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THE EFFECTS OF COLLABORATIVE TESTING AND THE TESTING EFFECT ON STUDENT ACHIEVEMENT AND CONFIDENCE OF UNDERGRADUATE BUSINESS STUDENTS

BY

Adrian Gerard Grubb

A Dissertation

Submitted to the Graduate Faculty of the
University of South Alabama
in partial fulfillment of the
requirements for the degree of

Doctor of Philosophy

in

Instructional Design and Development

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Abstract

Grubb, Adrian Gerard, Ph.D., University of South Alabama, May 2014. The Effects of Collaborative Testing and The Testing Effect on Student Achievement and Confidence of Undergraduate Business Students. Chair of Committee: Dr. Brenda C. Litchfield.

This study examined the effects of collaborative testing and the testing effect on student achievement and confidence of business students. It was hypothesized that the use of repeated collaborative testing would improve students' academic achievement, retention of learned material, attitudes on collaborative work, and confidence. The study utilized a quantitative dominant mixed methods research design, which combined qualitative and quantitative data collection techniques.

The study examined 87 students enrolled in an introductory undergraduate business course. The students were assigned to two treatment groups. Eight quizzes on the content presented in reading assignments and the class lectures were administered during the semester. Treatment group one took the first four quizzes as individuals and the second four quizzes as a collaborative group. Treatment group two followed an opposite schedule. Each quiz included a question for the students to rate their confidence on quiz performance. After each set of four quizzes were completed, examinations were given to the students as individuals.

Quantitative data collected included the students' grades on each set of four quizzes as well as the grades on each of the two examinations. Quantitative data were also collected from pre-study and post-study questionnaires. Qualitative data were collected

from the questionnaires as well with the inclusion of open-ended items designed to gain insight into the quantitative responses.

The collaborative groups scored significantly higher than the individuals on the quizzes. However, there was no difference in performance on the examinations. Additionally, there was no difference in achievement between the students who participated in this study and students in previous semesters that did not use repeated testing of any kind.

The data also revealed statistically significant differences in confidence with the students in collaborative groups indicating higher levels of confidence than students who completed the tests individually. In addition, the students' attitudes about collaborative efficacy and potency were significantly improved as well.

Although the students rated their experience in this study significantly lower than prior collaborative experiences in other courses, the qualitative responses showed that the students found the experience helpful in networking, sharing ideas, and practice for future business contexts.

Chapter I- Introduction

Quizzes and examinations are used as the primary method for assessing achievement in classrooms (Rao, Collins, & DiCarlo, 2002). It has been the accepted practice in traditional learning environments for the student to listen to a lecture given by the instructor, study the material, and/or perform tasks related to the lecture. The usual culminating activity is to take an examination in order to gauge proficiency and understanding. More recent research suggests that frequent testing can be helpful as a learning tool in order to aid students' retention of the information taught in class (Roediger & Karpicke, 2006).

The use of frequent testing as a learning tool is called “the testing effect” (Karpicke, Butler & Roediger, 2009). The authors define the testing effect as the enhancement of student learning using an assessment of the material rather than repeatedly studying it. Testing effects have been tested, validated, and supported recently by a surge of literature and studies (Karpicke, Butler & Roediger, 2009; Roediger & Karpicke, 2006; Vojdanoska, Cranney, & Newell, 2009). Researchers contend that taking a test on the information presented to the student can have a larger positive effect on long-term retention of the material than simply restudying it (Roediger & Karpicke, 2006).

Although studies centered on frequent testing have gained popularity and attention, research on the topic has been confined to psychologists (Roediger & Karpicke, 2006).

Other areas of education and training have not studied the benefits of the testing

effect. Inaddition, the prior research has predominately focused on individuals and the testing effect. However, recent studies on collaborative use of the testing effect have introduced the idea that the positive effects of frequent testing can be enhanced by combining the learning tool with collaborative learning strategies.

Collaborative learning is defined as an instructional strategy where learners work in small groups in a number of different ways to achieve shared goals and optimize learning (Johnson & Johnson, 1987; Slavin, 1980). Collaborative learning has been used in education where students use interaction as a learning tool and is one of the most widespread and bountiful areas of educational research (Johnson, Johnson, Stanne, & Garibaldi, 1990). The popularity of collaborative learning is based on numerous factors such as its theory base, breadth, and applicability across disciplines (Johnson & Johnson, 1987). Slavin (1995) stated that collaborative learning has positive effects on student achievement, social skills, social cohesion, cognition, and the metacognitive development of children.

Although there are many different collaborative learning methods and strategies, there are very few studies that address collaborative testing (Breedlove, Burkett, & Winfield, 2007). Collaborative testing extends collaborative learning "into the evaluative setting" (Breedlove, Burkett, & Winfield, 2007, p. 2). The combination of collaboration and the use of tests as a learning tool have produced enhanced levels of learning and retention (Vojdanoska, Cranney, & Newell, 2009). Typically, studies using collaborative testing are conducted with students discussing topics in groups and then testing individually. This study examined the effects of collaborative testing when students took the tests together in groups.

Another variable that has not been associated with collaborative testing in previous studies is learner confidence. Confidence in this study was defined as the student's level of assurance that an answer given was correct (Shoemaker, 2010). In addition, Bandura's (1977) theory of self-efficacy was related to the previous definition in an attempt to describe learner confidence as it related to this study. This study sought to understand learner confidence and the degree that is either enhanced or diminished by testing either collaboratively or individually. Confidence was omitted in previous studies (Vojdanoska, Cranney, & Newell, 2009) and should be studied in order to more accurately gauge the effects and effectiveness of collaborative testing and the testing effect.

Purpose and Scope of the Study

This study centered on two important issues. The first was to address the gap in the literature addressing repeated collaborative testing and its effects on student achievement. This was important in higher education because educators must continue to develop effective instructional strategies for students. Academia is currently in a time that is experiencing a shortage of teachers, increased class sizes, and the underdevelopment of the student population entering higher education (Twigg, 2009). It is vital to find creative ways for teachers to facilitate knowledge rather than to be the sole dispenser of knowledge.

The other purpose of this research study was to evaluate if there was a difference in learner confidence of students who experienced repeated testing collaboratively or individually. Learners' confidence in their level of knowledge can play a significant role in their attitudes towards the treatment and the perceived benefits as a result. The psychological aspects of instructional tools (confidence, efficacy, level of comfort)

cannot be discounted and as a result are examined by this study as well.

Background of the Study

The workplace requires that individuals work in groups or teams to achieve goals (Cohen & Bailey, 1997). The individual must properly adapt to the team environment in order to achieve personal levels of success. Adaptation into the team requires that the individual be confident in his or her own abilities. However, successful adaptation requires that the individual is confident that he or she can function within the team as well as have a belief that the team can accomplish more than he has or she could accomplish on their own (Baker, 2001).

Higher education has recognized the need for students to be indoctrinated in the team environment. In business disciplines, group projects are required in order for students to become more familiar with what will be required in their future careers. The projects are assigned for students to learn collaborative techniques, form social peer groups, and learn how to constructively discuss others' opinions (Johnson & Johnson, 1999).

Collaboration in the business environment also includes training and development on new tasks, policies, procedures, and work processes. Often, training and development is completed by a team or work group. The new information must be learned, retained, and transferred by the individual on a micro-level. Conversely, the information may have to be used by a group on a macro-level in order to execute each individual level of the new process or task.

The ability for the group to successfully learn and retain the information presented within training sessions will ultimately determine the level of success that the organization will achieve (Little & Madigan, 1997). Training and development programs

are costly. The opportunity cost of the employee as well as the expense of instructors, materials, and other overhead must be utilized effectively. It is in the organization's best interests in the long-term to make the training sessions count as much as possible (Little & Madigan).

The testing effect is intended to aid the immediate and long-term retention of the material without long-periods of repetitious study (Karpicke & Roediger, 2007). The use of repeated testing in the classroom in order to facilitate comprehension of the topic can shorten the time it takes for the learner to master the material (Karpicke & Roediger). The reduction of time in the classroom results in a reduction in actual cost for the organization.

Tests and examinations are used as formal assessments of large amounts of information at the end of a class or lecture. The use of repeated testing on smaller chunks of information may expedite the learning process and allow for better retention of the material (Sandahl, 2009).

Another important cost to the organization is the time it takes for the employee and work group to become proficient in the new task or process. The time spent to achieve maximum levels of productivity after the material is introduced must be as short as possible. The transfer of the learned material to the actual context is directly related to the confidence that the employee has as a result of the training experience.

Keller's (1987) ARCS model addresses learner confidence and its importance when evaluating training programs. The confidence of the learner in the belief that the training adequately prepared them for the actual context will determine the steepness of the curve as far as transfer is concerned.

The researcher has spent the majority of his career in corporate training and development. A common statistic used in corporate training courses is that the employee retains approximately 30 percent of the information taught in class. That statistic implies that traditional training is inefficient and provides a limited benefit to the employee and the organization.

This study sought to identify if repeated testing is effective as a learning tool in order to aid retention. Also, the study was designed to identify if repeated testing was more effective when completed as an individual or as a collaborative group. Finally, the study was designed to understand if learners were more confident as an individual or as a group.

The insight gained from this and subsequent studies will be used to improve training techniques in actual business environments as well as aid instructors and students prepare within higher education.

Statement of Problem

Today's economic conditions are playing a dominant role in the way institutions of higher learning are conducting business (Altbach, Gumport, & Berdahl, 2011). Colleges and universities must evaluate the costs of education on every operational level from infrastructure, faculty needs, and student resources, among others (Pineda, 2013). The responsibility of providing quality educational services to the institution's surrounding communities is paramount in this time of uncertainty and constant budget cuts. Educational leaders must overcome the budget short flows while maintaining quality, access, and preserving institutional goals (Pineda).

Today's students learn and experience life socially (Baird & Fisher, 2005). Social

media allows all of us to communicate instantly, share our lives, thoughts, and feelings. In today's classrooms, it is important to incorporate social methods of teaching and learning in order to adapt to today's students in an effort to make them as successful as possible (Baird & Fisher).

This study focused on a high enrollment, undergraduate course. These courses account for the vast majority of the educational expenses of universities each year (Cueso, 2007). The attrition rate of first-year students is more than 25% at traditional universities and about 50% at junior and technical colleges (Cueso). Studies have shown that lecture-dominant courses do not meet the needs of all students with a variety of learning style preferences. High enrollment, undergraduate courses are typically lecture-dominant. The gap between lectures and students leads to a disconnect and the ultimate failure of many students (MacGregor, Cooper, Smith, & Robinson, 2000).

However, the lecture is not the only reason for students' lack of success. Lack of engagement, attention, assistance, and deviation of traditional high school type settings all play a role (Twigg, 2009). Finding and developing instructional strategies to offset the aforementioned weaknesses of traditional lecture-based classes is paramount to the success of today's students. Collaborative learning and retrieval practice strategies were employed in this study to determine their effectiveness on overall student achievement in a high enrollment, undergraduate course.

Retrieval practice has been tested, validated, and supported by numerous studies and a wealth of literature. The purpose of retrieval practice is to enhance long-term memory (Ormrod, 2008). Numerous metacognitive strategies are used to make the brain and memory more effective in storing information and recalling it accurately in the future by

organizing it in unique ways. Chunking, cuing, and practice are some of the more researched methods of retrieval (Bransford, 2000). This study researched how the testing effect played a role in student achievement.

Karpicke, Butler, and Roediger's (2009) theory of the testing effect is that the act of retrieving the information via testing has a significant impact on the students' learning of the material and more importantly their ability for long-term retention. This theory of testing effects has been corroborated by recent research by McDaniel and Callender (2008). The researchers have consistently shown limited benefits of repeated reading of the material as opposed to repeated testing when comparing academic achievement.

In McDaniel and Callendar's (2008) study, massed rereading of a text was compared to single reading in order to determine effectiveness in retention and comprehension. The participants were given the material to read and then were administered an examination consisting of multiple-choice, short-answer, and summary questions. The comparison and analysis came from the difference in groups. Group one took the examination immediately after reading the material. Group two took the examination after being allowed to reread the material. The scores between the two groups did not produce a statistically significant difference.

The testing effect and its theoretical underpinnings were critical to this study, as they were tested in two ways, both collaboratively and individually to determine which method worked more effectively for student achievement in high enrollment, undergraduate courses. The findings inform faculty on ways to facilitate undergraduate students learning in these critical courses in order to increase students' chances of retention and long-term success.

Significance and Contribution of Planned Research

Students new to higher educational learning are typically hesitant to embrace the change in the learning environment. The use of collaborative learning strategies and the testing effect may be beneficial to students and their transition to the collegiate context (Johnson, Johnson, & Smith, 2007). Issues with students' adaptation into higher education and the low ability to succeed in undergraduate courses may be alleviated by the use of the respective strategies (Twigg, 2009).

If students are more confident in higher education classrooms, they are more likely to succeed in the long-term. The testing effect and collaborative learning strategies have been found to promote active rather than passive learning, which leads to a more worthwhile learning experience (Brandt & Ellsworth, 1996). Furthermore, these learning strategies used by the student are more likely to be used in the future which may translate into better academic success overall (Brandt & Ellsworth).

Increased student performance and satisfaction are benefits to the institution as well. Increased performance will translate into lower dropout, withdrawal, fail rates which will lead to increases in revenue for the academic institution (Twigg, 2003).

