to acquire more teamwork skills. Students remained with the selected team members throughout the TSI assessment. It is recommended that teams work together at the first portion of the 12-week TSI program. This allowed for students to gain a deeper understanding of their team members normal behaviors and provided reliability for their observations. The inclusion of group roles and structured lessons within the TSI, allowed for students to have a more active learning experience from which to practice their teamwork skills.

Collectively, the five TSI lessons are designed to provide students with a structured learning experience to help them understand "the definition for team success, behaviors that are expected of everyone and conditions that promote fair and accurate feedback" (Brown, 2010, p. 31). The TSI lessons below are summations from Strom and Strom (2018) TSI Teacher Handout Version 2019.

The first TSI lesson was designed to help students define the meaning of success. It had a suggested time period of completion between week 1 to 2. During this lesson, groups selected their group names and worked together to define the word success. Later, teachers entered team names online in the TSI's class setup page along with student demographic information. In the introductory lesson, foundational basic teamwork skills were practiced as team members attempted to discuss, critique, and agree on a simple vocabulary word that had many underlying connotations within teamwork skills.

Lesson two was the introduction to the definitions of teamwork skills and completed within weeks 1 to 2. These goals explained the importance of teamwork skills and the role they play in their future workforce. Students were told that their future jobs would require them to be able to work cooperatively and have teamwork skills. Students were asked to write down specific teamwork skills with definitions in order to have a referenced criterion from which to self and peer assess other team members. Accommodations for special educations students included a fill in the blank or handout with definitions included.

The introduction of formative and summative assessments was discussed in the third lesson. It had a suggested time completion of somewhere between weeks 2 to 5. Students were informed that they would be observed and judged by their peers on their cooperative group work participation from their teammates. As such, the most important or valuable teamwork skills

were identified by the group members. Students were encouraged to discuss their newfound knowledge of teamwork skills with parents or guardians to reinforce their learned techniques. Also, during this 2-to-5 week gap, the fourth lesson ensues. During the fourth lesson students were recognized as the evaluators. In cooperative groups, team members discussed potential issues that may arise when they evaluated themselves and their peers. Then collaboratively, they developed methods to overcome each of the potential problems in a positive method.

During the 6th week, students assessed themselves and team members in their first online anonymous formative self and peer assessment. Since teachers had already entered the group names into the TSI, school codes and individual passwords were available for handout to each student for logging in to the TSI. Upon the first login, students were able to see their team page including their team's chosen name and group members. The formative self and peer assessment usual completion time is around 15–20 minutes. The assessment began by asking the student to identify teamwork skills they had observed on one of their teammates. "The evaluator is directed to place a check beside only those attitudes and skills this teammate demonstrated in a consistent way" (Strom & Strom, 2011, p. 241). They rated their observations using Flesch-Kincaid readability. The ratings are numerically based from 1 being the lowest and 20 being the highest. If a team member allocated a rating of 20 for a skill, a pop-up box appeared prompting students to reflect on their selection and ask the students if they are sure on their decision. If a team member was unsure of a criterion meaning, they could click the item and a definition box will arise. Once they had finished evaluating their first team member, another one is selected for appraisal. This continued on until all team members had been evaluated. The formative assessment concluded with the evaluation of the student's self-perspective on their teamwork abilities. "This instrument appeals to tech savvy students, avoids the task of hand scoring for

teachers, ad provides quick feedback to teachers and members of their classes" (Strom & Strom, 2011, p. 241). Students had access to the results within a few days of completion. Students were then able to review their feedback received and identify their strengths and weaknesses. Students remained in their respective teams and were encouraged to make adjustments based upon the feedback received.

The final lesson was to identify teamwork skills within the real world and included a suggested time frame occurring between weeks 7 to 10. Teammates were to research and find celebrities or known individuals who are known for their teamworking abilities. Furthermore, the group discussed what factors inhibited group success within their classroom and speculated whether or not this was applicable to the real world with the celebrities selected.

During weeks 11 and 12, students were administered the online anonymous summative evaluation to evaluate themselves and peer's performance. This was the final evaluation within the TSI. The results provided were similar to the format provided with the formative results. Students were able to access the summative results within a few days after evaluation. They were then able to see if there was an improvement from skills not observed during the formative evaluation to the summative evaluation. After students had sufficient time for discussion, the teacher reviewed the summative results with each team.

Setting Goals with Self-Reflection

Once students had received their formative assessment results, they were allotted time for self-reflection which occurred within or outside the classroom. Lew and Schmidt (2011) defined self-reflection as:

The processes that a learner undergoes to look back on his past

learning experiences and what he did to enable learning to occur

(i.e. self-reflection on how learning took place), and the

exploration of connections between the knowledge that was taught

and the learner's own ideas about them (i.e. self-reflection on what

was learned) (p. 530).

Students whom self-reflected meditated on their actions and behaviors they exhibit. They thought about how the assistance they provided by completing group and individual tasks was beneficial to the group. They also took time to ponder on how they could have performed an action or behavior differently to achieve a task more efficiently. When given the opportunity to reflect upon their team members perspectives of teamwork skills and behaviors observed, students were able to identify weaknesses they needed to target to improve before the summative assessment.

Teamwork skills can be identified three different ways; they can be a strength, weakness, or nonexistent. Skills are considered strength skills when they have ratings of 100% that indicates that all members observed this behavior. Skills that received a rating of 20% - 80% are behaviors that need improving (Brown, 2010; Strom & Strom, 2018). Furthermore, students who do not observe an attitude, behavior, or skill at all will receive a rating of 0% on a teamwork skill for a nonexistent skill. Students who receive above 80% on a particular teamwork skill from their team members and a check mark on the same skill under the self-assessment column, have exhibited evidence that both the student and the team members are observing the same skill in a similar manner (Strom & Strom, 2018; Brown, 2010). Essentially everyone in the group is in agreement that the team member is reliably demonstrating a behavior or skill. After students

reviewed their individual portfolios, they began to set goals to improve their weaknesses. On the basis of practicality, students reflected on the lowest rated skills to improve first. For example, if a student received a peer-assessed average score of zero on staying focused on the task during group work, then the student should have made a mental note to participate and be more attentive during cooperative group work. Students who practice self-reflection and setting goals are changing their learning techniques for a growth mind-set that is beneficial to their future employment.

Instrumentation

The goal of any assessment is to provide a reliable and accurate review of work submitted to determine content comprehension. The Teamwork Skills Inventory is a reliable instrument designed by Strom (1997) with the internal consistencies of the survey instrument and questions being calculated by Cronbach's alpha coefficient procedures to provide a true and accurate reliability of peer and self-assessment scores (p. 52). Furthermore, the TSI was verified as a reliable assessment tool with decades of proven results from Buros (2017) who are the "world's premier test review center" (Buros, 2021). Buros (2021) indicated a strength of the TSI to occur in its availability of online assessment with profiles available on an individual, group, and class-wide format. "Teachers and students are likely to find the TSI is a useful tool in determining strengths and limitations related to skills necessary for social interactions and teamwork success" (Buros, 2021, p. 5). The only concern indicated by Buros (2021) was the assessment tool could "marginalize students who are disliked by a group of peers" (p. 5). In anticipation of this potential problem, it was the educator's job to provide discussions on

effective evaluation techniques as well as have a general understanding of students' potential personality conflicts.

The TSI has 25 teamwork skill statements that students in cooperative groups evaluated each other as well as themselves. Students evaluated themselves and team members by selecting observed teamwork skills in an inventory type response. These responses were collected through an anonymous online format and then rated within five clusters. Approval from the internal review board was obtained to utilize this data (Appendix A). The feedback was presented to each student individually in a portfolio with anonymous ratings. Teachers were able to view all the data received in a excel spreadsheet. The TSI is available to all educators with permission being granted from the authors Strom and Strom (2019).

Data Analysis

This research consisted of a quantitative self and peer assessment design. Data was collected through formative and summative assessments. Furthermore the data was obtained electronically through the online anonymous TSI which can be found at www.teamworkskillsinventory.org. Feedback results were provided to the educator in an excel file format. The feedback results were computed utilizing the SPSS v.26. The first step in statistical analysis was to prepare the data; beginning by renaming the variables (for easier statistical analysis comprehension), computing total score for each category in the TSI, and identifying any data errors. Data analysis for the first research question was comparing the mean score of each category in the TSI between peer and self assessments in the formative and summative evaluation using the paired samples t-tests. Descriptive statistics and correlations were provided. The second and third research questions to identify the most and least observed

teamwork skills were analyzed by calculating the summation and frequency of the data on both an individual teamwork skill level and subscale level. The teamwork skill with the highest score was indicated for the most observed teamwork skills while the lowest score reflected the teamwork skill that is least observed by team members. The final research question was statistically analyzed to determine if gender perceptions on teamwork skills were existent through independent samples t-test. This provided scaled scores for the formative and summative results. A Cohen's *d* effect size was also analyzed to determine the effect size if there was a significant difference for men and women.

CHAPTER 4

FINDINGS

<u>Introduction</u>

This chapter provides transparent findings of the results obtained from the Teamwork

Skills Inventory, an online self and peer assessment as completed by 8th grade students in a math

classroom. It is with very strong reservations that this researcher suggests that the results may be

to some extent generalizable to other 8th grade math classes in secondary schools. The results

provide teachers with tested research data about adolescent students' potential misconceptions

that can be beneficial to teacher's instruction. For example, if teachers know are made aware of

potential gender misconceptions regarding teamwork skills, then techniques can be implemented

to curb this biased opinion. Consistent with the purpose of this research, the data were analyzed

using the most effective, transparent methods to provide accurate, unbiased findings. Again, this

research focused on the following research questions. Question One: How do self and peer

assessments of teamwork of 8th graders in a math course compare and contrast using the

Teamwork Skills Inventory (TSI)? Question Two: What teamwork skills lend themselves most to

teamwork during math learning for 8th graders from the Teamwork Skills Inventory (TSI)?

Question Three: What teamwork skills lend themselves least to teamwork during math learning

for 8th grades from the Teamwork Skills Inventory (TSI)? Question Four: How does gender

affect student's perception of teamwork skills using the Teamwork Skills Inventory (TSI)? The

findings for each research questions are presented below. The results can help teachers, schools,

and ultimately employers gain a better understanding of what age range students should be able

to learn certain types of ideas related to teamwork. This can provide information about a

particular age group of students, in this case 8th graders in a pre-algebra class, that might be generalizable to other schools. A level of agreement is also evident between the self and peer perceptions of adolescent students. For example, it can provide insight if girls vs boys will have considerable differences during middle school in an 8th grade math class. This can help teachers know ahead of time the potential misconceptions which can aid teachers with their instructions. Finally, the results can help inform current and future research projects.

The TSI was administered for formative and summative evaluations. All research questions utilized the 25 teamwork skills within the following 5 subcategories: attends to teamwork, seeks and shares information, communicates with teammates, thinks critically and creatively, and gets along in the team (Strom & Strom, 2018). Each student received an individual profile page that indicated teamwork skills observed and not observed according to team members as well as their self-assessment. Student profile pages were provided during the formative assessment and the summative assessment.

Descriptive Statistics

The sample consisted of 91 8th grade students from a math classroom. Of the 91 students none were excluded in the analysis of the data. The teamwork skills were divided into subcategories. The first subscale (S1), attends to teamwork, consisted of teamwork skills #1 –5. The second subscale (S2), seeks and shares information, includes teamwork skills #6 – 10. The third subscale (S3), communicates with teammates, contains teamwork skills #11– 15. The fourth subscale (S4), thinks critically and creatively, is composed of teamwork skills #16 – 20 and finally the fifth subscale (S5), gets along in the team, includes the remaining teamwork skills #21 – 25. Given the data includes both summative and formative peer and self-evaluation, the

findings henceforth will be reported according to the subscales 1 through 5 including the peer formative, peer summative, self formative, and self summative perspectives.

The highest mean of all the subscales including both formative and summative was 3.13 while 2.03 was the smallest average (Table 3). The mean numbers are representatives of the average of teamwork skills as observed by students. The equally small standard deviation band was from 1.7 to 0.74, showing an indication that the student observation ratings were very closely ranged.

Table 3

Overall Descriptive Statistics

	Peer Formative	Self Formative	Peer Summative	Self Summative
Subscale 1				
Mean	3.01	3.05	2.62	3.13
Std. Dev.	1.02	1.54	0.94	1.71
Subscale 2				
Mean	2.15	2.43	2.03	2.49
Std. Dev.	0.75	1.51	0.77	1.39
Subscale 3				
Mean	2.75	2.86	2.37	2.85
Std. Dev.	0.84	1.59	0.90	1.47
Subscale 4				
Mean	2.41	2.57	2.14	2.52
Std. Dev.	0.79	1.62	0.86	1.45
Subscale 5				
Mean	2.85	2.87	2.40	2.76
Std. Dev.	0.91	1.61	0.87	1.59

N=91

<u>Reliability</u>

Evidence of reliability was obtained by administering the Cronbach's Alpha test using SPSS v.26. The Cronbach's Alpha measures the internal consistency and indicates how closely related the subscale scales within the Teamwork Skills Inventory are to each other. The five subscales (S1 – S5) within peer formative were analyzed with the five subscales (S1 – S5) in peer summative (Table 4). Cronbach's alpha showed subscales reached acceptable reliability, $\alpha = 0.89$. No items were excluded, all cases were utilized in the analysis. Inter-item correlation indicated positive values with values above 0.5. Overall, there was a high correlation between peer formative and peer summative subscales. Similar results were obtained between self-formative subscales and self-summative subscales. Cronbach's Alpha indicated an acceptable reliability, $\alpha = 0.87$. Again, there were no items excluded and all inter-item correlation provided a positive value above 0.5 therefore indicating a high correlation between the self-formative and summative subscales.

Table 4

Peer and Self Formative and Summative Reliability

Subscale	Peer Formative	Peer Summative	Self Formative	Self Summative
S1	.64	.62	.65	.66
S2	.42	.44	.61	.49
S3	.58	.59	.67	.56
S4	.48	.50	.67	.54
S5	.61	.57	.67	.67

RQ1: How do self and peer assessments of teamwork of 8th graders in a math course compare and contrast using the Teamwork Skills Inventory (TSI)?

A parametric test, paired samples t-test, was conducted to determine whether or not there was statistical evidence of mean differences between peer and self-assessments using the TSI for research question one. Specifically, this researcher sought to determine if the means for peer assessments were the same or different for self-assessment of the twenty-five teamwork skills.

Using SPSS (v.26) the peer and self-assessment results were paired according to formative and summative subscales (Table 5). Pair 1 included the formative peer and self-assessment data for the first subscale (S1) of teamwork skills (teamwork skills 1 through 5) and pair 2 contained the summative peer and self-assessments for S1. The next set of pairs incorporated subscale 2 (S2) wherein pair 3 encompassed the formative peer and self-assessment data for teamwork skills (teamwork skills 6 through 10) and pair 4 contained the summative peer and self-assessments S2. Pair 5 included the formative peer and self-assessment data for the third subscale (S3) of teamwork skills (teamwork skills 11 through 15) and pair 6 contained the summative peer and self-assessments for S3. Teamwork skills 16 through 20 are identified as the fourth subscale (S4) and included pair 7, the formative peer and self-assessment data, was paired with pair 8, the summative peer and self-assessments. Pair 9 included the formative peer and self-assessment data for the fifth subscale (S5) of teamwork skills (teamwork skills 21 through 25) and pair 10 contained the summative peer and self-assessments for the fifth subscale (S5). To determine if the paired samples t-test provided statistically significant differences, the significance level of the paired samples t-test was set at .05.

Subscale One – Teamwork Skills Inventory Questions 1 - 5

The paired samples t-test examined the differences between self and peer formative evaluation for the first subscale, attends to teamwork. The result indicated that there was no

statistically significant difference between peer evaluation (*M*=3.01, *SD*=1.02) and self evaluation (*M*=3.05, *SD*=1.54), *t*(90)=-0.24, *p*=.81. Any correlation between the two pairs is likely due to chance.

The paired samples t-test examined the differences between self and peer summative evaluation for the first subscale, attends to teamwork. The result indicated that there was a statistically significant difference between peer evaluation (*M*=2.62, *SD*=0.94) and self evaluation (*M*=3.13, *SD*=1.71), *t*(90)=-2.453, *p*=.02. To determine the effect size, Cohen's *d* was calculated to determine a small effect size of 0.26. Essentially, the peer and self-assessment summative results did indicate a statistically significant difference between the mean wherein the self-assessment summative was slightly higher than the peer summative.

Subscale Two – Teamwork Skills Inventory Questions 6 - 10

The paired samples t-test examined the differences between self and peer formative evaluation for the second subscale, seeks and shares information. The result indicated no statistically significant difference between peer evaluation (*M*=2.15, *SD*=0.75) and self evaluation (*M*=2.43, *SD*=1.51), *t*(90)=-1.6, *p*=.11. Any correlation between the two pairs is likely due to chance.

The paired samples t-test examined the differences between self and peer summative evaluation for the second subscale, seeks and shares information. The result indicated that there was a statistically significant difference between peer evaluation (*M*=2.03, *SD*=0.77) and self evaluation (*M*=2.49, *SD*=1.39), *t*(90)=-2.6, *p*=.01. Cohen's *d* was utilized to discover the effect size of 0.27 in which the self-summative was slightly larger than the peer summative means.

Subscale Three – Teamwork Skills Inventory Questions 11 - 15

The paired samples t-test examined the differences between self and peer formative evaluation for the third subscale, communicates with teams. The result indicated that there was no statistically significant difference between peer evaluation (M=2.75, SD=0.84) and self evaluation (M=2.86, SD=1.59), t(90)=-0.58, p=.56. Any correlation between the two pairs is likely due to chance.