Research Questions

Research Question 1 – Does the use of repeated testing increase students' academic achievement in an undergraduate business course?

Research Question 2 – Does the use of collaborative testing increase students' confidence in an undergraduate business course?

Research Question 3 – Does the use of repeated testing affect students' study time in preparation for exams?

Research Question 4 – Does the use of collaborative repeated testing increase students' retention of material featured in the quizzes?

Research Question 5 – Does the use of collaborative repeated testing affect students' attitudes of the effectiveness of collaborative group exercises?

Definition of Key Terms

Collaborative Learning- Collaborative learning can be defined as a joint problem solving effort in which two or more people attempt a coordinated effort to solve a problem (Dillenbourg, 1999).

Collaborative Testing- The process of taking a test as a group, including the analysis, discussion, and agreeing on one answer formed by consensus.

Individual Testing- The process of taking a test individually, including the analysis, discussion, and concluding on a correct answer choice.

Learner Confidence- The degree that the learner believes the answer given on an examination is correct without the possibility of chance.

Repeated Testing- The process of taking multiple tests throughout the semester on small amounts of information.

Retention- Retention is measured by the students' performance on the examinations compared to student performance on the same examinations during previous semesters.

Self-reactiveness- Describes one's ability to motivate and regulate the execution of goals.

Self-reflectiveness- The metacognitive capability to reflect upon oneself and the adequacy of their own thoughts and actions (Bandura, 2001).

Student Achievement- The overall progress a student makes in learning assigned

material in an educational setting, gauged by a teacher made examination.

The Testing Effect- The belief that repeated testing can be superior to repeated studying of equal time.

Summary

This chapter described the purpose and scope of the reported study. The purpose of this study is to assess the effects of collaborative testing and the testing effect on student achievement and confidence of undergraduate business students. The new generation of learners prefers a different type of learning environment. The traditional lecture-based classroom does not provide the social learning tools that today's students prefer. The use of collaborative learning strategies can provide the optimal tools in order to help students succeed.

The testing effect provides another alternative to traditional educational formats. The testing effect, which is based on the use of tests to retain material, has been found to be more effective than the typical student cramming for the test. Current undergraduate students are preoccupied with other responsibilities such as work and family and cannot devote time solely to academic pursuits. By implementing repeated testing in class, the student should use class time more efficiently in preparing for examinations and reduce the amount of time spent studying away from the classroom.

The theory base for this study comes from collaborative learning which has a well-developed pool of research. The testing effect has also developed a following but has not been extensively researched (Roediger & Karpicke, 2006). This study provides an addition to the existing literature and theory base through the addition of learner

confidence, which has not been studied in conjunction with the testing effect and collaborative testing.

Chapter II – Literature Review

The study and its theoretical framework are centered on the pairing of two distinct learning strategies: collaborative learning and the testing effect. This chapter details both along with other associated topics such as collaborative testing, group efficacy, and learner confidence.

Collaborative learning is not a new instructional paradigm. However, today's society and its dependence on socialization have made higher education re-evaluate its use of collaborative strategies in and out of the classroom (Wang & Burton, 2010).

The current economic issues that surround higher education have also played a role in the renaissance of collaborative learning strategies (Duderstadt, 2000). Universities are in a process of rethinking how to retain their customer base (Duderstadt). The University system now, more than ever, is beholden to academic success because achievement results in a larger receipt of tuition and fees (Ignash, 1997).

The millennial generation has been inundated with technology and a social-dominant environment. This generation prefers conversation and collaboration (Carlson, 2005). Many classrooms dominated by lectures and notepads have been replaced with hybrid and online courses. The course redesign initiative, which is encouraging the change to hybrid and online courses, is using collaborative techniques as a cornerstone in the attempt to aid retention and academic achievement (Twigg, 2009).

Collaborative Learning

Collaboration is an essential part of conducting business on a daily basis. Typically, in the business environment, there is seldom a project that people or departments can accomplish on their own. This is the chief reason that business colleges utilize collaborative and group work throughout their curriculum (Johnson & Johnson, 1999).

Collaborative learning can be defined as a joint problem-solving effort in which two or more people attempt a coordinated effort to solve a problem (Dillenbourg, 1999). The communication between the participants enhances the learning processes. The thought is that students can use collaborative learning if they actively communicate within their peer group. Through that communication, students can reach convergence by constructing, monitoring, and repairing shared knowledge (Kuhn & Dean, 2004).

Collaborative learning exercises facilitate the sharing, explaining, and understanding of a topic or topics (Wei & Chen, 2006). The social interaction enables the participants to constantly elaborate and change their perceptions on issues which fosters more debate. A shared understanding is reached when concepts become known though verbal exchange (Van Boxtel, Van der Linden, & Kanselaar, 2000). The shared understanding is essential to the collaborative process. In business, the adoption of an idea cannot be facilitated unless there is some type of acceptable consensus.

Slavin (1995) stated that research on collaborative learning can be called one of the most prominent successes in educational research. The research as a whole and the focus on student achievement on all levels has taken place in almost every context (Slavin). The most important aspect is the application of the research in the academic world. By Slavin's count, over 79% of elementary and 62% of middle school teachers use some

form of collaborative learning methods.

Collaborative learning can have effects on learning and goal achievement. If used correctly, just like any tool, the best co-workers and students will bring the weaker members of the team up to par (Felder & Brent, 2007). If used incorrectly, collaborative learning can be disastrous with the best team members minimizing their efforts as the weaker team members piggyback on the stronger members' mediocrity (Felder & Brent). It is the responsibility of the team leader to motivate the team to optimal performance.

Theoretical foundations of collaborative learning. Vygotsky (1977) and his zone of proximal development as well as Bandura's (1977) social learning theory are two of the most important theoretical foundations of collaborative learning. Each of these men is what is termed socio-constructivists (Hickey, 1997). Socio–constructivists and their theories are centered on the term "cognitive conflict" which described the displeasure that one has when a difference is realized between one's existing schema and newly acquired information or experiences (Hickey). Hickey further stated that cognitive conflict is an essential component in achieving mental growth. It is the social interactions that we encounter on a daily basis whether in the classroom or the boardroom that drive this cognitive conflict and enable us to achieve more advanced levels of cognition. This study examined that cognitive conflict. It is important for business students to understand this conflict in a positive way in order to succeed in class and prepare them for the business environment after they conclude their academic career.

Vygotsky's zone of proximal development. Vygotsky (1977) believed that knowledge comes directly from the surrounding environment. The zone of proximal development is the distance between what the individual can achieve and the possible goals that can be

attained with the help of others. Although Vygotsky typically conducted his research with children paired with adults, the principle can be applied to peer groups where levels of subject-matter knowledge vary as well as a mentoring program in a business environment.

Vygotsky's zone of proximal development implies that through interaction a less competent person will become independently proficient in the originally grouped task through the guidance of a more competent person (Ang & Zaphiris, 2008). In essence, the least competent person will understand the task more clearly with the guidance and then be able to attain a previously unattainable goal. This concept is important to remember in the realm of collaborative learning. In the student groups, a team member who is unsure of the level of study habits and work needed to be able to actively participate in the group should, at first, be aided by the other team members. After the peer group demonstrates what is needed to become successful, the less prepared student will have a roadmap for success and should be able to achieve higher individual goals.

Gallimore and Tharpe (1990) stated that a zone of proximal development could be created for any learning domain. The collaboration used in this study prepares the students for the examination by refining study habits. It is hypothesized in this study that through this interaction students' study habits will be positively affected.

Moreover, the zone of proximal development can be used in the classroom with the instructor also serving as a facilitator (Cueso, 1992). In collaborative groups within the academic environment, the instructor gives insight and feedback as the group members interact with each other. The instructor's feedback serves to enlighten the group on its processes and direction. This feedback should serve as a reference for the group as it moves

forward in its tasks.

This type of facilitator role is also used in the business environment as well (Macneil, 2001). Companies pair new employees with peer leaders or managers in an effort to assist in their development. Middle managers can be mentored by executive managers in order for that person to be groomed for the next level. Each of these mentoring concepts is deeply rooted in the zone of proximal development (Gallimore & Tharp, 1990).

Bandura's social cognitive theory. Bandura's (1977) social cognitive theory is a causal model, which explains psychosocial functioning. The social cognitive theory is based on behavior, cognitive, and environmental events influencing each other in a reciprocal manner. This next section details the social cognitive theory and the components that make the connection between the theory and this study.

Agentic perspective of social cognitive theory. Bandura (2001) stated that a key component of the social cognitive theory is the agentic perspective. An agent is the intentional affecting of one's functioning and life circumstances (Bandura, 2004). There are four core features of agency: (1) intentionality, (2) forethought, (3) self-reactiveness, (4) self-reflectiveness (Bandura, 2001).

Intentionality is "the power to originate actions for given purposes" (Bandura, 2001 p.6). In other words, intentionality is the relationship between cause and effect. However, the key point with intentionality is that a person is committing to intended plans of actions to produce a desired result. In our lives, we have the potential to produce unintended results even with the best intentions in mind. In this study, the student's intentionality was the degree of planning and adjusting based on the quizzes to improve study habits to ultimately achieve an acceptable score on the tests.

Forethought is essential to the realization of goals and the motivation to work towards them. Bandura (2006) describes forethought as "anticipatory self-guidance.” In other words, forethought is the ability to anticipate future actions based on the actions of today. Forethought can be enhanced through this study because the testing effect has shown that study habits are improved by reducing the need for the students to cram for the test. Through the administration of quizzes with immediate feedback, the students are constantly informed of their baseline and are able to adjust study habits in anticipation of the exam. This should allow for better retention and more likely attainment of academic goals.

Even the best plan of action cannot anticipate every variable and issue that may arise. Bandura (2001) stated that "one cannot simply sit back and wait for the appropriate performances to appear” (p. 8). Self-reactiveness accounts for the need of the agent to have a level of flexibility in order to adjust present and future actions. Self-reactiveness also describes one’s ability to motivate and regulate the execution of goals. Self-reactiveness in this study is directly related to the group dynamic and the individual's confidence that the group can be more effective than their own individual efforts.

The final core feature of the agentic perspective according to Bandura (2001) is self-reflectiveness. Bandura defines self-reflectiveness as “the metacognitive capability to reflect upon oneself and the adequacy of their own thoughts and actions.” Through self-reflectiveness, people will constantly evaluate their motivation, actions, and the outcomes and effects on themselves and others because of those actions (Bandura). In business, or the team academic environment, self-reflectiveness will shape the actions of leaders in adjusting their teams, and allow followers to change their level of effort in order to

achieve the intended goals.

A major component of self-reflectiveness and the ability to adjust and adapt is directly related to a person's individual and the group's efficacy beliefs (Bandura, 2006). The individual or the group will only adapt if there is a belief that effort will make a positive impact, and goals are more easily achieved. The most used solution to understanding actions and the effect of those actions is through modeling (Wood & Bandura, 1989). Modeling others and basing future decisions on the outcomes of practiced or witnessed events give the individual and the group a roadmap for success or failure.

Modeling. In the business world, modeling is used to develop skills and competencies within the workplace (Wood & Bandura, 1989). Best practices are demonstrated by mentors or subject matter experts in order to increase productivity, enhance safety, and enforce policies, to name a few (Wood & Bandura). However, people learn by modeling throughout their lives and not just in the business arena. Through modeling, people can develop behaviorally, socially, and intellectually. An understanding of modeling can assist the individual, manager, teacher, and instructional designer in the achievement of their personal and career goals.

The modeling process consists of three distinct steps. In the first step, basic skills are modeled in order to communicate the appropriate competencies. Skills that are more complex are broken down into sub skills (Bandura, 1988). The mastery of the sub skills is significant because this will allow the transfer to multiple situations. For modeling to be successful, trainees must learn how to apply the learned skills to multiple contexts (Wood & Bandura, 1989). For example, if the student models proper study habits because of

working within the collaborative group, the hope is that those study habits will transfer to every class throughout the student's academic career.

Bandura (1988) stated that "human competency requires not only skills, but also self-belief in one's capability to use those skills well" (p. 276). The goal when modeling is used is that students or trainees build self-confidence. As confidence increases, it is more likely that the modeled behavior will be accepted and used long-term (Bandura).

The second step of the modeling process allows participants to practice the newly acquired skills. "Proficiency requires extensive practice" (Bandura, 1988, p. 276). This step is designed to simulate the actual context and receive immediate feedback. Role-playing is typically used in this step (Bandura). Feedback in this step is essential but it must be constructive (Bandura). Negative feedback can affect the students or trainees in such a manner that they will no longer believe that they can accomplish the task. For feedback to be effective, the appropriate behavior, process, and or skill must be emphasized immediately (Gibbs & Simpson, 2004).

In this study, feedback was given by posting the answers to the pop quizzes immediately after the last quiz is taken that day. In previous studies, feedback on the quiz questions were given immediately after the quiz was taken in each section of the course. The researcher decided not to perform the study in that manner because the answers can be shared with other students before the next section. This possibility needed to be avoided because of the potential negative effects on the reliability of the data.