The paired samples t-test examined the differences between self and peer summative evaluation for the third subscale, communicates with teams. The result indicated that there was a statistically significant difference between peer evaluation (M=2.37, SD=0.9) and self evaluation (M=2.85, SD=1.47), t(90)=-2.5, p=.01. To determine the effect size, Cohen's d was calculated to determine a small effect size of 0.26. Essentially, the peer and self-assessment summative results did indicate a statistically significant difference between the mean wherein the self-assessment summative was slightly higher than the peer summative.

Subscale Four – Teamwork Skills Inventory Questions 16 - 20

The paired samples t-test examined the differences between self and peer formative evaluation for the fourth subscale, thinks critically and creatively. The result indicated that there was no statistically significant difference between peer evaluation (M=2.41, SD=0.79) and self evaluation (M=2.57, SD=1.62), t(90)=-0.88, p=.38. Any correlation between the two pairs is likely due to chance.

The paired samples t-test examined the differences between self and peer summative evaluation for the fourth subscale, thinks critically and creatively. The result indicated a statistically significant difference between peer evaluation (M=2.14, SD=0.86) and self

evaluation (*M*=2.52, *SD*=1.45), $t(90)$=-2.07, *p*=.04. To determine the effect size, Cohen's *d* was calculated to determine a small effect size of 0.22. Essentially, the peer and self-assessment summative results did indicate a statistically significant difference between the mean wherein the self-assessment summative was slightly higher than the peer summative.

Subscale Five – Teamwork Skills Inventory Questions 21 through 25

The paired samples t-test examined the differences between self and peer formative evaluation for the fifth subscale, gets along in the team. The result indicated no statistically significant difference between peer evaluation (*M*=2.90, *SD*=0.91) and self evaluation (*M*=2.87, *SD*=1.61), $t(90)$=-0.09, *p*=.93. Any correlation between the two pairs is likely due to chance.

The paired samples t-test examined the differences between self and peer summative evaluation for the fifth subscale, gets along in the team. The result indicated a statistically significant difference between peer evaluation (*M*=2.40, *SD*=0.87) and self evaluation (*M*=2.76, *SD*=1.60), $t(90)$=-2.06, *p*=.04. To determine the effect size, Cohen's *d* was calculated to determine a small effect size of 0.22. Essentially, the peer and self-assessment summative results did indicate a statistically significant difference between the mean wherein the self-assessment summative was slightly higher than the peer summative.

Table 5: Summary of TSI Paired T-Tests

Subscale of TSI Teamwork Skills	Pairs	N	Form. or Sum.	Peer Mean(SD)	Self Mean(SD)	t-value	Sig. *p.*	Cohen's D Effect Size
S1	Pair 1	91	F	3.01(1.01)	3.08(1.57)	-0.24	0.808	n/a

S1	Pair 2	91	S	2.62(0.94)	3.13(1.71)	-2.45	0.016	0.26
S2	Pair 3	91	F	2.15(0.75)	2.43(1.51)	-1.60	0.114	n/a
S2	Pair 4	91	S	2.03(0.77)	2.49(1.39)	-2.59	0.011	0.27
S3	Pair 5	91	F	2.75(0.84)	2.86(1.60)	-0.58	0.563	n/a
S3	Pair 6	91	S	2.37(0.90)	2.85(1.49)	-2.50	0.014	0.26
S4	Pair 7	91	F	2.41(0.79)	2.57(1.62)	-0.88	0.380	n/a
S4	Pair 8	91	S	2.14(0.86)	2.52(1.45)	-2.07	0.041	0.22
S5	Pair 9	91	F	2.85(0.91)	2.87(1.61)	-0.09	0.927	n/a
S5	Pair 10	91	S	2.40(0.87)	2.76(1.60)	-2.06	0.042	0.22

RQ2: What teamwork skills lend themselves most to teamwork during math learning for 8th graders from the Teamwork Skills Inventory (TSI)?

The second research question focused on identifying the most often observed teamwork skill within the peer, self, and subscale formative and summative results. The collected data reflected students' responses as either a 0 or a 1; where 0 would indicate a teamwork skill not being present and a 1 would indicate a teamwork skill being present. The frequency of the data was calculated and separated according to categories; peer formative, peer summative, self-assessment formative, and self-assessment summative. The sum of the number of each skills observed was calculated for each individual teamwork skill level and then for each of the five teamwork skill subscales. From this the frequency was obtained through addition and the results represented according to the most observed teamwork skill in the peer formative, the peer summative, the self-assessment formative, the self-assessment summative, the subscale formative, and the subscale summative. See Table 6 for frequencies of teamwork skills.

Peer Formative

The peer formative data reflected students' perception of teamwork skills they observed from their peers within their cooperative groups. The formative assessment occurred after a period of three-to-four weeks and included students recording their observation of teamwork skills in an online anonymous assessment. This was the initial evaluation from which students identified teamwork skills observed or not observed. This information was then provided to team members as a means for them to improve upon teamwork skills that were not existent. Analysis of the peer formative data indicated that the most frequently observed teamwork skill in the peer formative data was teamwork skill twenty-one, "this peer takes suggestions for improvement in a friendly way" (Strom & Strom, 2018, p. 7). In adolescence students this can be a challenge as "students sometimes consider criticism a threat to self-esteem" (Strom & Strom, 2018, p. 10). While criticism is difficult, the majority of the 8th grade students in this math class observed their team members being able to discuss potential improvement options and were open to suggestions during cooperative group to help accomplish the group goals.

Subscale Peer Formative

The peer formative data was also utilized to determine the most observed subscale of teamwork skills through summation of the frequencies of individual teamwork skills. The total summation for the frequencies of each subscale were: S1-869, S2-625, S3-800, S4-699, and S5-834 (Table 6). The data indicated the greatest frequency occurred in attends to teamwork (S1). S1 includes the following teamwork skills; attends to teamwork, seeks and shares information, communicates with teammates, thinks critically and creatively, and gets along in the team (Strom

& Strom, 2018, p. 7). This formative data is reflective of student observations in this research study with no prior knowledge of which teamwork skills the students need to become more proficient in. Collectively, the cooperative group members indicated that they observed most of the S1 teamwork skills while working in their groups the initial three-to-four weeks.

Peer Summative

Following the formative assessment, students were provided an individual profile page. This helped students to identify which of the twenty-five teamwork skills they needed to refine and which ones they were proficient at. To aid in teamwork skill proficiency, class discussions were held both in whole group and individual conference to discuss ways to improve teamwork skill deficiencies. After three-to-four weeks of working on improving teamwork skills within their cooperative groups a summative assessment was administered. The peer summative data reflected students' observation of their peers' teamwork skills. Analysis of the peer summative data indicated that the most frequently observed teamwork skill was teamwork skill one, "this peer shows acceptable attendance for team meetings" (Strom & Strom, 2018, p. 7). In a public school setting, this teamwork skill is reflective of student attendance. Students who have a habit of attending class regularly "are able to make a greater contribution to the group" (Strom & Strom, 2018, p. 8). Consistently attending school can create healthy habits for future employment wherein they will be relied upon to work effectively in cooperative groups.

Subscale Peer Summative

The frequency of the individual teamwork skills in the peer summative results were added according to the subscales to determine which subscale occurred the most. This indicated

which set of teamwork skills were observed the most by the adolescent students. The total summation for the frequencies of each peer summative subscale were: S1-767, S2-599, S3-705, S4-636, and S5-719 (Table 6). Like the peer formative subscale results, the peer summative subscale results also indicate that the most frequently subscale observed was attends to teamwork (S1). Following teamwork skill in-class discussions and cooperative group work practice for an additional three-to-four weeks, students remained consistent in verifying that the most observed team member behaviors occurred within the S1 teamwork skills.

Self Formative

The self formative data reflected students' self formative assessment of their performance of teamwork skills they perceived to be occurring while participating within their cooperative groups. The self and peer formative data was collected when the Teamwork Skills Inventory was initially administered. This information was then provided to team members as a means for them to improve upon teamwork skills they identified themselves as not existent. Analysis of the self formative data indicated that students identified teamwork skill 5 as the most observed; "this peer does a fair share of the work expected of everyone" (Strom & Strom, 2018, p. 7). This is indicative of students believing that they have a high level of group participation wherein they are recognizing themselves "for the efforts they make to support group success" (Strom & Strom, 2018, p. 8).

Subscale Self Formative

The self formative data was also utilized to determine the most observed subscale of teamwork skills. The total summation for each of the five subscales were: S1-278, S2-221, S3-

260, S4-235, and S5-261 (Table 6). As with the peer formative and summative, the self formative data also reflected attends to teamwork (S1) as being the most observed by the adolescent students. Attends to teamwork (S1) results were chosen by the students after cooperative group participation for three weeks and without prior identification of deficient teamwork skills.