The third aspect of modeling is the transfer program. The transfer program is when the modeled skills are put into actual contexts (Bandura, 1988). This step will begin the reinforcement of the behavior with the participant experiencing "self-directed success"

rather than guided success with the mentor in the previous step. The participant will naturally progress from basic to more complex tasks testing the applicability of the skills and expanding on the previous results. In relation to this study, the researcher hypothesized that as the students' progress through the quizzes, the students' study habits would become more efficient as far as focus and time.

Bandura's social cognitive theory (1988) provided the foundation for the research that defined and developed collaborative learning theory. In fact, Bandura has continued to contribute to the literature. However, the primary influences on the development of collaborative learning theory are Johnson and Johnson (1987) as well as Slavin (1980). Their dedication to collaborative learning has inspired a wealth of study and impacted students and teachers across the globe. The next section will detail Johnson and Johnson's definitions, and foundations of collaborative learning.

Johnson and Johnson's definition of collaborative learning theory. Johnson and Johnson (1994) believed there was a gap in the preparation of the learning environment. They believed that there was not enough attention paid to how students should interact with each other to facilitate learning. They further stated that learning was often dedicated to interactions between students and curriculum, students and textbooks, and teacher, student interaction. However, referencing back to the social cognitive theory and the benefits of peer interaction, Johnson and Johnson believed that learning through interaction with other students fell by the wayside.

Through competition, individual goals, or team-based cooperation, students can collaborate and grow from their interactions with each other (Webb, 1982). The most common form of student interaction is through competition (Webb). Johnson and

Johnson (1994) stated that students believed that the educational environment is a "competitive enterprise where one tries to do better than other students." Collaborative learning can use this competitive thought process to enhance the learning experience and positively motivate students to achieve their goals.

Although competition is important, it is essential for students to become comfortable with the individual and team-based contexts as well. Businesses often place employees in competitive situations, such as a sales office or a collection center. In addition, marketing teams may compete against another for a lucrative contract. Collaborative learning would be helpful for business students in preparation for their professional careers.

Johnson and Johnson (1994) differentiate group work and collaborative learning. This differentiation is the key to collaborative learning. The difference is defined by the term positive interdependence. Positive interdependence is the notion that the group will survive or fail together (Johnson, Johnson, & Smith, 2007). When students work in a group, such as when studying for an exam, their score typically is their own. With positive interdependence, the students would study together and take the test as a team with everyone sharing the same score or an average of the scores. Sharing results is the key collaborative interaction and not just sharing thoughts and ideas (Dyer & Singh, 1998).

Johnson and Johnson's elements of collaborative learning. In many cases, individual efforts will be much more successful than group work. In an interpersonal competitive situation, there is negative goal interdependence, where one person wins and the other competitors lose (Johnson & Johnson, 1998). This type of competitive educational structure is natural and students instinctively strive for individual success

inside of the classroom. The survival of the fittest mentality is very powerful and for people seeking out collaborative success, five elements must be present. Johnson and Johnson stated that the four elements are essential because the elements promote effective collaboration. The elements distinguish collaboration from individuals achieving similar goals (Johnson & Johnson).

Positive interdependence. The first essential element of collaborative learning is positive interdependence (Johnson & Johnson, 1994). This term as stated before, is the fact that all team members are invested in the final grade or assessment (Johnson and Johnson, 1994). However, positive interdependence is much more complex than the definition suggests. First, students or coworkers must believe that each group member's effort is critical to the achievement of the goal (Johnson and Johnson, 1994). In addition, each group member must have a unique contribution to the effort (Johnson and Johnson, 1994). For example, in a business environment a new process design may include multiple departments contributing to the project on a micro scale to achieve the overall goal.

Along with the unique effort, complementary roles, and shared goals for positive interdependence to be structured, there must be positive resource interdependence (Ortiz, Johnson, & Johnson, 1996). Positive resource interdependence is achieved if each group member has only a portion of the resources (Ortiz, Johnson, & Johnson). In effect, each group member's resources on its own are useless; however, when combined the resources can then be used to successfully achieve the goal. Positive task, positive identity, outside threat and fantasy interdependence are other types of positive interdependence (Johnson & Johnson, 1994).

Positive task interdependence mirrors a relay race where one member must complete one portion of the task before the next person can complete his or her own (Griffin, Neal, & Parker, 2007). Griffin, Neal, and Parker state that positive identity exists when groups share a mutual identity through a name or motto. The outside threat exists when groups are in direct completion with one another (Griffin, Neal, & Parker). Finally, fantasy interdependence focuses on group members collaborating on a hypothetical situation (Griffin, Neal, & Parker).

Johnson and Johnson (1994) have actively researched and studied positive interdependence. The research has consistently found that groups have not achieved their goals regularly unless positive interdependence has been structured effectively (Johnson, Johnson, & Smith, 2007). In addition, when goals and rewards are combined, the effect is greater than when a goal or resource interdependence is used alone (Johnson, Johnson, & Smith, 2007).

Interaction and accountability. Promotive interaction is a result of positive interdependence (Johnson & Johnson, 1998). Promotive interaction is characterized by group members encouraging and assisting each other in order to produce results, achieve goals, and complete tasks. The face-to-face component of promotive interaction, which is characterized by providing assistance, exchanging resources, providing feedback and constructively challenging each other, is an important key to successful collaboration. This interaction promotes team-based effort, motivation, higher order decision making ability, and influencing for the shared cause.

The next essential element of collaborative learning is individual accountability (Stahl, 1994). Johnson and Johnson (1994) stated, “the purpose of collaborative learning

groups is to make each member a stronger individual in his or her own right (p.32).” The way to ensure that individuals are strengthened by collaborative learning is by holding the individuals responsible to partners for their own contribution (Johnson & Johnson, 1994). In many cases in higher education, this is done by each group member rating the other members and a grade is assigned as a result (Johnson & Johnson, 1994). The group members who contributed less attain a lower score than those who contributed more

The term for a group member that rides the work of others is called “social loafing” (Smrt & Karau, 2011). Many times within group work, equal effort is not displayed and the few complete the work of many. The individual accountability component is intended to provide a control for that type of behavior (Johnson & Johnson, 1994). If the group does feel that others are not carrying their weight, the top performers can regress to the other’s effort or hold resentment while picking up the slack, which is not conducive to the collaborative learning environment.

There are a number of instructional strategies that can assist in establishing individual accountability (Johnson & Johnson, 1994). Strategies include group size. Individuals will have more accountability with smaller group sizes. Individuals can get lost in the crowd with large groups and, as a result, not put forth their expected level of effort. Individual tests and observation are also ways to ensure accountability (Johnson & Johnson, 1994). The group can turn in a combined effort but also be tested as individuals on the subject matter. A key point of collaborative learning is the instructor serving as a facilitator (Cueso, 1992). Through interaction and observation, a well-trained instructor should be able to evaluate the effort of individuals within the group.

In the business world, one of the most effective ways to ensure equal effort is to

randomly call out group members for explanations of the group's work (Dyer & Singh, 1998). This strategy will quickly identify social loafers as well as highlight the amount of participation that is expected. Continued nonconformity can result in poor individual scores and expulsion from the group (Dyer & Singh, 1998). This strategy used in this study through the use of the quizzes, which will be highlighted later in this chapter.

Interpersonal and small-group skills. In order to accomplish shared goals, students must interact, support, and accept each other (Johnson & Johnson, 1999). Groups must believe that they can constructively solve issues in order to identify optimal solutions. The development of the ability to interact with groups on an interpersonal level is the fourth element of collaborative learning (Johnson & Johnson, 1999). Students and employees are not naturally comfortable with working in group settings (Hansen, 2006). The ability to learn and develop the social skills to be able to be successful in the group dynamic, must be taught and aided by instructors, supervisors and co-workers (Johnson & Johnson, 1998). In many cases, modeling within the group will allow individuals to refine their behavior within the context.

Group processing. The group must be aware of its effectiveness in order to improve (Cohen & Bailey, 1997). The ability of the group to form an opinion of its current level of achievement and make changes in order to improve is referred to as group processing (Johnson, Johnson, Stanne, & Garibaldi, 1990). At the outset, the instructor or supervisor may guide the group through this component. However, eventually the group should be able to work through and identify its opportunities for improvement and strategies for advancement.

Johnson et al. (1990) identified two levels of processing. The first level is small

group. In small group processing the instructor or supervisor will spend time with each collaborative group in order to process how effective the group functioned (Yager, Johnson, Johnson, & Snider, 1986). Groups should elaborate on positive and negative interactions, as well as make decisions on what changes should be made in the future. Small group processing promotes cohesiveness, potency, and esteem within the group because of the interaction (Yager, Johnson, Johnson, & Snider).

Whole class processing is the second level (Johnson et al., 1990).The instructor, after working with the groups individually, would then share the findings with the class as a whole. This strategy allows the small groups to relate to each other and compare opportunities and strategies for improvement (Johnson et al., 1990). This also allows research to be combined among groups rather than within. The comparative analysis can allow data to be compared on a class-by-class or workgroup-by-workgroup basis in order to make determinations.

Slavin's perspectives on collaborative learning. Slavin (1995) is also one of the most respected researchers of collaborative learning. His work at Johns Hopkins University has been admired and used around the world. Slavin has dedicated his research to the use of collaborative learning in elementary and middle schools, however his theories and thoughts on the subject can be used in multiple contexts.

Slavin (1995) is most known for his four theoretical perspectives on collaborative learning. The four perspectives are: (1) motivational, (2) social cohesion, (3) cognitive, and (4) cognitive elaboration. The theories are designed to explain the effects of collaborative learning on achievement. The following sections will summarize each of the four theories and detail their effects on student achievement.

Slavin's motivational perspective. Collaborative learning focuses on reward or goal structures in order to facilitate an equal effort in groups and shared responsibility (Slavin 1977). Incentive structures insure that individuals can only achieve their goals if the group achieves the desired level. In essence this causes the individual to participate and help ensure that the group succeeds. An intervention that Slavin (1995) suggests is group contingency.

Group contingency is comparable to an "academic quid pro quo." The group will know what the requirements are as well as the reward for achieving the goals (Slavin, Wodarski, & Blackburn, 1981). Slavin (1995) notes that group contingency does not suggest that members help each other, but requires members to perform their roles in the group. Slavin (1977) described group contingency within an apartment complex saving electricity. All of the tenants that resided within the complex equally shared the bill. By saving electricity, everyone benefited. Reid, Schuh-Wear, and Brannon (1978) researched group contingency and its effects on employee absenteeism. In this case, unnecessary absenteeism is reduced by the use of group contingency.

The traditional motivational intervention is competition (Jameson, 2007). In collaborative learning, this implies that one group's success would decrease the chance that other groups would succeed as well. In business and sales, this is often the case with the top sales group earning the reward and the others do not. Vroom (1969) described this as the "rate buster" in a sales environment. This is when one particular salesperson sets the bar with an incomparable performance while achieving the prize and setting expectations for coworkers by this success. Through the one salesperson's success, the rest of the salespeople are motivated to raise their own level of achievement.

Slavin's social cohesion perspective. The social cohesion perspective relates to the motivational perspective. The concept behind the social cohesion perspective is that the cohesiveness of the group can ultimately determine the level of goals achieved. This perspective emphasizes motivational rather than cognitive explanations for effectiveness (Slavin, 1995). In essence, group members care about the group and will assist each other in learning because it is in their best interests to do so (Slavin). The difference is that motivational perspectives are reward-based, whereas social cohesion is a people-based motivation.

Team-building activities are a cornerstone of the social cohesion perspective (Slavin, 1995). Team-building activities, along with group self-evaluation, are used to gauge the abilities of the team and its parts and enable a plan for success to be developed by its members. This study used a team icebreaker as well as the pre-study questionnaire as team-building and self-evaluation techniques, respectively.

The jigsaw method (Wood & Dixon, 2011) is used for social cohesion purposes and is a popular collaborative learning strategy. The jigsaw method allows for the members to learn subsets of an overall topic, then meet and share the information with each other. The group will only perform as well as the group members' level of mastery of the information that they are responsible for. The jigsaw method can also be used on a larger scale with each group within a class taking a topic and sharing with the other groups.

Another aspect of the jigsaw method is the assigning of roles within a group (Slavin, 1995). Roles such as "observer," "recorder," and "team leader" can be assigned to members further specifying their responsibility and accountability to the team. The expected result is a team that is not motivated by reward but by devotion to the others that

are depending on their efforts.

Slavin's cognitive perspective. Slavin (1995) notes that the major alternative to motivational and social perspectives is the cognitive perspective. The cognitive perspective is founded on the notion that interactions within themselves will increase performance and goal attainment (Slavin, 1995). The cognitive perspective is similar to Vygotsky's (1977) zone of proximal development that was summarized earlier. The cognitive perspective suggests that through the guidance of and interaction with peers students can learn more than if attempting to achieve the same goal on their own.

The opportunity for students to discuss, debate, share, and understand each others' viewpoints are the critical element of collaborative learning (Slavin, 1995). Damon and Phleps (1989, p. 10) proposes his conceptual foundation for a collaborative-based educational plan as four points:

1. Mutual feedback and debate spurs motivation and facilitates learning through the abandonment of misconceptions and the search for better solutions.
2. Participation and peer communication can help the process of verification, which assists in learning development.
3. Discovery learning enables and encourages creative thinking.
4. Children can better generate thought and innovative ideas through peer interaction.