Self Summative

Following the self formative assessment, students evaluated their individual profile page to identify which of the twenty-five teamwork skills they needed to refine. In-class discussions and extended time to work in cooperative groups provided an opportunity for students to practice and self-reflect upon their teamwork skills. The self summative data reflected students' perception of their teamwork skills. Analysis of the self summative data provided the most frequently observed teamwork skill to be teamwork skill one, "this peer shows acceptable attendance for team meetings" (Strom & Strom, 2018, p. 7). Essentially, the majority of adolescent students in this research study identified attendance to team meetings as one of their most occurring teamwork skills since they attended and participated within the cooperative group on a consistent, regular basis. This is an essential skill for future employers as new hires will be relied upon to attend work regularly and have the ability to work cooperatively to obtain team goals.

Subscale Self Summative

The self summative subscale of teamwork skills includes the top five teamwork skills with the highest frequency after summation. Following addition of the frequency of individual

teamwork skills, the most observed self summative subscale was identified. The total summation for each of the five self summative subscales were: S1-275, S2-227, S3-261, S4-228, and S5-254 (Table 6). As in the previous subscales, the self summative data indicated attends to teamwork (S1) as the most observed set of teamwork skills.

Table 6: Total Frequency for Subscales and Individual Teamwork Skills

Sub-scale	Teamwork Skill	PF	PS	SF	SS
S1	**Attends to Teamwork**	**869**	**767**	**278**	**275**
1	This peer shows acceptable attendance for team meetings.	184	190	64	68
2	This peer arrives on time for team meetings.	185	183	55	59
3	This peer stays focused on the task during class.	168	146	56	56
4	This peer fulfills individual roles such as organizer or reporter.	142	100	37	36
5	This peer does a fair share of the work expected of everyone	190	148	66	56
S2	**Seeks and Shares Information**	**625**	**599**	**221**	**227**
6	This peer admits uncertainty when in doubt about what to do.	181	168	59	60
7	This peer asks questions that help the group to understand lessons.	159	155	46	55
8	This peer helps others by explaining or reviewing lessons.	132	126	56	52
9	This peer brings reading materials for the group to examine.	74	66	27	29
10	This peer refers to reading materials during discussions.	79	84	33	31
S3	**Communicates with Teammates**	**800**	**705**	**260**	**261**
11	This peer shares experiences, feelings, ideas, or opinions.	184	167	55	58
12	This peer speaks clearly and uses easily understood vocabulary.	175	153	61	59
13	This peer limits the length of comments so others get to talk.	137	122	44	40
14	This peer listens to everyone and respects his or her views.	180	155	64	58
15	This peer encourages and recognizes the contributions of others.	124	108	36	46
S4	**Thinks Critically and Creatively**	**699**	**636**	**235**	**228**
16	This peer considers views that differ from his or her opinions.	162	147	60	55
17	This peer uses logic to challenge group thinking or work methods.	118	106	32	28
18	This peer carefully thinks about ideas before reaching conclusions.	142	135	54	61
19	This peer builds on the ideas of others.	161	141	50	47
20	This peer offers new ways of looking at ideas or problems.	116	107	39	37
S5	**Gets Along in the Team**	**834**	**719**	**261**	**254**
21	This peer takes suggestions for improvement in a friendly way.	197	183	60	66
22	This peer avoids using put-downs or blaming others for problems.	147	132	56	45
23	This peer accepts compromise as a way to deal with conflict.	154	133	44	47
24	This peer keeps trying even when the task becomes hard.	179	151	59	56
25	This peer expresses hope about group success.	157	120	42	40

PF – Peer Formative; PS – Peer Summative; SF – Self Formative; SS – Self Summative

RQ3: What teamwork skills lend themselves least to teamwork during math learning for 8th grades from the Teamwork Skills Inventory (TSI)?

The third research question focused on identifying the least often observed teamwork skill within the peer, self, and subscale formative and summative results. As indicated earlier to calculate the frequencies of teamwork skills, a 0 or 1 was provided to a teamwork skill according to whether or not a student observed the behavior. Next the data was separated according to categories and the sum of the data was added for the individual teamwork skill level. Once the individual teamwork skill frequency was obtained, every five skills were added to create the subscale of teamwork skills. With the data analyzed accordingly, the least observed teamwork skills for peer formative, peer summative, self assessment formative, self assessment summative, subscale formative and subscale summative were obtained. See Table 6 for frequencies of teamwork skills.

Peer Formative

As indicated earlier in research question two, the peer formative data reflected peer observations within cooperative groups. The formative assessment was the initial assessment in this research study and began after students had three-to-four week time period to make observations while working in cooperative groups. Analysis of the peer formative data indicated that the least frequently observed teamwork skill was nine, "this peer brings reading materials for the group to examine" (Strom & Strom, 2018, p. 7). Strom and Strom (2018) recommended that for this teamwork skill, "everyone should locate other reading materials related to lessons without being told to do so" (p. 9). This skill can be a challenge for adolescent students as the majority do not bring additional outside reading materials to a math class involving math with

the exception of a math textbook; thereby indicating the least observed teamwork skill according to peers in the formative assessment.

Subscale Peer Formative

The collected peer formative data were obtained following a three-week time period in which students worked collaboratively with their team members. Through summation of the frequencies of individual teamwork skills, the peer formative subscale data was obtained. This data specified the least observed subscale of teamwork skills. The total summation for the frequencies of each subscale were: S1-869, S2-625, S3-800, S4-699, and S5-834 (Table 6). The subscale that was observed the least amount by adolescent peers in an 8th grade math class was subscale 2, seeks and shares information. S2 teamwork skills focus on seeking and sharing information amongst team members within cooperative groups (Strom & Strom, 2018). The least observed teamwork skill as identified by the peer formative data is also encompassed within seeks and shares information subscale. The formative data reflected student's observations without having previously identified any teamwork skill deficits.

Peer Summative

The peer summative data were collected after students worked collaboratively and had obtained the results from their formative assessment on teamwork skills. Like the peer formative, the least frequently observed teamwork skill for the peer summative was teamwork skill nine; "this peer brings reading materials for the group to examine" (Strom & Strom, 2018, p. 7). This indicates that although the students were able to identify this weak teamwork skill

weeks prior to improve upon, they did not observe their team members displaying this teamwork skill.

Subscale Peer Summative

The peer formative subscale identified seeks and shares information subscale as the least amount of frequency for peer subscale of teamwork skills. This is also true for the peer summative subscale. The total summation for the frequencies of each peer summative subscale were: S1-767, S2-599, S3-705, S4-636, and S5-719 (Table 6). S2 teamwork skills incorporates students admitting to uncertainty when in doubt about what to do, asking questions that help the group to understand lessons, help others by explaining or reviewing the lessons, bring reading materials for the group to examine, and refers to reading materials during discussions (Strom & Strom, 2018).

Self Formative

Students' perceptions of what teamwork skills they were or were not portraying during cooperative group work are imbedded in the formative data results. Echoing the peer formative and summative results, students' formative self assessment results also indicated that teamwork skill nine was the least observed. Through self-reflection, students recognized their lack of bringing reading materials to their cooperative groups. This recognition of teamwork skill deficit should have prompted students to bring appropriate reading materials to aid with group success.

Subscale Self Formative

The formative assessment provided an opportunity for students to self-reflect on teamwork skills they perceived to have or to have not exhibited during cooperative group work. The data indicated the least observed subscale of teamwork skills to occur within the subscale 2 , seeks and shares information. The total summation for each of the five subscales were: S1-278, S2-221, S3-260, S4-235, and S5-261(Table 6). Seeks and shares information subscale contained the least observed self formative teamwork skill nine as well.

Self Summative

The self assessment summative data were collected following a three-week time period from the formative assessment. The formative data indicated which teamwork skills students could focus on that were identified as weak or non-existent. Analysis of the self summative data provided the most frequently observed teamwork skill to be teamwork skill 17, "this peer uses logic to challenge group thinking or work methods" (Strom & Strom, 2018, p. 7). Essentially, the majority of adolescent students in this research study identified this critical thinking skill as one of their least occurring teamwork skills. Having the ability to think critically and creatively is beneficial for future employment and as such, students should have more opportunities to practice this teamwork skill.

Subscale Self Summative

In this research study, students self-reflected on their cooperative group work experiences during the summative assessment. During this assessment, students were able to reflect on teamwork skills that were weak or non-existent. The subscale of teamwork skills that students indicated as occurring the least amount during cooperative group work was thinks critically and

creatively (S4). S4 teamwork skills include; peers consider views that differ from their opinions, peer uses logic to challenge group thinking, peers think about ideas before reaching conclusions, peers built on ideas of others, and peers offer new ways of solving problems (Strom & Strom, 2018). The total summation for each of the five self summative subscales were: S1-275, S2-227, S3-261, S4-228, and S5-254 (Table 6). While subscale thinks critically and creatively is very close in frequency with subscale seeks and shares information, it is important to note that the focus was on which subscale of teamwork skills were the least observed.