The key point to remember about the cognitive perspective is that it rejects the use of extrinsic incentives. Damon and Phelps (1989) state, "there is no reason to include any extrinsic motivators in peer learning strategies" (p. 11). The current study is based on some of the foundational aspects of the cognitive perspective. The students during their

group quizzes will debate the concepts learned in class and on their own to come to a consensus answer. The reward is only the score on the quiz and on the exam that follows.

Slavin's cognitive elaboration perspective. Cognitive psychology researchers have maintained that in order for information to be retained in long-term memory, the learner must engage in the elaboration of the material (Slavin, 1995). One of the best ways of elaborating learned materials is explaining the material to someone else (Slavin, 1995). The concept of elaboration mirrors the previously summarized social cognitive perspective. The discussion resulting from the explanation of the material will allow for greater levels of understanding. The difference is that the group of students assists each other in summarizing and fact checking the information as well as correcting any inaccuracies.

Process modeling and reciprocal teaching are also popular ways to facilitate elaboration and assist in long-term retrieval. Process models can illustrate the material to be learned and allow the students to evaluate the material in a non-traditional manner (Wood & Bandura, 1989). Reciprocal teaching is a method that utilizes the formulation of questions in order to identify important elements of material (Slavin, 1995). In the current study, the quizzes served as the reciprocal teaching tool that will allow the students to gauge what material is important which will, in theory, reduce overall study time.

Collective Efficacy

Collective efficacy has been given only a small amount of attention in higher education, although it is directly related to collaborative learning efforts (Baker, 2001). Bandura (2001) addressed collective efficacy throughout his research with self-efficacy. The majority of the research that has followed was formed from Bandura's theories.

The collective efficacy of a group is essential to the attainment of the shared goal (Goddard, Hoy, & Hoy, 2004). The following section will provide an overview of collective efficacy as well as discuss the relationship between collective efficacy and achievement.

Collective efficacy and motivation. Within the social cognitive theory, Bandura (2001) stated that the control that collaborative groups exert is influenced by their perceptions of efficacy. The degree of consensus on the capabilities and ability of the group to achieve the desired goal will ultimately determine the group's effort towards success (Baker, 2001). The degree of consensus is derived from the notion that the group members will weigh, integrate, and evaluate their group's capabilities and then regulate their efforts as a result (Baker).

Collective efficacy is directly related to motivational theories such as expectancy theory and goal setting theory (Cherian & Jacob, 2013). Expectancy theory is based on the premise that action is determined by the belief that effort will lead to a level of performance (Vroom, 1969). Bandura (2006) stated that groups will judge more in terms of what their collective actions will be able to produce rather than rate their individual capabilities. This suggests that the group will naturally gauge its potential collectively. The level that the group believes can be attained will regulate the effort of the members.

Group efforts must be properly integrated (Baker, 2001). Think of a great sports team with a collection of stars that have a losing record. Talents must be properly coordinated or the team will not succeed. This lack of success, despite a high level of efficacy can produce self-debilitating thought patterns and continue a downward spiral of results (Baker). The self-debilitating thought patterns have a negative impact on motivation and

collective efficacy of the group (Baker).

Groups with high levels of efficacy tend to give credit for success to the group rather than the individual (Durham, Locke, Poon, & McLeod, 2000). In addition, groups with strong beliefs in their collective talents will be less likely to blame failures on external factors and will be more likely to direct their attention to increasing effort (Durham et al.). Groups with high levels of efficacy will be more persistent and will persevere through initial struggles. It is the groups' cognitive belief in the ability and the motivation to see that ability produce that drives their behavior.

Origins of collective efficacy. Collective efficacy is produced through the interactive sharing of ideas and the common experiences of group members to objective stimuli (Baker, 2001). Bandura (2006) stated that the sources of collective efficacy included enactive mastery experiences, vicarious experiences, verbal persuasion, as well as emotional states. Past performance is an integral component of collective efficacy (Jung & Sosik, 2003). A group's previous accomplishments and failures will determine the level of collective efficacy.

However, other factors can play a role in collective efficacy. Unlike self-efficacy where the individual is directly responsible for results, groups may change based on their team members, such as, if the star player is injured and cannot play in the big game. Efficacy is judged by the interactive assessments of group members (Goddard et al., 2004). If the balance of the team is disturbed in any manner this may negatively affect the belief that the group can perform.

Collective efficacy and self-efficacy share many of the same foundational components. A group can positively affect one's self efficacy, however a single

participant in a group may or may not perceive that the other group members can perform to the needed level (Baker, 2001). Collective efficacy as mentioned before, depends on the group member interacting and coordinating their abilities in a cohesive manner (Goddard et al., 2004). In order to achieve their goals, teams must have the ability to resolve conflicts and communicate effectively. If the groups are unable to communicate effectively, then they may not achieve the goals that their abilities may suggest.

Assessing collective efficacy. Assessing collective efficacy can be challenging. Group responses to efficacy can be easily influenced and are susceptible to pressures of conformity and groupthink (Kroon, Van, & Rabbie, 1992). Bandura (2006) stated that forced consensus can hide the actual levels efficacy beliefs within groups.

The research has suggested a few approaches for assessing levels of collective efficacy. One method is to poll individuals about their own belief of the group's ability to perform at desired levels (Baker, 2001). The mean of the individual scores is then used to arrive at the group score. This method has been used in both academic and business situations. Prussia and Kinicki (1996), asked individual members to assess the group's ability to perform a brainstorming task. Riggs and Knight (1994) developed the Collective Efficacy Beliefs Scale, which asked workers to rate each individual in the group as well as the group as a whole. Other studies have assessed work behaviors such as problem solving and cohesiveness (Little & Madigan, 1997) as well as group potency (Jex & Bliese, 1999).

There have been some assessment issues as a result from researchers calling for a separation in the terms group potency and collective efficacy (Baker, 2001). Group potency is defined as the groups' generalized belief in their effectiveness (Hu & Liden,

2011). Although both include considerations for the "shared beliefs" of the group, some have argued that potency assumes high levels of agreement and inter-rater agreement within the group (Chu & Chu, 2010). In order to distinguish the two, researchers have contended that assessments that focus on collective efficacy will allow for questions about the individual and the group whereas, group potency will include group-based questions exclusively (Chu & Chu).

In business and academia, researchers study process and outcome measures as they relate to collective efficacy (Baker, 2001). Outcome measures are targeted toward specific performance levels whereas process measures focus around the group's ability to coordinate effectively (Wooley, 2009). Researchers commonly choose to focus on outcome or process measures based on the research context (Wooley). Academic and business environments can use both outcome and performance measures independently or concurrently (Wooley).

In the current study, the researcher used both process and outcome measures. Outcome measures were evaluated using the assessment at the end of the quizzes. Each of the eight quizzes included a question polling the group members on the number of questions they believe they scored correctly. Process measures were evaluated through the pre-study and post-study questionnaires. The individuals were asked whether they were able to function with the group as an individual as well as evaluate the group's ability to succeed and communicate collectively. The questionnaires included both group efficacy and potency items in order to perform the analysis.

Previous research on collective efficacy. Compared to self-efficacy, collective efficacy has been researched substantially less (Baker, 2001). The majority of studies

have focused on collective efficacy and performance. Only a few have focused on task persistence and goal setting (Baker, 2001). Groups that have been featured in studies about collective efficacy and overall performance included athletic teams and work/project teams (Chiocchio & Essiembre, 2006).

Feltz and Lirgg (1988) found a positive relationship between collective efficacy and athletic performance. In this study, the effects of efficacy beliefs on the performance of a hockey team were examined. The researchers found that collective efficacy played a role in better statistical benchmarks throughout the season. Spink (1990) in a similar study with volleyball teams found a positive relationship between collective efficacy and performance in tournaments.

Research in higher education and organizational settings has produced similar results. Little and Madigan (1997) examined self-managed work teams and their performance. The researchers observed a positive relationship between collective efficacy and performance. However, the researchers observed that team members agreed about the perception of the team as a whole, but were varied in their own abilities to accomplish the task. The researchers noted that the individual differences were based on conflicting perceptions of resources, the ability to coordinate with other team members, and problem solving acumen. This may suggest that managing beliefs may be as important as managing skills in motivating performance.

Bandura (1977) studied the beliefs of institutional effectiveness and collective efficacy in a school district. He examined each of the 79 schools in the district and noted that there was a positive relationship between collective efficacy and performance of academic tasks as well as the perception of the organization’s effectiveness (Goddard et

al., 2004). Durham, Knight, and Locke (1997) were able to reproduce similar results using simulation games and other academic tasks.

Other studies have stated that collective efficacy can have an effect on resilience after failure, performance beyond ability level, goal setting, and communication. A study that many organizations and academic institutions may be interested in is a study of army teams conducted by Bliese and Jex (1999). The researchers found that group-level efficacy was negatively related to both psychological strain and negative physical symptoms. In other words, the teams high in collective efficacy were stressed less and not as prone to illness because of their efficacy.

The Testing Effect

Roediger and Karpicke (2006) define the testing effect as memory gain produced by tests. Bloom (1984) noted that the common evaluator of knowledge in the classroom is the test, which provides evidence of the mastery of learned material. The test, which is the most common evaluation tool, is rarely used for formative evaluation, but is primarily used for summative purposes. The theory is that by taking repeated tests throughout the semester, students will better understand and retain the material (Roediger & Karpicke, 2006). For example, students who are tested 10 times throughout the semester will perform better than students that only take a midterm and a final examination.

One of the main hypotheses that this study focused on was whether repeated testing is perceived as helpful for the student and has positive effects on the students' study habits and overall achievement in the course. This section of the literature review summarizes the testing effect and its benefits.

The first researcher who examined the benefits of taking tests to improve retention

was Gates in 1917 (as cited in Roediger & Karpicke, 2006). Gates argued that deficiencies in memory may be due to poor study habits and that self–testing would be a good study practice to improve memory. Roediger and Karpicke detailed Gate's groundbreaking experiment. The study used two groups, that were both given the same material to learn. The first group was given 4 hours to study the material and was then given a test. The second group, after 2 hours was asked to look away from the material and recite it back to themselves. Then at the 4-hour mark, the second group was administered the same test as group one. The results showed that the second group that participated in a form of self-testing showed improved retention over the first group on the first and subsequent tests (Roediger and Karpicke).

Time passed throughout the 20th century with little effort invested in research on the testing effect. Glover (1989) reviewed the topic in his influential article, which has served as the springboard for the research conducted in the 21st century. Although the testing effect is gaining popularity in academic circles it still has a very thin body of knowledge. Roediger, has pioneered the testing effects rebirth with his research at Washington University in Saint Louis, Missouri.

Roediger has focused on taking the testing effect to the classroom in order to diminish the misconceptions associated with tests by both faculty and students (Vojdanoska, Cranney, & Newell, 2009). Students were accustomed to taking tests infrequently, which counted heavily toward their final grade. The test, as a result, is a source of anxiety for the student, which plays a role in how tests are perceived (Nie, Lau, & Liau, 2011). Also, teachers are unfamiliar with the benefits of offering more tests to their students in order to improve performance (Roediger & Butler, 2011).

Benefits of repeated testing. The benefits of repeated testing and the testing effect are based on both direct and indirect effects (Roediger & Karpicke, 2006). The direct effects of testing are the ability to retrieve tested material better than if the material were only studied (Roediger, Putnam, & Smith, 2011). The indirect effects refer to the reduction of study time as a result of repeated testing (Roediger, Putnam, & Smith). This section summarizes the benefits of repeated testing. Also, possible detriments to the use of repeated testing are discussed as well.

The first benefit of the testing effect is that retrieval aids later retention (Roediger, Putnam, & Smith, 2011). Wheeler and Roediger (1992) conducted an experiment that produced a strong testing effect. In the experiment, there were three groups of subjects. The first group was given material to read and turn it back in. The group was then told to return a week later to take a test. The second group was given the same instructions but were given a 7-minute test before leaving. The third was given three 7-minute tests and were told to come back in a week. The result was that the third group recalled 80% more information than the first group.

Wheeler and Roediger (1992) considered the point that some make about the testing effect stating that the third group was able to study the material more as a result of the tests given before they left the first time. This point is disputed by including a restudy control group in testing effect experiments (Roediger, Putnam, & Smith, 2011). The testing group is now at a disadvantage because of the timed tests whereas the restudy group has unlimited time between the first and second sessions (Roediger, Putnam, & Smith, 2011).

In an experiment by Roediger and Karpicke (2006), the first group of students was

given four study sessions after the material was presented and left for the day. That group scored the lowest on the test given a week later of the three groups. This was set to imply that cramming was only beneficial when the test occurred immediately after studying (Roediger, Putnam, & Smith, 2011). This result has been repeated over numerous studies (see also Karpicke, 2009; Karpicke & Roediger, 2007; Wheeler, Ewers, & Buonanno, 2003).

This point is stressed because the primary argument against repeated testing is that it is considered very similar to studying. However, Roediger, Putnam, & Smith (2011) suggest that testing produces a mnemonic boost relative to restudying. As a result, testing should be considered a learning strategy rather than a study tool in the traditional sense.