RQ4: How does gender effect student's perception of teamwork skills using the Teamwork Skills Inventory (TSI)?

Research question four focused on determining if gender affected student's perception of the twenty-five teamwork skills. To determine if there are any influences between means for males, females and the subscale of teamwork skills, an independent samples t-test was conducted based on student's self assessment scores. This data contained 44 females and 47 males' means were compared with formative and summative subscales teamwork skills to find out if the means of the two genders were different. There was no indication of which gender would be greater, therefore a non-directional two-tailed test was applied. An alpha level of 0.05 or 5% was allowed for the margin of error. The degrees of freedom (df) were 89. SPSS v.26, provided 10 sample comparisons for analysis wherein females were assigned a 1 and males a 2. All results are equal variances assumed as Levene's Test for Equality of Variances was not significant due to having a significance value greater than .05. The above information was utilized with the 10 mean comparisons from the independent samples t-test.

Independent Samples T-Test Subscale 1 Formative

An independent samples t-test was conducted to determine a difference of means between males and females self assessment formative data within the teamwork skills subscale attends to teamwork. The groups did not differ significantly, $t(89) = 0.35$, $p = .73$, 95% CI [-0.53, 0.76]. The mean for the females ($M = 3.11$, $SD = 1.59$) was not significantly different than the mean for the males ($M = 3.00$, $SD = 1.50$). This finding does not support the idea that there was a different perception of the subscale attends to teamwork between male and female students' formative self assessment.

Independent Samples T-Test Subscale 1 Summative

The summative data for teamwork skills subscale, attends to teamwork, was analyzed using an independent samples t-test to determine a difference of means between genders. The group means did not differ significantly, $t(89) = -0.34$, $p = .73$, 95% CI [-0.84, 0.60]. The mean for the females ($M = 3.07$, $SD = 1.63$) was not significantly different than the mean for the males ($M = 3.19$, $SD = 1.80$). This finding does not support the idea that there was a different perception of the subscale attends to teamwork between male and female students' summative self assessment.

Independent Samples T-Test Subscale 2 Formative

An independent samples t-test was conducted to determine a difference of means between males and females self assessment formative data within the teamwork skills subscale, seeks and shares information. The groups did not differ significantly, $t(89) = -1.52$, $p = .13$, 95% CI [-1.10, 0.15]. The mean for the females ($M = 2.18$, $SD = 1.50$) was not significantly different than the

mean for the males (M =2.66, SD = 1.51). This finding does not support the idea that there was a different perception of the teamwork subscale seeks and shares information between male and female students' formative self assessment.

Independent Samples T-Test Subscale 2 Summative

Seeks and shares information teamwork skills data was utilized to determine a difference of means between male and female summative data with an independent samples t-test. The groups did not differ significantly, $t(89)$ = -1.02, p = .31, 95% CI [-0.88, 0.28]. The mean for the females (M =2.34, SD = 1.35) was not significantly different than the mean for the males (M =2.64, SD = 1.42). This finding does not support the idea that there was a different perception of the teamwork skills subscale seeks and shares information between male and female students' summative self assessment.

Independent Samples T-Test Subscale 3 Formative

Communicates with teammates teamwork skills data were applied in an independent samples t-test to determine a difference of means between males and females self assessment formative data. The groups did not differ significantly, $t(89)$ = 0.04, p = .97, 95% CI [-0.65, 0.68]. The mean for the females (M =2.86, SD = 1.49) was not significantly different than the mean for the males (M =2.85, SD = 1.69). This finding does not support the idea that there was a different perception of the teamwork subscale communicates with teammates between male and female students' formative self assessment.

Independent Samples T-Test Subscale 3 Summative

The summative data for teamwork skills subscale, communicates with teammates, was analyzed using an independent samples t-test to determine a difference of means between genders. The groups did not differ significantly, $t(89) = -0.32$, $p = .75$, 95% CI [-0.71, 0.52]. The mean for the females ($M = 2.80$, $SD = 1.41$) was not significantly different than the mean for the males ($M = 2.89$, $SD = 1.54$). This finding does not support the idea that there was a different perception of the teamwork skills subscale communicates with teammates between male and female students' summative self assessment.

Independent Samples T-Test Subscale 4 Formative

An independent samples t-test was conducted to determine a difference of means between males and females self assessment formative data within the teamwork skills subscale thinks critically and creatively. The groups did not differ significantly, $t(89) = -1.19$, $p = .24$, 95% CI [-1.08, 0.27]. The mean for the females ($M = 2.36$, $SD = 1.53$) was not significantly different than the mean for the males ($M = 2.77$, $SD = 1.70$). This finding does not support the idea that there was a different perception of the teamwork subscale thinks critically and creatively between male and female students' formative self assessment.

Independent Samples T-Test Subscale 4 Summative

The summative data from teamwork skills subscale thinks critically and creatively were once again utilized to determine a difference of means between males and females. This sample comparison focused on the self assessment summative data. The groups did not differ significantly, $t(89) = .04$, $p = .97$, 95% CI [-0.60, 0.62]. The mean for the females ($M = 2.52$, $SD = 1.42$) was not significantly different than the mean for the males ($M = 2.51$, $SD = 1.49$). This

finding does not support the idea that there was a different perception of the teamwork skills subscale thinks critically and creatively between male and female students' summative self assessment.

Independent Samples T-Test Subscale 5 Formative

An independent samples t-test was conducted to determine a difference of means between males and females self assessment formative data within the teamwork skills subscale gets along in the team. The groups did not differ significantly, $t(89) = -.94$, $p = .35$, 95% CI [-0.99, 0.36]. The mean for the females ($M = 2.70$, $SD = 1.65$) was not significantly different than the mean for the males ($M = 3.02$, $SD = 1.58$). This finding does not support the idea that there was a different perception of the teamwork subscale gets along in the team between male and female students' formative self assessment.

Independent Samples T-Test Subscale 5 Summative

The final comparison in the independent samples t-test was conducted to determine a difference of means between males and females' self assessment summative data within the teamwork skills subscale gets along in the team. Again, the groups did not differ significantly, $t(89) = -.57$, $p = .57$, 95% CI [-0.86, 0.48]. The mean for the females ($M = 2.66$, $SD = 1.66$) was not significantly different than the mean for the males ($M = 2.85$, $SD = 1.55$). This finding does not support the idea that there was a different perception of the teamwork skills subscale gets along in the team between male and female students' summative self assessment.

Summary

This chapter focused on providing a transparent analysis for the students' perception of teamwork skills. Descriptive statistics for each of the subscales according to formative and summative were reported which included the means and standard deviation. Total frequencies for individual and subscale teamwork skills were provided. Individual and paired samples t-test results were also conveyed. The aforementioned tests and statistical results were utilized in each of the proposed research questions.

Research question one sought to determine if the formative and summative means for peer assessments are the same or different for self assessment of the twenty-five teamwork skills. Paired samples t-test conducted for each of the subscales, including both formative and summative, were reported. The results indicated no significant difference between peer and self formative evaluation. Following the identification of teamwork skills, summative results indicated a statistically significant difference between the peer and self summative evaluations for each of the subscales.

Research question two sought to identify the most commonly observed teamwork skills as identified by peer, self, formative subscale, and summative subscale results. By calculating the sum of the number of skills observed, this researcher was able to identify teamwork skill twenty-one, this peer takes suggestions for improvement in a friendly way, as the most observed teamwork skill according to the peer formative results; while this peer shows acceptable attendance for team meetings, was the most observed teamwork skill for the peer summative (Strom & Strom, 2018). The self formative data identified teamwork skill five, this peer does a fair share of work expected of everyone, as the most occurring; while the self summative results indicated teamwork skill one, this peer shows acceptable attendance for team meetings as the

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most occurring (Strom & Strom, 2018). The subscale most identified according to the peer formative, peer summative, self formative, and self summative data was subscale 1, attends to teamwork (Strom & Strom, 2018).

The least observed teamwork skill was the focus for research question three where peer, self, formative and summative subscale results were identified. Peer formative, peer summative, and self formative each indicated that teamwork skill nine, this peer brings reading materials for the group to examine, as the least observed teamwork skill (Strom & Strom, 2018). Subscale peer formative, subscale peer summative, and subscale self formative each reported that subscale 2, seeks and shares information to be the least observed subscale (Strom & Strom, 2018). Teamwork skill seventeen was the least observed teamwork skill according to the self summative data. Finally, subscale four was the least observed according to the subscale self summative. The individual and subscale frequencies can be located in Table 6.

The final research question focused on determining if gender affected student's perception of the twenty-five teamwork skills. Student's self assessment results were analyzed through an independent samples t-test to determine if there were any effects between teamwork skill means for gender and subscale. Following a non-directional analysis, all comparisons reported that the findings do not support the idea that there was a different perception of teamwork skills between male and female students.