The second benefit of the testing effect is that testing identifies gaps in the knowledge (Roediger, Putnam, & Smith, 2011). This benefit is an indirect effect of testing however, it may be the most relevant as far as student achievement is concerned. Taking the test allows the student to assess study needs and focus on missed questions for the examination. Amlund, Kardash, and Kulhavy (1986), noted that subjects corrected errors on the second test when given feedback after the first test. In addition, students spent longer time reviewing the questions missed rather than the ones answered correctly. Kornell and Bjork (1997) inquired how students normally study for a test. Typical answers were flash cards, chapter quizzes, and other testing techniques. In fact, 68% of participants quizzed themselves in some manner (Kornell & Bjork). Self-testing in that regard is a naturalistic study technique that has been used by many students and recommended by teachers. The process of incorporating tests into the classroom is where the debate begins.

The third benefit of the testing effect is that it can enhance learning in future study sessions. Pyc and Rawson (2010) showed that subjects formed better mediators, which are defined as mnemonic devices that link a cue to a target, when tested before a study session. Karpicke and Roediger (2007) found similar results as well. This benefit helps students by guiding them through the material and allowing for improved study habits. Vojdanoska, Cranney, and Newell (2009), also noted that feedback after the examination supported this benefit of the testing effect and enhanced student achievement as a result.

The fourth benefit of the testing effect is that testing allowed better organization of knowledge (Roediger, Putnam, & Smith, 2011). This concept is important because it is directly related to the recall of the material. Zaromb and Roediger (2010) showed that testing can improve category clustering and the subjective organization of materials. This improvement helped the student prepare for the examination by chunking the information into more easily studied sections, therefore reducing study time.

The fifth benefit of testing is that testing improved transfer of knowledge to new contexts (Roediger, Putnam, & Smith, 2011). One of the major points that Roediger and colleagues suggested is that testing allows information to be used to solve new problems. For example, Jacoby, Wahlheim, and Coane (2010) conducted a study that tested knowledge transfer. In this study, participants were shown information about specific birds including classifications. One group of students was tested on the information and the other studied the material. Both groups were then given an exam. Following the testing, the students were given new birds and were asked to put the birds in their appropriate classification. The students who took a test before the examination performed better than those who only studied the material.

Butler (2010) in a series of experiments demonstrated that testing aids transfer to new contexts. In experiments one and two, it was shown that testing promotes retention of learned material as well as new material within a knowledge domain. In experiment three Butler showed that transfer to different domains could be improved as well.

After repeated tests, participants were asked to take the previously tested material and associate it with new knowledge domains. Subjects who were tested instead of studying (the process is similar in all of the experiments), were more likely to be able to associate learned information to a new topic. For example, during the first round of testing, the participants learned about bats. In the transfer portion of the experiment, the participants were asked to compare how bats fly to sonar on a submarine. The testing group performed much better than the study group in this trial.

The fact that testing does transfer to multiple contexts validates its claim as a worthwhile learning strategy, which can be beneficial to students over the course of their academic careers. If students learn how to test themselves effectively and teachers incorporate testing into their curriculums, student achievement can be increased.

A major benefit of the testing effect is that it can facilitate retrieval of non-tested information (Roediger, Putnam, & Smith, 2011). Chan, McDermott, and Roediger (2006) studied the repeated testing's effect on related non-tested information. In the study, participants studied an article. After reading the article, they were given either a test or asked to re-read the article. The next day, all participants were given a test that included questions conceptually related to the initial test. Those who were tested initially, performed better than those who were asked to re-read the material

Another benefit of the testing effect is that testing improves metacognitive monitoring

(Roediger, Putnam, & Smith, 2011). This implies that because of testing, students will be more able to accurately predict what they do and do not know. When students reread material they can be overconfident in their self-assessment of how prepared they are (Roediger, Putnam, & Smith). However, testing can help balance that over confidence with a finding known as the underconfdence with practice effect (Finn & Metcalfe, 2007).

Finn and Metcalfe (2007) stated that testing can reduce confidence in students if feedback is not given after the test. In the current study feedback was given after the quiz, when the correct answers are given to the students. After feedback is given, the students will be better at differentiating what they do know and what they do not know as well. This will aid in studying and make more efficient use of their time (Roediger, Putnam, & Smith, 2011).

Finally, two very important benefits to testing that most can agree on is that testing provides feedback to instructors and encourages students to study (Roediger, Putnam, & Smith, 2011). Kelley (1999) noted that instructors overestimate their belief of what their students know because it can be a reflection of their own effectiveness. Testing can provide a way to improve instructors' estimation of student retention and knowledge. With a better understanding of their own students' progression, instructors can adjust their lesson plans and presentation to facilitate student achievement.

The students will naturally prepare for the tests as they have throughout their academic career. The purpose of the repeated tests is to make students better at testing in order to score better. Then, using the benefits as stated earlier in the section, the students will improve and understand how to use testing to their advantage (Lyle & Crawford,

2011). Also, the tests can be given as a participation grade and used as a tool. This may relieve some of the anxiety associated with it.

There are a few potential drawbacks to frequent testing. Karpicke and Blunt (2011) stated that testing took away from other opportunities within the classroom because of time constraints. There are no studies yet conducted that have examined the worth of testing rather than lecturing or any other classroom activity (Roediger, Putnam, & Smith, 2011).

The next criticism is that quizzes provide a type of superficial learning where the student only studies for the test. Butler (2010) addressed this concern with the use of feedback in order to discuss the material beyond the quiz that was given. The final criticism is that students will have a false sense of what is important by taking a limited number of questions on a quiz (Roediger, Putnam, & Smith, 2011). In essence, the students can be fooled by the quiz into narrowing their scope of study too far. The benefits from the previous research would suggest that this is not a concern. However, there has not been any substantial work in this area and is an opportunity for future research.

This section provided an overview of the testing effect which is an important component of this study. The use of repeated testing was an important source of data for the study. However, the focus of the study becomes clearer when repeated testing is merged with collaborative learning. The next section outlines collaborative testing as well as its uses and benefits.

Collaborative Testing

Collaborative testing occurs when students work together on an exam or assessment

(Lusk & Conklin, 2003). Collaborative testing, on the surface, would seem like the perfect complement to collaborative learning strategies. However, it is different from traditional examinations. Some argue that collaborative testing provides the opportunity for free loading and will take away from the academic experience (Kapitanoff, 2009). Others praise the effects of collaborative testing and state that collaborative testing reduces stress and anxiety while enhancing student achievement (Breedlove et al., 2007).

This study examined the effectiveness of collaborative testing on student achievement. Also, this study analyzed student perceptions of collaborative testing's relationship to social loafing, and learner confidence. The purpose is to understand collaborative testing in order to evaluate its worth, contexts where it can be used, as well as the impact on student learning outcomes.

In general, there have only been a few studies conducted that have examined collaborative testing in the college environment (Breedlove et al., 2007). This section provides a review of collaborative testing studies. Also, insight into the methods used, and the results of the included studies will be highlighted. The goal is to understand the outcomes of the previous research efforts in order to effectively design this study as well as a research base for the future.

Most collaborative testing studies center around two methods: (1) when students work together and turn in individual answers or (2) when students work together to turn in a consensus answer sheet (Breedlove, Burkett, & Winfield, 2007). Another popular form of collaborative testing is when students take the test twice. Students first take the test as individuals and then as a group (Rao et al., 2002).

The main difference in the approaches is the need for agreement. Most advocates of

collaborative testing agree that although the debate is useful, collaborative testing should include an agreement on an answer (Giraud & Enders, 2000). One advantage of collaborative testing is the instant formative feedback for the students (Meseke et al., 2008). Through discussion, students are able to provide insight and guide each other to higher levels of understanding. In fact, the concept is similar to Vygotsky's (1977) zone of proximal development, where one can accomplish more with the assistance of another.

There have been a number of studies that have used consensus tests. Meseke, Nafziger, and Meseke (2008) conducted a study in a chiropractic class that included a group that took quizzes as individuals and another as a consensus group. The results included significant differences in quiz scores. The consensus group scored significantly better on the weekly quizzes administered throughout the study. However, when both groups took the three examinations as individuals there were no significant differences in individual performance.

Giraud and Enders (2000) stated that the collaborative testing group retained as much information as the individual group supports collaborative testing practices. However, if the culture of education and the view of tests as summative assessments will be changed, then more evidence of the effects of collaborative testing is needed. Helmericks (1993) explored the consensus group exam in an undergraduate class. In this study the students were all assigned to collaborative groups and the results were compared to the previous semester when quizzes were given as individuals. The scores on the collaborative exams were 13.46% higher than the exams taken as individuals. However, the collaborative class scored 5.75% lower on the final exam.

Leight, Saunders, Calkins, and Withers, (2012) also stated in their study that

performance improved but retention did not have a significant gain over the course of the study. In this study, a large-enrollment undergraduate course, which is similar to the class used in this study, students showed improvement when taking collaborative tests. However when questions from the tests were included in the cumulative examinations taken as individuals, the students exposed to collaborative testing did not perform significantly better.

The aforementioned results give credence to both sides of the argument. The collaborative group did score higher than the individual group throughout the semester. However, it seems that long-term retention suffered. The lack of improvement in long-term retention would also dispute the research associated with the testing effect as well. Multiple studies concerning collaborative learning have used the final exam performance as the definition of long-term retention (Breedlove et al., 2007; Haberyan & Barnett, 2010; Sandahl, 2009). Long-term retention, as mentioned in the testing effect section in this chapter, is one of the major goals of education. If long-term retention is reduced as a result of collaborative testing then its perceived effectiveness would suffer as a result.

The study conducted by Helmericks (1993) was not designed to answer why the scores were different when the final was taken. Helmerick stated that it was possible that the students had achieved their final grade and coasted through the final. Also, the quizzes may have not prepared the students for the final exam. There are many variables that could have played a role in the difference in scores. As a result, other researchers began to include tools to capture student attitudes toward collaborative testing.

The research has been strong in support of the notion that student achievement is improved as a result of taking collaborative tests. Zimbardo, Butler, and Wolfe (2003)

stated that collaborative groups scored significantly higher than individuals. The study also noted that participants reported positive attitudes towards the experience. Zimbardo et al. reported reduced test anxiety, elevated confidence, irrelevance of cheating, and increased enjoyment of the course. Each of the previously listed positive effects is beneficial to students and has been found to be consistent with other studies.

Ioannou and Artino (2010) used collaborative testing in order to reduce test anxiety, and make the class experience more positive. The students' attitudes were found to be supportive of the collaborative testing initiative. The students also reported low levels of anxiety as it relates to the testing process. The authors stated that the students believed that the collaborative test was “beneficial for learning,” “more enjoyable,” “less stressful,” and “probably as fair” as a traditional exam (p. 196).

The qualitative data included in the Ioannou and Artino (2010) study was helpful for the researchers to understand the indirect effects of collaborative testing. Other studies have used qualitative data to provide insight into the experience from the student perspective. Meseke, Nafiziger, and Meseke (2010) used a student survey featuring qualitative data. Comments documented within the literature included “effective for multiple exposure for the material,” “ group quizzes allow you to talk through the questions,” and “ I learned key points from others” (p. 26). The authors also observed a large amount of peer to peer interaction. The current study included open- ended questions on the pre- and post-study questionnaire in order to capture data about attitudes and satisfaction.

It has been noted that individuals will reduce their effort when working within collaborative groups (Meseke, et al., 2010). As mentioned previously, the reduced effort

is called social loafing. The major opponents of collaborative learning/testing often raise the possibility of social loafing as a reason that collaborative methods do not enhance student learning. Studies have examined social loafing and included comments from participants such as: “I studied so I would not look bad in front of my peers,” “I wanted to be prepared for the discussion” (Breedlove et al., 2007; Ioannou & Artino, 2010; Meseke et al., 2010; Sandahl, 2009).

However, within the same studies there were comments that supported the notion that social loafing was prevalent with the use of collaborative testing. Studies showed that some students complained that others would have failed without their help (Ioannou and Artino, 2010). Other studies noted that some students, if given a choice, would have not participated in collaborative testing because of social loafing (Breedlove et al., 2007).

The students who typically do not want to participate in collaborative testing and complain about social loafing are high performing students (Giuliodori, Lujan, & DiCarlo, 2008). High performing students are normally more adept to being prepared without the motivation of a quiz (Haberyan & Barnett, 2010). Haberyan and Barnett noted the difference in student performance played a role when students were given a choice of whether they wanted to participate in collaborative learning. High performing students preferred to work alone and often cited the fact that they would “out work” their peers as a reason to not participate in groups.

There have not been many studies on how collaborative testing affects learner confidence. Learner confidence was defined in this study as the degree that the learner believes the answer given on an examination is correct without the possibility of chance. Few studies have focused on confidence in any form. One of note is the Giuliodori et al.

(2008). In the study, the researchers gauged whether students, when taking a non consensus group test, would change their answers on an individual test taken previously. The study showed that students were more likely to change their answers after collaborating with the group. However, a closer look at the data suggested that low performing students were much more likely to change their answers.

In conclusion, the research base for collaborative testing has not been developed to a level where appropriate, confident statements of effectiveness can be made. The studies reviewed reveal that there are a number of different methods for the use of collaborative testing, with one method no better than the others.

Confidence

Learner confidence was included within this study in order to gauge if the students were more confident in their quiz answers as a collaborative group or as individuals. In Vojdanoska et al., (2009) the researchers noted that the relationship between learner confidence and the testing effect was not analyzed in their own or previous studies. The researchers suggested that the relationship should be included within future research on the topic. Confidence is an important driver of achievement and success. An understanding of how confidence dictates effort and lack thereof is important to the instructor, trainer, and instructional designer.