CHAPTER 5

DISCUSSION

The purpose of this research study was to broaden the awareness of online performance-based assessment of teamwork skills in a middle school classroom as expressed through students' perception of observed self and peer cooperative group work behaviors. Additionally, this research sought to identify the most and least observed teamwork skills according to students' perceptions through an online anonymous assessment tool, the Teamwork Skills Inventory. Furthermore, this study examined whether or not student perceptions might have been based on gender. It is important to provide students with an opportunity for their voices to be heard. This valuable information can provide insights into cooperative group work from team members observations. By giving students an opportunity to identify, reflect upon, and practice teamwork skills in a safe learning environment, they can refine their cooperative group work techniques for future employment.

Cooperative Learning

The ultimate goal for any student is to obtain skills that will make them successful members of society and productive in their future jobs. Cooperative learning requires team members to have proficient teamwork skills for effective collaboration to ensue. Student's ability to work together towards a common goal is the primary underlying fundamental aspect of effective cooperative learning. Therefore, the success or failure of the group depends upon its team members having proficient teamwork skills to work productively together to accomplish a task. When given a chance to identify weak or non-existent teamwork skills along with opportunities to focus on sharpening those skills, students can become more efficient within their cooperative groups.

Today, technology is integrated with nearly all aspects of learning within the classroom. The ability to maneuver and operate a calculator, computer tablet, and media platforms is an essential skill that most students should be able to accomplish. Cooperative learning can provide learning opportunities for students to accomplish group goals with the aid of technology and various media platforms. Utilizing teamwork skills, group members can assist with navigating technological issues that may arise.

Teamwork skills and the ability to work cooperatively can be beneficial for regular and special education students regardless of ethnic relations. During cooperative group work, all students work together to achieve a common goal. This cohesiveness can improve the classroom environment and support the building of positive relationships between team members.

While the improvement of teamwork skills is mainly dependent upon the students, educators also play a vital role in teamwork skill development. Educators should have professional development training, established techniques, and ample practice with guiding cooperative group work. They should be able to provide clear and concise directions to team members regarding their roles and learning goals. From this guidance, students should be able to work succinctly to achieve the group goals.

Teamwork Skills Inventory

The Teamwork Skills Inventory (TSI) supports cooperative group work by providing a measurable analysis of observed teamwork skills according to group members. The measurable observations are obtained through the self and peer perspective from each team member. This information can aid students in identifying teamwork skills from which they need to improve upon. This will ultimately enhance group performance with achieving its goal; thereby creating a

more effective cooperative learning opportunity. Effective collaboration can aid in student comprehension or a deeper understanding of the content knowledge being presented. Furthermore, social skills can also develop and improve during effective group work as students discuss to solve tasks.

The Teamwork Skills Inventory has been developing and evolving over the past few decades to provide educators and students with a user-friendly, reliable assessment tool with technological advances. By providing educators with an anonymous, online software opportunity, they are meeting administrative requirements that are often imposed upon them. The verbiage within the TSI is clear, concise, and easy enough for adolescent students to comprehend. Teamwork skills are clearly defined and discussed prior to the administering of the assessment; moreover, students' role as observers are explained and expectations are established. These expectations of evaluation are deeply discussed due to the possibility of students evaluating team members under peer pressure. Educators must stress the importance for students to provide true reflections of their team members regardless of ethnic relations, social status, or gender. This foundational support is essential prior to the administering the TSI formative and summative assessment. As we are all aware, a good foundation is required for any structure to operate efficiently.

Findings from student observations are presented in individual portfolios with easy-to-follow peer and self assessment results of teamwork skills. By comparing their self and peer assessment data, students become an active participant in understanding their strengths and weaknesses. Essentially, they are held accountable for their growth and development of observed teamwork skills. Student portfolios are automatically generated following assessment and assist students with identifying strong, weak, or non-existent teamwork skills. These portfolios can be

referred to often as a reference or guide for reflection upon their teamwork skill progression. Through repetitive assessments, students can track teamwork skill progression and make adjustments accordingly to improve their teamwork skills. This revolving assessment of teamwork skills highlights the importance of targeting and improving these skills by providing students with continual up to date information about their skill progress.

Educators are able to view student portfolios as a means to gather valuable data on students' teamwork skill abilities. The student portfolios can provide support to educators with planning and developing future activities tailored to strengthen students' targeted teamwork skills. With diversified accommodations, educators can improve student learning and improve student discipline conditions.

Research Questions

1. How do self and peer assessments of teamwork of 8th graders in a math course compare and contrast using the Teamwork Skills Inventory (TSI)?

2. What teamwork skills lend themselves most to teamwork during math learning for 8th graders from the Teamwork Skills Inventory (TSI)?

3. What teamwork skills lend themselves least to teamwork during math learning for 8th grades from the Teamwork Skills Inventory (TSI)?

4. How does gender effect student's perception of teamwork skills using the Teamwork Skills Inventory (TSI)?

Evaluation and Discussion of Research Question 1

Research question one focused on whether or not there was a statistically significant difference between peer and self assessments as assessed through the Teamwork Skills Inventory (TSI). Following a formative and summative assessment, the data was analyzed in a paired samples t-test within SPSS (v.26). There was a total of ten paired samples results obtained. All of the summative pairings indicated a significant difference occurring between the means. Each of the self assessment means were slightly higher than the peer assessment means. Given this, Cohen's *d* was calculated to determine the effect sizes. Each of the effect sizes were small and ranged from 0.22 to 0.27. From this we can conclude that following the formative assessment, the identification of target teamwork skills, and opportunities to practice these skills, students did improve upon their weak or non-existent teamwork skills to become more productive members of the cooperative group.

Evaluation and Discussion of Research Question 2

Research question two concentrated on identifying the most commonly observed teamwork skills as indicated through peer and self observations. Data was collected and defined according to peer, self, formative subscale, and summative subscale results. The frequency of each individual teamwork skill was calculated, followed by the frequency calculation for the formative and summative subscales respectively. The analysis indicated that the most occurring teamwork skill in the peer formative results was skill twenty-one wherein students were receptive to suggestions from other group members and responsive in a friendly way. This researcher attributes this result due to the foundational structure from the Teamwork Skills Inventory and whole class discussions on group work expectations. The peer summative, the self assessment summative, peer formative, peer summative, self formative, and self summative

results all indicated that teamwork skill one, this peer shows acceptable attendance for team meetings, was the most identified skill. As such, students considered their attendance to be the most occurring teamwork skill due to the majority of group members in attendance during cooperative group work. Students were given an opportunity to self reflect upon their teamwork skill behaviors during the TSI self formative assessment and indicated teamwork skill five, this peer does a fair share of work expected of everyone (Strom & Strom, 2018). This observation is a result of students' self-reflection and group work performance. Through extensive research there has been no literature found on most commonly observed teamwork skills in an 8th grade math class.

Evaluation and Discussion of Research Question 3

The least observed teamwork skill was the focus for research question three. Using the peer, self, formative and summative subscale teamwork skills results, the least observed teamwork skills were identified from frequency calculations. Peer formative, peer summative, and self formative indicated teamwork skill nine, peers bringing reading materials for the group to examine, as the least observed teamwork skill (Strom & Strom, 2018). This researcher contributes this observation to the fact that within this math class, math textbooks remained in the classroom and furthermore, students did not initiate the possibility of obtaining and bringing outside reading material on the math content being discussed. Subscale peer formative, subscale peer summative, and subscale self formative reported subscale two, seeks and shares information, to be the least observed subscale. During cooperative group work, students did not take the initiative to research and delve deeper into the content. According to the self summative data, there was an improvement from the self formative results as their perspective indicated that

they did improve upon bringing reading material to the class; however, when students self-reflected for the final assessment, they indicated that they themselves did not challenge other team members with logic to enhance group thinking, teamwork skill seventeen. Students' final self summative assessment indicted an improvement from the subscale self formative; however, a new subscale was identified as the least observed which focused on students contributing to the cooperative group with critical thinking and creativity skills. Even though a thorough research was conducted, this researcher did not find any literature on the least observed teamwork skills in an 8th grade math class.

Evaluation and Discussion of Research Question 4

Research question four pursued the ongoing debate as to whether or not gender affected student's perception of teamwork skills. Following analysis of an independent samples t-test to determine if there were any effects between teamwork skill means for gender and subscale, there were no indications that being male or female affected the observation of teamwork skills within this math classroom. All comparisons calculated that the findings do not support the idea that there was a different perception of teamwork skills between male and female students. This researcher acknowledges that this information is applicable to this research study and may change based upon different student age groups and location. As with the case found at the high school level by Strom (2002) where there were significant differences found by gender; largely females were seen by both genders as far more effectively demonstrating most of the team skills in comparison to boys. Similar findings were also discovered by Malone (2018), in which females portrayed more teamwork skills than males as indicated through his eye measurement instrument.

<u>Future Research and Implications</u>

For Education Administrators, Educators, and Students

This researcher sought to provide a means to help support teachers by providing insights as to how to improve student comprehension by identifying teamwork skills necessary to support cooperative learning and ultimately productive members of society. A proven reliable, accurate, and free tool to support educators and students with identifying teamwork skills is the Teamwork Skills Inventory. This easy to use, online anonymous platform can increase student's self-efficacy and motivation as students participate in cooperative learning. As a means to support educators, the TSI is accompanied with easy to understand, verbatim instructions and step-by-step guided video instructions on how to incorporate the TSI into their daily or weekly lessons.

The findings from this research study have generalizable features that can be applied within other classrooms. The results obtained in research question one, indicated that following the identification of weak or non-existent teamwork skills and given an opportunity to improve upon these teamwork skills, students' perception of observed teamwork skills within cooperative group learning did improve. Furthermore, given the findings of this study, 8th grade educators should not expect a difference in gender perspectives of teamwork skills and therefore should not anticipate any biased perspectives to curtail.

For Researchers

The results obtained in this research study can aid and guide future research development projects. While this research study focused on identifying student teamwork skills in one course

content in an 8th grade class, potential future research studies could evaluate teamwork skills in other course content areas such as English, Science, History, and electives. Furthermore, other possible research prospects could focus on different student age groups such as high school. This research would be similar to Strom's (2002) research on high school students' teamwork perception but in a current study. A final potential research study could also focus on tiered student's perspective beginning with freshman year and completing data collection with student's senior year. Regardless of what a future principal investigator decides as their research project, a proven and effective assessment tool to collect anonymous data is the teamwork skills inventory (TSI).

Summary

The identification and opportunity to improve upon teamwork skills is a critical component for successful implementation of cooperative group work; a requirement for successful future employment and productive member of society. A currently recognized problem in society is that graduating seniors and collegiate students lack teamwork skills to work effectively within cooperative groups. This can be attributed to student's not having an opportunity to assess and develop teamwork skills, both on a peer evaluation and self evaluation. This lack of assessment opportunities can result from either a lack of awareness from educators or unwillingness to change. By accentuating the benefits of teamwork skill identification and implementation, educators can have a different perspective of cooperative learning. Therefore, the purpose of this research study was to help individuals gain a better understanding of what age group students should be able to learn teamwork skills. As evidenced within these findings, 8th grade students are able to comprehend and improve upon teamwork skills in the 8th grade and

gender did not procure a significant difference of student perception of teamwork skills. This data could not have been effectively obtained and refined without the aid of Teamwork Skills Inventory. This anonymous, online assessment tool provided student friendly, easy to comprehend, analysis of self and peer observed teamwork skills from which students could easily target skills to improve upon. These results can be generalizable to other students within this particular age group. This research study is advantageous to administrators, teachers, future employers, scholarly researchers, and society as we all benefit by collaboratively working together.

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APPENDICES

Appendix A

Institutional Review Board

AUBURN
UNIVERSITY

IRB/Office of Research Compliance
540 Devall Drive
Auburn University, AL 36832

Telephone: 334-844-5966
Fax: 334-844-4391
IRBadmin@auburn.edu
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April 26, 2021

MEMORANDUM TO: Stephanie Cason-Ogletree
                   College of Education

PROTOCOL TITLE: "Self and peer perceptions of teamwork skills in an 8th grade math course using the
                   Teamwork Skills Inventory"

IRB FILE NUMBER: 21-216
IRB DETERMINATION: Non-human Subjects Research (NHSR)

Thank you for submitting your protocol to the Institutional Review Board for review. According to your
description of this project and the intended use, the IRB has determined that your activities as described **do
not constitute "human subjects research"** according to the existing guidelines and statutes (45 CFR
46.102).

> *Research* means a systematic investigation, including research development, testing and
> evaluation, designed to develop or contribute to generalizable knowledge. Activities, which
> meet this definition, constitute research for purposes of this policy, whether or not they are
> conducted or supported under a program, which is considered research for other purposes. For
> example, some demonstration and service programs may include research activities.

> *Human subject* means a living individual about whom an investigator (whether professional or
> student) conducting research obtains:

>> (1) data through intervention or interaction with the individual, or
>> (2) identifiable private information.

If there are any changes made which would constitute human subjects research, or if there are any events
adverse or otherwise which concern the investigator(s), we encourage you to contact this office for further
consultation.

If you have any questions, contact the Office of Research Compliance at irbsubmit@auburn.edu.

Bernie R. Olin, Pharm.D.
Chair of the Institutional Review Board #2
For the Use of Human Subjects in Research

Appendix B

Teamwork Skills Inventory Student Guide

TEAMWORK SKILLS INVENTORY

STUDENT GUIDE

By
Paris S. Strom, PhD
and
Robert D. Strom, PhD

Version 2019

This document is intended for educational use only by faculty and the students they teach. The faculty will disseminate this STUDENT GUIDE to students for the purpose of understanding how to use the TSI.

All Steps in a Nutshell: Summary of TSI Steps, Description, and Schedule

    Students will work in the same teams for a full semester. About 3-4 weeks after working in teams, a formative assessment needs to be administered. Soon after this, the results must be shown to students for interpretation and feedback. Student teams then work for another 3-4 weeks and then complete a summative assessment. Shortly thereafter, they are provided results for the summative assessment.

    The below represents STEPS 1 – 8 with active links that must be used with the TSI from beginning to end. WATCH the videos, READ the Student Guide as directed, and DO each task as shown for each step using active links provided. This Nutshell page should be posted online at the school for students for easy access. *Asterisks show Orientation Lessons and Advising Students which are optional tasks for the teacher.*

STEPS	WEEK	DESCRIPTION	TIME LENGTH
Step 1 Intro	Week 1 - 2	* Teacher presents Orientation Lesson 1. **(a) WATCH: Introduction to TSI** **(b) READ: Student Guide, pp. 3-11.** **(c) DO: Teacher discusses any questions** * Teacher presents Orientation Lesson 2.	* 20 min.-Lesson 1. (a) Watch Video: 5 min (b) Read: 15 min (c) Discuss: 10-20 min * 10 min.-Lesson 2.
Step 2 Teamwork	Week 2 - 5	* Teacher presents Orientation Lesson 3. **DO: Students work in teams as directed by the Instructor. Students remain in the same teams.** * Teacher presents Orientation Lesson 4.	* 25 min.-Lesson 3. 3 – 4 weeks of teamwork * 25 min.-Lesson 4.
Step 3 Complete Formative Evaluation	Week 6	**(a) WATCH: Logging Into TSI** **WATCH: Completing Formative Evaluation** **(b) READ: Student Guide, pp. 12-13.** **(c) DO: Teachers facilitate students to complete the <u>Formative</u> Evaluation.** *TSI Login here*	(a) Watch videos: 30 sec and 7 min. (b) Read: 7 min. (c) Complete the <u>Formative</u>: 10-15 min
Step 4 Interpret Formative Profile	Week 6	**(a) WATCH: Interpreting Formative Profile** **(b) READ: Student Guide, pp. 14-16.** **(c) DO: Teachers facilitate students to interpret the <u>Formative</u> Profile.** *TSI Login here*	(a) Watch Video: 7 min. (b) Read: 7 min. (c) Interpret the <u>Formative</u>: 10-15 min
Step 5 Teamwork	Week 7 - 10	* Teacher presents Orientation Lesson 5. **DO: Students work in teams as directed by the Instructor. Students remain in the same teams.** * Teacher advises individuals who have problematic TSI feedback.	* 20 min.-Lesson 5. 3 – 4 weeks of teamwork * 15-20 min.
Step 6 Complete Summative Evaluation	Week 11-12	**(a) WATCH: Completing Summative Evaluation** **(b) READ: Student Guide, pp. 17-18.** **(c) DO: Teachers facilitate students to complete the <u>Summative</u> Evaluation.** *TSI Login here*	(a) Watch Video: 7 min. (b) Read: 7 min. (c) Complete the <u>Summative</u>: 10-15 min
Step 7 Interpret Summative Profile	Week 11-12	**(a) WATCH: Interpreting Summative Profile** **(b) READ: Student Guide, pp. 19-21.** **(c) DO: Teachers facilitate students to interpret the <u>Summative</u> Profile.** *TSI Login here*	(a) Watch Video: 9 min. (b) Read: 7 min. (c) Interpret the <u>Summative</u>: 10-15 min
Step 8 Class Discussion	Anytime Before Finals	**DO: Teacher shows each team their Team Summative Profile and discusses the results.** * Teacher advises individuals who have problematic TSI feedback. **DO: Teams finish teamwork activities.**	15-20 min. * 15-20 min.