The literature describes confidence as a situation-specific trait (Keller, 1979). Basically, confidence depends on the context as well as the perceived level of competency for the context. We are more likely to be confident in tasks that are close to our unique skill sets. For instance, an ice skater will not be as confident in his or her ability to win the 100 meter dash. However, when performing a triple axel, the ice skater

should be beaming with confidence.

In the classroom this idea still holds true. A business major will be much more confident that he or she will succeed in business related courses than if they were forced to take an engineering course as an elective.

The belief that confidence stems from comfortability and preparedness of the topic or task is similar to expectancy theories (Bandura, 1977). Bandura stated that confidence is attributed to the individual's expected level of success. If the learner has a high expectancy for achievement, their confidence will increase. If the learner has a high fear of failure then they will have a low level of confidence.

Davies (2000) conducted a study on confidence and found that when confidence levels are high, the participants learned from failure. Also, participants with high levels of confidence were more apt to take risks in order to achieve higher levels of achievement. The researcher also noted that participants with low levels of confidence were hesitant to lose credibility with their peers, which caused them to participate less when in groups.

Dunlosky and Rawson (2012) showed a different effect of confidence. In their study, the researchers found that students are often overconfident in their understanding of the topic which results in a decrease in achievement. Dunlosky and Rawson also stated that this overconfidence produces a false sense of security with the student which affects study time. The study concluded that students could benefit from instruction that focuses on improving skills on judging learning.

Miller and Geraci (2011) also addressed overconfidence in students' self-assessments. The researchers stated that this issue was more prevelant in underachieving students. In their study, the researchers observed that it is not only a lack of knowledge

but a lack of awareness of what they do and do not know. The lack of awareness caused a larger gap between expected and actual results when compared to the higher performing students.

The ARCS (Keller, 1987) model provides the theoretical framework for the inclusion of confidence in the analysis of this study. Whether in higher education or business and industry time must be used effectively and efficiently when instructing learners in the classroom. If the use of collaborative testing enhances learner confidence compared to individual testing, then theoretically classroom time spent reviewing topics could be adjusted to introduce new topics. If the learner confidence is improved then retention is increased and the transfer of learning is shorter which results in a greater return on investment for the organization.

The following section includes a brief explanation of the ARCS model as well as an explanation of the model's components.

Keller's ARCS model. The ARCS model was designed to be a systematic process for analyzing learner motivation and developing learning strategies to address motivational gaps (Keller & Suzuki, 2004). In other words, the ARCS model can be used as a front-end analysis tool as well as a guide for designing instruction. However, a third use of the ARCS model is to evaluate instruction based on the inclusion and effectiveness of the four components. The four components of the ARCS model: attention, relevance, confidence, and satisfaction are important factors that affect the learner's motivation to actually learn and retain the information presented.

The first component, attention describes the ability for the instruction to gain and sustain the learner's interest (Keller & Suzuki, 2004). Often in a presentation the speaker

will show a video, tell a joke, or give a testimonial in order to gain the audience's attention. This is done to start the flame of interest and curiosity from the learner. If the learner becomes interested in the topic they are much more likely to put forth the required effort to master and retain the information presented.

Relevance is the next component of the ARCS model. In order for the learner to be motivated to learn the material, the instruction must be relevant and consistent with the learner's goals and areas of focus (Keller, 1987). The key to relevance is that the instructional content must relate to future job requirements, academic goals, or a topic that the learner has a personal interest. If the content is not relevant to the learner, then there will be a lack of motivation and the instruction will not be successful.

The third component included in the ARCS model is Confidence. Keller (1987) defines confidence as the ability to help learners believe that their success was a result of their own effort and not by luck or chance. The learner's confidence in his or her own ability to control and produce positive outcomes consistently with the knowledge gained within the instruction is critical for success. The learner must have confidence that they have acquired the skills needed as well as have the ability to transfer the knowledge into actual contexts.

Satisfaction describes the learner's level of positive feelings about the learning experience as a whole (Keller & Suzuki, 2004). The learner will reflect on the quality of the instruction and the effort needed to achieve a satisfactory result. The learner also evaluates the fairness of examinations, the ability to apply the material, and the use of reinforcement. If there is an imbalance on any of the previously listed factors there is bound to be a lack of satisfaction. A lack of satisfaction will reduce the learner's

motivation in similar contexts or when introduced to similar instructional strategies.

Learner confidence is an important focus for instructors when designing and evaluating learning strategies, tools, and aids. However, the literature on how confidence is manipulated is sparce. The literature on how confidence is affected by collaborative testing in non-existent. This study aims to add to the literature and possible create a foundation for future research.

Summary

This chapter reviewed the research related to the foundational theories associated with collaborative learning, collective efficacy, the testing effect, collaborative testing, and learner confidence.

The chapter began with an overview of collaborative learning. Collaborative learning is not a new instructional strategy. Collaborative learning strategies have been well researched and a wealth of information is available on its uses. Slavin (1995) stated that research on collaborative learning can be called one of the most prominent successes in educational research. The foundational works of Vygotsky, Johnson and Johnson, Slavin, and Bandura provide the theoretical base for this study. The works associated with these researchers have stood the test of time and will continue to guide the use of collaboration in classrooms.

Collaborative learning exercises facilitate the sharing, explaining, and understanding of a topic or topics (Wei & Chen, 2006).Though social interaction, the participants in the collaborative group will further elaborate on the topic which will enable higher levels of understanding.

The millennial generation prefers conversation and collaboration as well as

opportunities to learn socially (Carlson, 2005). Collaborative learning strategies have been reintroduced on all levels as a way to address the learning preferences of this audience. In addition, due to economic constraints, which have produced larger class sizes and a reduction of faculty, it seems that, the instructor is best suited in a role of facilitator rather than a traditional lecturer (Twigg, 2009). The use of collaborative learning strategies is a perfect solution for the changing academic landscape as well.

Collaborative learning research centers around the work of Vygotsky and Bandura. Vygotsky's (1977) zone of proximal development as well as Bandura's (1977) social learning theory provide the foundation for collaborative learning theories and practice.

The zone of proximal development is the distance between what the individual can achieve and the possible goals that can be attained with the help of others. Vygotsky's zone of proximal development implies that through interaction a less competent person will become independently proficient in the originally grouped task through the guidance of a more competent person (Ang & Zaphiris, 2008). This relates to collaborative learning through the idea that stronger team members will pick up those with weaker skills.

Bandura's (1977) social cognitive theory is based on behavior, cognitive, and environmental events influencing each other in a reciprocal manner. The chapter focused on the two major points to the social cognitive theory, the agentic perspective and modeling.

Bandura (2001) stated that a key component of the social cognitive theory is the agentic perspective. An agent is the intentional affecting of one's functioning and life circumstances (Bandura, 2004). There are four core features of agency: (1) intentionality,

(2) forethought, (3) self-reactiveness, and (4) self-reflectiveness (Bandura, 2001).

Intentionality is "the power to originate actions for given purposes" (Bandura, 2001 p.6). Forethought is the ability to anticipate future actions based on the actions of today. Self-reactiveness describes one's ability to motivate and regulate the execution of goals. Self-reflectiveness is the metacognitive capability to reflect upon oneself and the adequacy of their own thoughts and actions.

Through modeling, people can develop behaviorally, socially, and intellectually. The modeling process consists of three distinct steps. In the first step, basic skills are modeled in order to communicate the appropriate competencies. The second step of the modeling process allows participants to practice the newly acquired skills. The third aspect of modeling is the transfer program. The transfer program is when the modeled skills are put into actual contexts (Bandura, 1988). Modeling is important in collaborative settings when weaker group members must catch up to others who are more skilled. Modeling allows the less skilled members to form a template of their needed level of competency to draw from.

The next section detailed the work of Johnson and Johnson. The researchers are considered to be two of the most respected researchers on collaborative learning. Johnson and Johnson's work is rooted in the belief that there was not enough attention paid to how students should interact with each other to facilitate learning. Collaborative learning in that regard focuses on peer to peer interaction with the instructor serving as a facilitator.

Collaborative learning is often confused with group work. Because of this, Johnson and Johnson defined four elements of collaborative learning: (1) positive interdependence, (2) interaction and accountability, (3) interpersonal and small group

skills, and (4) group processing.

Positive interdependence is the fact that all team members are invested in the final grade or assessment. Promotive interaction is characterized by group members encouraging and assisting each other in order to produce results, achieve goals, and complete tasks. Individual accountability is holding individuals responsible to partners for their own contribution. Interpersonal and small group skills is the group actually functioning as a cohesive team. Finally group processing is the group's formative evaluation of itself in order to identify strengths and weaknesses in order to improve.

Slavin is another respected researcher on the topic of collaborative learning. Slavin (1995) is most known for his four theoretical perspectives on collaborative learning. The four perspectives are: (1) motivational, (2) social cohesion, (3) cognitive, and (4) cognitive elaboration.

The motivational perspective requires that the individual can only accomplish their goals if the group accomplishes its ultimate goal as well. The concept behind the social cohesion perspective is that the cohesiveness of the group can ultimately determine the level of goals achieved. The cognitive perspective is founded on the notion that interactions within themselves will increase performance and goal attainment (Slavin, 1995). The cognitive elaboration perspective states that in order for information to be retained in long-term memory, the learner must engage in the elaboration of the material (Slavin, 1995).

The next section in the chapter focused on collective efficacy. The chapter covered collective efficacy's origins, relationship with motivation, assessment, and previous research conducted. The collective efficacy of a group is essential to the attainment of the

shared goal (Goddard et al., 2004). The degree of consensus on the capabilities and ability of the group to achieve the desired goal will ultimately determine the group's effort towards success (Baker, 2001).

Collective efficacy is directly related to motivational theories such as expectancy theory and goal setting theory (Cherian & Jacob, 2013). A group's previous accomplishments and failures will determine the level of collective efficacy. Collective efficacy and self-efficacy share many of the same foundational components. A group can positively affect one's self efficacy, however a single participant in a group may or may not perceive that the other group members can perform to the needed level (Baker, 2001).

Assessing collective efficacy can be challenging. Group responses to efficacy can be easily influenced and are susceptible to pressures of conformity and groupthink (Kroon et al., 1992). The research has suggested a few approaches for assessing levels of collective efficacy. Scales and survey instruments have been designed to poll the group on its ability to perform.

Prior research on collective efficacy has focused on athletic teams and work/project teams. Feltz and Lirgg (1998) found a positive relationship between collective efficacy and athletic performance. Little and Madigan (1997) examined self-managed work teams and their performance. The researchers observed a positive relationship between collective efficacy and performance. Bliese and Jex (1999) found that group-level efficacy was negatively related to both psychological strain and negative physical symptoms.

The next section detailed the testing effect. Roediger and Karpicke (2006) define the testing effect as memory gain produced by tests. The test, which is the most common

evaluation tool, is rarely used for formative evaluation, but is primarily used for summative purposes. The theory is that by taking repeated tests throughout the semester, students will better understand and retain the material (Roediger & Karpicke, 2006).

The primary benefit of repeated testing that is included in the chapter is that repeated testing allows for a greater level of retention than repeated studying of the material. Testing can also identify knowledge gaps and opportunities for improvement. Another benefit is that study habits can be redefined and improved over time as a result of testing on the material. Testing removes the ambiguity that a student has when deciding importance. Finally, that testing improves transfer of knowledge to new contexts (Roediger, Putnam, & Smith, 2011).

Collaborative testing occurs when students work together on an exam or assessment (Lusk & Conklin, 2003). There have only been a few studies conducted that have examined collaborative testing in the college environment (Breedlove et al., 2007). One advantage found in collaborative testing studies is the instant formative feedback for the students (Meseke et al., 2008). Through discussion, students are able to provide insight and guide each other to higher levels of understanding.

The research has been strong in support of the notion that student achievement is improved as a result of taking collaborative tests. Zimbardo et al. (2003) stated that collaborative groups scored significantly higher than individuals. The study also noted that participants reported positive attitudes towards the experience.

It has been noted that individuals will reduce their effort when working within collaborative groups (Meseke et al., 2010). As mentioned previously, the reduced effort is called social loafing. The major opponents of collaborative learning/testing often raise the

possibility of social loafing as a reason that collaborative methods do not enhance student learning.

Learner confidence was included within this study in order to gauge if the students were more confident in their quiz answers as a collaborative group or as individuals. The literature describes confidence as a situation-specific trait (Keller, 1979). That statement implies that confidence can change based on event, skill, task, or context.

Research on confidence has found that groups who are more confident are more likely to achieve their goals as well as rebound from failure. Giuliodori et al. (2009) showed that students were more likely to change their answers after collaborating with the group. However, Dunlosky and Rawson (2012) showed a different effect of confidence. In their study, the researchers found that students are often overconfident in their understanding of the topic which results in a decrease in achievement.

The inclusion of confidence as an evaluator on the success of collaborative testing is grounded in Keller's (1987) ARCS model. The confidence of the learner in his or her abilities to flourish as a result of the intervention is critical to their success. Keller's ARCS model was summarized in order to give insight on the importance of confidence in goal achievement.

Chapter III – Method

The literature review supports the use of collaborative learning strategies and the testing effect to improve student achievement and learner confidence. The current study assesses these effects. This study helped determine if there is a difference in student achievement and confidence among participants, who take repeated collaborative quizzes or individual quizzes. Finally, the current study examined the students' attitudes, efficacy, and satisfaction as it relates to the testing effect and collaborative testing.