TEAMWORK SKILLS INVENTORY

Step 1: Teamwork Skills and Definitions

	ATTENDS TO TEAMWORK
1	This peer shows acceptable attendance for team meetings.
2	This peer arrives on time for team meetings.
3	This peer stays focused on the task during class.
4	This peer fulfills individual roles such as organizer or reporter.
5	This peer does a fair share of the work expected of everyone.
	SEEKS AND SHARES INFORMATION
6	This peer admits uncertainty when in doubt about what to do.
7	This peer asks questions that help the group to understand lessons.
8	This peer helps others by explaining or reviewing lessons.
9	This peer brings reading materials for the group to examine.
10	This peer refers to reading materials during discussions.
	COMMUNICATES WITH TEAMMATES
11	This peer shares experiences, feelings, ideas, or opinions.
12	This peer speaks clearly and uses easily understood vocabulary.
13	This peer limits the length of comments so others get to talk.
14	This peer listens to everyone and respects his or her views.
15	This peer encourages and recognizes the contributions of others.
	THINKS CRITICALLY AND CREATIVELY
16	This peer considers views that differ from his or her opinions.
17	This peer uses logic to challenge group thinking or work methods.
18	This peer carefully thinks about ideas before reaching conclusions.
19	This peer builds on the ideas of others.
20	This peer offers new ways of looking at ideas or problems.
	GETS ALONG IN THE TEAM
21	This peer takes suggestions for improvement in a friendly way.
22	This peer avoids using put-downs or blaming others for problems.
23	This peer accepts compromise as a way to deal with conflict.
24	This peer keeps trying even when the task becomes hard.
25	This peer expresses hope about group success.

Step 7: Student Directions for <u>Interpreting</u> the <u>Summative</u> Profile

a. The date you can start viewing your <u>Summative</u> profile will be: ASK INSTRUCTOR

b. Go to http://www.teamworkskillsinventory.org

c. Login to lower right by selecting student and then entering your username and password assigned by the teacher. Keep these private for your access only.

d. In your **Student Portal**, you will see EVALUATIONS and below see your Team Name and underneath in green at left, View Individual Profile . Click - <u>View Individual Profile</u> at left.

e. The above step takes you to the Individual Profile which reveals *peer* observations and *self* - impressions of your teamwork skills demonstrated in group work. By considering both sets of views, your achievements and shortcomings can be more accurately detected. Remember that the Formative Evaluation is shown in the F column and lets Indira know how she is doing to make changes in her behavior. The Summative Evaluation is shown in the S column and informs Indira how she did on the Summative. Let's start by looking at how teammates view things. **Table** 2 (on page 23) is an example of Indira Vandira's Teamwork Skills Profile. Interpreting the Summative evaluation means that you will be examining the data which compares the Formative and Summative results.

f. *Peer Perceptions.* The proportion of teammates that assigned Indira credit for demonstrating each of the skills is recorded in the *Peers % Formative (F)* and *Summative (S)* columns. For example, Indira's team has five (5) peers, so the proportionate influence of each of her 5 peers observers is 20%. The change column makes known whether the ratings for an individual remained the same (0), improved (+), or declined (-) from Formative to Summative Evaluation.

The percentage of teammates reported that you fulfilled each of the 25 skills are shown. Focus on the *Peers %* column to identify any items indicating 100%. These are items for which every teammate agreed that the specific skills were demonstrated. It is wise to continue these behaviors. Now look at the *Peers %* column to read those items where responses were between 20% and 80%. These items identify areas in which growth is needed. It means that considerable effort may be required to make the desired changes. Next, find the items indicating 0%. In these cases, teammates were agreed in reporting that Indira failed to exhibit the skill. These are areas that should cause you to think about how progress can be made.

g. *Peer Observations versus Self-Impressions*. There is benefit in comparing the observations of peers with self-assessment. Find items in the *Peers %* column where there is 100% agreement that Indira showed a skill. On these same items, examine the *Self* column to see if there is a check (√) that indicates Indira sees herself in the same way as she is seen by others. Next, look for items where 20% to 80% of her peers reported that she demonstrated a skill. Confidence about each of these behaviors should take into account the percentages reported. Items showing 0% reveal that no one observed that skill. When the *Self* column is also marked 0, Indira agreed with all her teammates that she did not demonstrate this skill. However, if she checked the *Self* column, she credited herself for a skill that no one else saw. Self-columns with a check (√) indicate that she gave herself credit for the item, or a zero (0) indicates that she did not give

herself credit for the item. The + and − and 0 marks apply to the change column in the Self Evaluation area also.

h. *Goals for improvement*. Self-evaluation includes making some decisions that will guide personal improvement. Note that when looking at the Formative Profile, it shows which skills Indira selected as goals for improvement. These same items are noted still under the Formative area and are now compared with her view of those goals in the Summative area in the change column. A solid star shows there was improvement in a goal from the Formative to the Summative. A half star signifies there is no change in the goal from the Formative to the Summative. A hollow star signifies a decline in the goal from the Formative to the Summative. Note that the legend at the bottom of the Summative Profile briefly explains the status of what each type of goal star means and what the zeros, pluses, and minuses mean.

i. *Inflation Index*. During evaluation the reminder that a very high rating has been given is meant to encourage reflection about whether to submit that rating. The teacher needs to detect students who inflate evaluations, and must also find out whether their ratings are applied to one, two, or more team members. The total number of persons who are scored as exhibiting 20 or more skills appears as an *Inflation Index* on the bottom left of the Teamwork Skills Profile. This allows the profile to function as an intervention tool to identify students who require additional guidance about authentic evaluation. The *Inflation Index* can also serve as a sign of progress as someone advances from assigning inflated ratings to being realistic in peer and self-evaluation. Indira's Summative Inflation Index shows that she did not inflate any of her 6 evaluations (5 peers plus herself). This was an improvement since on her Formative she inflated one (1) of the six (6) evaluations.

j. When done examining the Profile, click print at the bottom right of the Profile if you wish. Click Logout in the bottom right of the page.

Team Member Name: Indira Vandira

Team Name: RONIN

Teamwork Skills Items	Peers %			Self-Evaluation		
	F (n = 5)	S (n = 5)	Chg	F (n = 1)	S (n = 1)	Chg
Attends to Teamwork						
Q1. This peer shows acceptable attendance for team meetings.	60.0	80.0	★	0	√	★
Q2. This peer arrives on time for team meetings.	40.0	60.0	+	√	√	0
Q3. This peer stays focused on the task during class.	60.0	60.0	0	√	0	–
Q4. This peer fulfills individual roles such as organizer or reporter.	20.0	40.0	+	0	0	0
Q5. This peer does a fair share of the work expected of everyone.	40.0	20.0	–	√	0	–
Seeks and Shares Information						
Q6. This peer admits uncertainty when in doubt about what to do.	40.0	80.0	★	0	0	☆
Q7. This peer asks questions that help the group to understand lessons.	100.0	60.0	–	0	√	+
Q8. This peer helps others by explaining or reviewing lessons.	80.0	60.0	–	√	0	–
Q9. This peer brings reading materials for the group to examine.	60.0	40.0	–	√	√	0
Q10. This peer refers to reading materials during discussions.	80.0	20.0	–	0	0	0
Communicates with Teammates						
Q11. This peer shares experiences, feelings, ideas or opinions.	60.0	20.0	–	√	0	–
Q12. This peer speaks clearly and uses easily understood vocabulary.	60.0	60.0	0	√	0	–
Q13. This peer limits the length of comments so others get to talk.	80.0	60.0	☆	0	√	★
Q14. This peer listens to everyone and respects his or her views.	60.0	40.0	–	√	√	0
Q15. This peer encourages and recognizes the contributions of others.	80.0	40.0	–	√	√	0
Thinks Critically and Creatively						
Q16. This peer considers views that differ from his or her opinions.	40.0	20.0	–	√	0	–
Q17. This peer uses logic to challenge group thinking or work methods.	80.0	40.0	☆	0	√	★
Q18. This peer carefully thinks about ideas before reaching conclusions.	60.0	20.0	–	√	0	–
Q19. This peer builds on the ideas of others.	60.0	60.0	0	√	0	–
Q20. This peer offers new ways of looking at ideas or problems.	40.0	20.0	–	√	0	–
Gets Along on the Team						
Q21. This peer takes suggestions for improvement in a friendly way.	60.0	40.0	–	√	0	–
Q22. This peer avoids using put-downs or blaming others for problems.	60.0	80.0	+	√	0	–
Q23. This peer accepts compromise as a way to deal with conflict.	40.0	40.0	0	√	0	–
Q24. This peer keeps trying even when the task becomes hard.	60.0	80.0	+	0	√	+
Q25. This peer expresses hope about group success.	60.0	60.0	0	0	0	0

Formative Inflation Index: 1:6 ❔
Summative Inflation Index: 0:6 ❔   🖶

Icon Legend
★ Improvement in Goal from the Formative to the Summative
☆ No Change in Goal from the Formative to the Summative
☆ Decline in Goal from the Formative to the Summative
+ Improvement in Item from the Formative to the Summative
0 No Change in Item from the Formative to the Summative
– Decline in Item from the Formative to the Summative