This chapter includes a description of the participants, the independent and dependent variables, and the research design. The chapter also provides an overview of the instruments used and an explanation of research procedures. Finally, this chapter includes a discussion of how data were collected and analyzed.

Research Hypotheses

Based on the information from the literature review, the following hypotheses were explored in the study:

Hypothesis 1-The academic achievement of students who participated in collaborative group testing is greater than the academic achievement of students who take the tests as individuals. The literature on collaborative testing suggests that its use positively influences students' academic performance. Better academic achievement may be achieved because of students' collaborative elaboration of the material.

Hypothesis 2-The confidence of students who participate in collaborative group testing

is greater than the confidence of students who take the tests as individuals. Confidence is essential to the development of the student and the success of collaborative learning strategies. Limited research has shown that students are more confident in their answers when taking a test as a collaborative group as compared to taking the test as an individual. This study adds to the literature base in that regard and facilitates future inquiry.

Hypothesis 3-Students perceptions of study time will be less than expected as a result of the testing effect. This hypothesis is based on the assumption that students are better prepared for examinations because of the use of repeated testing. Repeated testing will allow for students to better focus their studies and provide confidence in their knowledge of the material.

Hypothesis 4-Retention of learned material is increased as a result of collaborative testing. Collaborative testing and the ability for the students to discuss complex topics with their groups allow for better retention of the material. Retention is examined by comparing scores from the first and second examinations to the same examinations given in two previous semesters where repeated testing was not used.

Hypothesis 5-Student attitudes towards collaborative testing, as well as perceptions of group efficacy and potency will improve during the semester. It is assumed that students are initially reluctant to participate in collaborative testing. High achieving students will not perceive the benefits of collaborative testing because of the potential of social loafing by their peers. However, at the end of the study, it is expected that students will be more receptive of collaborative testing and its merits.

Research Design

The design of the study is a quantitative dominant mixed methods research design that involves collecting quantitative and qualitative data in order to gain a comprehensive understanding of the research questions. The quantitative design is a cross-over repeated measures design with multiple dependent variables. The quantitative data consist of the pre- and post-questionnaire responses, and the students' grades on each of the four collaborative quizzes as well as each of the four individual quizzes. Also, the students' scores on the two exams were used to measure student achievement. Qualitative data were collected within the pre-study and post-study questionnaires in order to illustrate the quantitative responses within the questionnaire. The qualitative data are important in capturing the voice of the students and providing a personal assessment of their experience.

Random assignment and counterbalancing was used as control techniques for potential extraneous variables. Participants were randomly assigned to one of two groups, testing group one and testing group two. Each group experienced both levels of the independent variable (independent versus collaborative group), but in counterbalanced order. Testing group one took the first four quizzes as individuals and their second four quizzes as a collaborative group. Testing group two took the first four quizzes as a collaborative group and the second four quizzes individually. Table 1 presents an overview of the research design.

Table 1

Research Design

Group	Pre-Study Questionnaire	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Exam 1	Quiz 5	Quiz 6	Quiz 7	Quiz 8	Exam 2	Post-Study Questionnaire
		Individual Condition					Collaborative Condition					
1	O	X	X	X	X	O	X	X	X	X	O	O
		Collaborative Condition					Individual Condition					
2	O	X	X	X	X	O	X	X	X	X	O	O

Participants

Students concentrating in any business concentration at the University of South Alabama are required to take MGT 300 – Management Theory and Practice. The course covers the theories of organizational structures, practices, and behavior, and the effective leadership and management of organizations. It is offered as an on campus or online class.

The participants in the current study initially consisted of 197 students enrolled in four on campus MGT 300 sections at the University. The sections of the course were assigned the order of intervention. Sections 101 and 103 took the first four quizzes as individuals, while sections 102 and 104 were given the first four quizzes as collaborative groups. The students in each section were randomly assigned to their collaborative groups using a random number generator. Demographic information was collected on the students as a part of the pre and post-study questionnaire.

Variables

The dependent variables in the current study were student achievement and learner

confidence. Student achievement was measured by the students' grades on each of the four collaborative quizzes as well as each of the four individual quizzes. In addition, the students' scores on the two exams were used to measure student achievement. Learner confidence was assessed through the inclusion of a final question on each of the eight quizzes. The question asked either the individual or the group to predict the number of questions answered correctly on the quiz.

The independent variable in this study was the use of collaborative groups. The students were accustomed to taking quizzes as individuals. In addition, some students had been accustomed to working in groups. However, few students had experience with testing in groups.

Instrumentation

The pre-study (Appendix A) and post-study (Appendix B) questionnaires provided the insight needed to accurately assess student attitudes about collaborative learning and testing before and after participating in collaborative learning in the class. Specifically, the questionnaire was an inquiry into the perceptions of group work: both previous and current, group potency, efficacy, and achievement goals. The questionnaire, because of its scope, was designed from multiple sources, which are described in this section.

Group work experience. The first section of the questionnaire included five items which examined previous experiences with collaborative groups. The first item, following a set of administrative inquiries (name, class section), asked the student, "given a choice, I would rather work alone than in a group." The researcher included this particular question before the prior experience- based questions to serve as a baseline for the student attitudes in the survey. The answer set was a 6-point rating scale, with

anchoring ranging from strongly disagree to strongly agree.

The following items in the group work experience section asked the students how many classes had they taken (in their lifetime) that had used collaborative groups. If the student answered zero, indicating no experience, then the next three questions were skipped. The next items inquired about the students' overall experience with collaborative groups as well as two open-ended questions that asked the students to list positive and negative experiences with collaborative groups.

These experience items were designed to serve as a foundation to gauge students' past experiences versus the present expectations and future goals when working in collaborative groups.

Personal efficacy. The next set of items was developed from Riggs, Warka, Babasa, Betancourt, and Hooker's (1994) personal outcome expectancy scale. The items were constructed by Riggs et al. (1994) to be consistent with Bandura's (1977) theories. When designing the scale, Riggs et al. used expert judgment to determine the questions to be included. Scale reliability was measured at α=. 88.

The questionnaires for this study contained three items based on the personal efficacy scale. The items poll the students on their beliefs that they will perform well on the individual quizzes in class and the amount of control that they have over the results. An example is, "when my performance on the individual quizzes is poor it is due to a lack of preparation." The answer set is a 6-point rating scale from "strongly disagree" to "strongly agree."

Self-efficacy for group work. Five items on the next section were adapted with permission from the self-efficacy for group measure from Baker (2001). The measure is

designed to gauge the students' perceived ability to work within the group setting. Five items were taken from Baker's questionnaire. Baker reported alpha reliability of .95. The questions that were taken from the original questionnaire had factor loadings in the original study that ranged from .76 to .80.

Examples of items that were included in the section are, "I will be able to explain my opinions to other members," and "I will be able to combine group members' viewpoints to reach a shared idea."

Group potency. The next set of five items examined group potency. Group potency describes the expected level of success for the collaborative group. The questions were used with permission from Baker (2001). The included questions had a reported alpha reliability of .88 and an intragroup agreement correlation of .95 in Baker's study.

Examples of the items regarding group potency include "my grades will be higher when working in a collaborative group than as an individual," and "my collaborative group will be confident in our answers on the quizzes."

Demographics. The final item set inquired about race, gender, age, academic class, major, expected grade, and current GPA.

The only difference between the pre-study and post-study questionnaires is that the format in the pre-study questionnaire is formatted in the present or future tense. The post-study questionnaire was worded in the past tense. The design was to compare expectations to reflections in order to make statements about the impacts of collaborative testing.

Treatment

Approval for this study was obtained from the University of South Alabama's

Institutional Review Board (Appendix C). Students enrolled in four sections of the Management Theory & Practice course were invited to participate in the semester-long study of the effects of the testing effect and collaborative testing on student achievement and learner confidence. Following an introductory PowerPoint presentation, (Appendix D), the consent form (Appendix E), which detailed the study's purpose, was supplied to the students using an online survey tool.

If the students did not wish to participate, their grades were not used in the study. However, they still participated in all in-class activities and quizzes as listed in the course syllabus. After the students consented to the study, they were randomly assigned to collaborative groups. The collaborative groups were used for all collaborative activities throughout the semester and were not restricted to the scope of this study.

The use of repeated testing, both collaborative and individual was used to help the students prepare of the class and examinations more effectively and efficiently. Through peer interaction and repeated exposure to the material, students should have learned how to better plan, scrutinize, and appraise their study habits and progress. The metacognitive aspect of repeated testing should enhance the students learning efforts more effectively than traditional study methods.

Procedure

The study was conducted in an on campus class at the University of South Alabama's Mitchell College of Business. During the second week of class, the researcher introduced the study to the students. A PowerPoint presentation on the background of the study was presented as well as the results of the random assignment of collaborative groups. After the class, a link to the consent form and the pre-study questionnaire was sent to the

students' University e-mail accounts. The consent form and questionnaire were managed by an online survey tool.

After the study was presented, the students were asked to assemble in their collaborative groups. The groups were instructed to exchange contact information and participate in an icebreaker activity. The icebreaker activity consisted of the students presenting another student within the group to the class by announcing their name, major, hometown, and an interesting fact about that person.

The four sections of the course were assigned an order for taking the quizzes. Sections 101 and 103 were part of treatment group one, which took the first four quizzes as individuals and the second four as a collaborative group. Sections 102 and 104 took the first four as a collaborative group and the second four as individuals. The sections were not told the dates of the quizzes or the order that their section would take them. The first four quizzes took place before exam one and the second four quizzes were administered before exam two.

The syllabus and course content including lectures, reading assignments, homework and in-class activities were identical for the four sections. With 20 minutes remaining in the class, the researcher entered the classroom and announced the quiz. The students either separated as individuals or formed their pre-assigned collaborative groups depending on the section or quiz number. Students were given a paper copy of the questions and entered their answers on a standard Scantron answer sheet. Collaborative groups were allowed to discuss the questions whereas individuals took the quiz without input from others or resources. Students were allowed 15 minutes to complete each quiz.

After all sections completed the quiz, the students were sent an e-mail informing them

that the answer key was posted to the University e-learning site for the class. Students' grades were posted the evening of a quiz day in order for students to compare their scores to the answer key.

After the eighth and final quiz, the students were sent a link to the post-study questionnaire where they answered questions about their overall experience with repeated testing and collaborative groups. The study was then concluded and subjected to analysis.

Statistical Analyses

Data analyses were conducted in the Statistical Package for the Social Sciences (SPSS). An analysis of variance (ANOVA) was performed to examine any mean difference between the groups in the total point-value of students' grades on the eight quizzes and two exams. A *t* test was also performed to determine if there was a mean difference in learner confidence between the two groups. The final quantitative data were generated from a comparison of the pre and post-study questionnaire results as well as the comparison to the questionnaire answers to the academic achievement scores. Multiple *t* tests were used to analyze these comparison data.

Qualitative data were collected from the responses to the open-ended questions on the pre- and post-study questionnaire.

Summary

This chapter summarized the methods and procedures that were used to collect and analyze the data in the proposed study. A quantitative, dominant mixed methods study was used to evaluate the effects of the independent variable, collaborative groups, on the dependent variables, student achievement, and learner confidence. Both quantitative and qualitative data were collected to fully explore these effects.

The participants were 197 students enrolled in four traditional sections of Management Theory & Practice at the University of South Alabama. The four sections of the course were assigned an order for taking the quizzes. Treatment group one, took the first four quizzes as individuals and the second four quizzes as a collaborative group. Treatment group two, took the first four quizzes as a collaborative group and the second four quizzes as individuals. The first four quizzes took place before exam one with the second four occurred before exam two.

During the second week of class, the researcher introduced the study to the students. A PowerPoint presentation on the background of the study was presented as well as the results of the random assignment of collaborative groups. After the class, a link to the consent form and the pre-study questionnaire was sent to the students' University e-mail accounts.

The pre- and post- study questionnaires provided the insight needed to accurately assess student attitudes about collaborative testing. Specifically, the questionnaire was an inquiry into the perceptions into group work; both previous and current, group potency, efficacy, and achievement goals. Demographics were also included in order to provide details of the sample. SPSS was used to analyze all of the quantitative data. Qualitative data were analyzed in order to add specificity to the quantitative data.

Chapter IV – Results

The purpose of the current study was to investigate the effects of collaborative learning and the testing effect on student achievement and confidence of undergraduate business students. The study was also designed to examine potential changes in attitude as it related to group efficacy, group potency, personal expectancy, and working in collaborative groups. The students were randomly assigned to collaborative groups within the four sections of an introductory business course. After a pre-study questionnaire that inquired about the student's perceptions and prior experiences working in groups, the students were given eight chapter quizzes based on the class lectures. Four quizzes were given before the first exam and four were given before the second exam. Two of the four sections were given the first set of quizzes as a collaborative group. The other two sections took the initial set of quizzes as individuals. After the first exam, the sections switched methods. The method for data collection was a crossover, repeated-measures design. Following the second examination, the students completed a post-study questionnaire that polled their reaction to the collaborative testing.

The results of the quantitative and qualitative analyses are presented based on the research questions. The quantitative data were analyzed using SPSS. The alpha level used to determine statistical significance was .05.

Statistical Analyses

The independent variables in this study were students' quiz scores given as

individuals or collaborative. The dependent variables included student achievement, learner confidence, and attitudes on collaborative work, group efficacy, group potency, and personal expectancy. The sample included in the study consisted of 38 males and 46 females (three chose not to answer). The sample also included 1 freshman, 33 sophomores, 38 juniors, and 14 seniors (one chose not to answer). Ages ranged from 19 to 55 with ages 19 through 23 appearing most frequently (three chose not to answer).The following research questions were addressed in this study.

Research question 1. Research Question 1 **-** Does the use of repeated testing increase students' academic achievement in an undergraduate business course?

Hypothesis 1 - The academic achievement of students who participate in collaborative group testing will be greater than the academic achievement of students who take the tests as individuals.

Question 1 was examined using quantitative data collected from the students' grades on the eight weekly quizzes and the two exams. A repeated measures ANOVA was conducted to determine whether there was a statistically significant difference in the academic achievement of students who took the quizzes either collaboratively or as individuals.

The repeated measures ANOVA revealed a statistically significant difference in quiz scores between treatment group one, the students that took the first four quizzes as individuals and treatment group two, the students that took the first four quizzes as collaborative groups, $F(1, 85) = 20.14$, $MSE = 96.57$, $p = .001$. The ANOVA that was conducted for quizzes five through eight also revealed a statistically significant difference in quiz scores for the two treatment groups. Treatment group one, who were graded as a

collaborative group, scored significantly higher on the quizzes than treatment group two F (1, 85) = 42.91, MSE = 164.46, p=.001. Table 2 lists the means and standard deviations of the quiz scores by treatment group.

Table 2

Means and Standard Deviations of Quiz Scores by Group

	Treatment Group	*M*	*SD*
Quiz 1	1Individual	7.45	1.77
	2 Group	8.23	1.65
Quiz 2	1	6.68	1.87
	2	7.74	1.53
Quiz 3	1	5.98	1.80
	2	7.42	1.72
Quiz 4	1	6.11	1.70
	2	7.05	1.33
Quiz 5	1 Group	8.59	1.02
	2 Individual	6.98	1.97
Quiz 6	1	8.55	1.23
	2	6.77	2.22
Quiz 7	1	9.11	.92
	2	7.88	1.53
Quiz 8	1	7.25	1.14
	2	6.37	1.89
Total	Individual	6.78	1.21
	Group	7.99	.63

An examination of the two exam scores did not produce a statistically significant difference. An independent sample t test was conducted in order to compare the differences in performance of each treatment group. On the first examination, treatment group one, individual quiz takers (M= 77.63, SD= 13.07) did not score significantly better or worse than treatment group two, collaborative quiz takers (M= 77.23, SD= 14.03), t

(85) = .14, p=.89. Exam two produced similar results with treatment group one, collaborative quiz takers (*M*= 77.05, *SD*= 13.07) and treatment group two, individual quiz takers (*M*= 77.40, *SD*= 13.49), *t* (85) = -.12, *p*=.90. Table 3 displays the means and standard deviations by group for the two examinations.

Table 3

Means and Standard Deviations of Exam Scores by Group

	Treatment Group	*n*	*M*	*SD*
Exam1	1 Individual	44	77.64	13.07
	2 Collaborative	43	77.23	14.03
Exam2	1 Collaborative	44	77.05	13.07
	2 Individual	43	77.40	13.49

Research question 2. Research Question 2- Does the use of collaborative testing increase students' confidence in their answers to quiz questions in an undergraduate business course?

Hypothesis 2- The confidence of students who participate in collaborative group testing will be greater than the confidence of students who participate as individuals.

Quantitative data collected from the confidence questions within the eight quizzes were used to answer research question 2. The final question on each of the quizzes was designed to gauge the confidence of either the individual or collaborative group by asking how many questions were answered correctly. The students were given five choices to answer the question on confidence. The choices; 0-2, 3-4, 5-6. 7-8, and 9-10 were coded as 1 through 5 respectively and analyzed utilizing a repeated measures ANOVA in SPSS.

The analysis of quizzes 1-4 in which treatment group 1 participated as individuals and

treatment group 2 participated as collaborative groups produced a statistically significant main effect for treatment group, F (1, 84) = 8.39, p = .005, such that the average confidence score on the quizzes was significantly higher for collaborative groups (M = 3.84, SD = .98) than for individuals (M = 3.34, SD = 1.04).

The analysis of quizzes 5-8 in which treatment group 1 participated as collaborative groups and treatment group 2 participated as individuals produced a statistically significant main effect for treatment group, F (1, 84) = 21.97, p = .001, such that the average confidence score on the quizzes was significantly higher for collaborative groups (M = 4.28, SD = .98) than for individuals (M = 3.47, SD = 1.18). Table 4 lists the means and standard deviations for the confidence scores on the quizzes by group.

Table 4

Means and Standard Deviations of Quiz Confidence Scores by Group

		Quizzes 1-4			Quizzes 5-8	
Group	*n*	*M*	*SD*		*M*	*SD*
1.Individual	44	3.34	0.9768	1. Group	4.28	0.98
2. Group	43	3.84	1.175	2. Individual	3.47	1.18

Note: Highest available score was 5.

An analysis of the confidence related questions on the pre-study and post-study questionnaire also produced significant results. The pre-study questionnaire asked how confident the students are in their ability as a group or as an individual to perform well on the quizzes. A t test was conducted to determine if there was a significant difference. The

results indicated that the students were more confident that they would perform well as a group (M = 5.04, SD = .86) than as individuals (M = 4.42, SD = 1.07), $t(82) = -4.72$, p = .001.

The analysis of the same questions on the post-study questionnaire produced similar results. The students reflected on their confidence level when taking the quizzes as an individual and as a group. The students reported that they were significantly more confident in their answers when taking the quizzes as a group (M = 4.92, SD = .95) than as individuals (M = 4.36, SD = 1.05), $t(85) = -3.96$, p = .001. Table 5 shows the items from the questionnaires as well as the means and standard deviations.

Table 5

Means and Standard Deviations of Confidence Items on the Pre-study and Post-study Questionnaires

	Pre-Study Questionnaire		Post-study Questionnaire	
Item	*M*	*SD*	*M*	*SD*
I am/ was confident in my ability to perform well on the individual quizzes this term.	4.42	1.07	4.36	1.05
My collaborative group will be/ was confident in our answers on the quizzes	5.04	0.86	4.92	0.95

Note: Scale= 1. Strongly Disagree 2. Moderately Disagree 3. Slightly Disagree 4. Slightly Agree 5. Moderately Agree 6. Strongly Agree

Research question 3. Research Question 3- Does the use of repeated testing affect

students' study time in preparation for exams?

Hypothesis 3- Students study time will be less than expected as a result of the testing effect.

Question 3 was examined using quantitative data obtained from the pre-study and post-study questionnaires. The first analysis conducted was a comparison to a question that asked the students how many hours a week they expected to (pre-study) and actually (post-study) study each week for the course. A *t* test produced results that indicated that students studied significantly less at the end of the study ($M = 2.66$, $SD = .82$) than expected at the beginning ($M = 2.85$, $SD = .73$), $t(85) = 2.14$, $p = .04$. Table 6 shows the means and standard deviations from the two questionnaire items.

Table 6

Means and Standard Deviations of Overall Study Time Items on the Pre-study and Post-study Questionnaires

	Pre-study Questionnaire		Post-study Questionnaire	
Item	*M*	*SD*	*M*	*SD*
Overall, how many hours do you expect to study each week for MGT 300?	2.85	1.07		
Overall, how many hours did you study each week for MGT 300?			2.66	0.82

Note: Scale: 1= 0 2= 1-2 3= 3-4 4= 5-6 5= 7+

Another item included within the post-study questionnaire asked the students if the quizzes affected the time spent studying for the exams. The students could answer that

the quizzes either: (1) increased, (2) decreased, or (3) did not affect their study habits. Table 7 shows the frequency and percentage for each answer.

Table 7

Post- study Change in Study Time Frequencies

	Frequency	Percent	Cumulative Percent
Increase Study Time for Exams	29	34.1	34.1
Decrease Study Time for Exams	22	25.9	60.0
The Quizzes Did Not Affect My Study Habits	34	40.0	100.0
Total	85	100.0	

A one-way ANOVA was run on selected demographic information collected in the post-study questionnaire with the change in study time item serving as the dependent variable. The analyses conducted at the $p<.05$ level on expected grade [F (2, 82) = 1.30, p = .28], gender [F (1, 81) = .33, p = .57], academic class [F (3, 81) = .69, p = .56], major [F (7, 77) = .46, p = .86], and treatment group [F (1, 83) = .78, p = .38] were not statistically significant.

Research question 4. Research question 4- Does the use of collaborative repeated testing increase students' retention of learned material?

Hypothesis 4 – Retention of learned material will be increased as a result of collaborative testing.

The questions on the quizzes were designed to serve as study guides for the exams. Through the preparation for taking and reviewing the quiz it was hypothesized that

students' would retain the information better than those who did not use this learning strategy. Furthermore, it was hypothesized those who took the quizzes as a collaborative group would perform better on the examinations than those who took the quizzes as individuals.

The first analysis conducted for research question 4 was a *t* test that was conducted to determine if treatment group one who took the first four quizzes as individuals scored significantly better or worse on the first exam than treatment group two, who answered the quizzes collaboratively. The results indicated that there was no significant difference in treatment group one ($M = 77.64$, $SD = 13.07$) in test performance than treatment group two ($M = 77.23$, $SD = 14.03$), $t(85) = .14$, $p = .89$.

The second analysis conducted for research question 4 was a *t* test that was conducted to determine if treatment group two, who took the first four quizzes as individuals, scored significantly better or worse on the midterm exam than treatment group one who answered the quizzes collaboratively. The results indicated that there was no significant difference in treatment group two ($M = 77.40$, $SD = 13.50$) in test performance than treatment group one ($M = 77.05$, $SD = 13.07$), $t\ (85) = -.12$, $p = .90$. Table 8 shows the means and standard deviations for the two groups for the first two exams.

Table 8

Means and Standard Deviations of Exam Scores by Group

		Exam 1		Exam 2	
Group	*n*	*M*	*SD*	*M*	*SD*
		Individual Condition		Collaborative Condition	
1	44	77.37	13.07	77.05	13.07
		Collaborative Condition		Individual Condition	
2	43	77.23	14.03	77.40	13.50

The next analysis centered on whether the groups as a whole scored better on the exams than the previous semesters who did not use repeated testing at all. A *t* test was conducted on both exams to determine statistical significance. The students who participated in the study scored similarly on the first exam ($M = 77.44$, $SD = 13.48$) than the students in the five previous semesters ($M = 77.54$, $SD = 13.20$), $t\ (85) = -.071$, $p = .943$. In addition, the students who participated in the study scored slightly higher on the second exam ($M = 77.22$, $SD = 13.20$) than the students in the five previous semesters ($M = 75.78$, $SD = 11.91$), $t\ (85) = 4.96$, $p = .312$. Table 9 shows the results from the paired differences.

Table 9

Paired Differences for Exam Performance- Current and Previous Semesters

		M	*SD*	*SEM*
Pair 1	Test1 - Past1	-.10	13.47	1.44
Pair 2	Test2 - Past2	1.44	11.91	1.42

When analyzing the groups separately, neither the individual group (M = 77.64, SD = 13.07) nor the collaborative group (M = 77.23, SD = 14.03), scored better than the other compared to the previous five semesters on exam one (M = 77.54, SD = 13.47) t (85) = -.14, p = .89. The analysis produced the same results on exam two. The collaborative group (M = 77.05, SD = 13.07) and the individual group (M = 77.40, SD = 13.50) did not score significantly higher or lower than the other in comparison to exam two from the previous five semesters (M = 75.78, SD = 11.91), t (85) = .89, p = .38.

Research question 5. Research question 5- Does the use of collaborative repeated testing affect students' attitudes regarding the effectiveness of collaborative group exercises.

Hypothesis 5- Student attitudes toward collaborative testing, as well as perceptions of group efficacy, and potency will improve during the semester.

Student attitudes. Paired-samples t tests were conducted using the quantitative data from the pre-study and post-study questionnaires. The items were designed to gauge the students' perceptions of collaborative learning before the study and attempt to determine if their attitudes had significantly changed after the study concluded.

The first item included in this section asked the students how much they agreed with the statement: "Given a choice, I would rather work alone than in a group." The students were asked to answer this with a 6-point scale with 1-"Strongly Disagree and 6-"Strongly Agree." The analysis of the results showed no significant difference between the pre-study questionnaire (M = 3.79, SD = 1.44) and the post-study questionnaire (M = 3.45, SD = 1.49), t (86) = 1.94, p = .03 (one-tailed).

The next item comparison focused on the students' previous experiences with

collaborative groups and reflections on their experience in this study. The pre-study questionnaire item, “My overall experience with collaborative groups in the past has been:“ was compared to the post-study questionnaire item, “My overall experience with collaborative groups in Management 300 was:.” The item scale ranged from 1- “Very Negative” to 6- “Very Positive.” The results indicated a significant difference between the pre-study questionnaire (M = 2.77, SD = 1.07) and the post-study questionnaire (M = 2.10, SD = .92), t (82) = 5.12, p = .001(one-tailed).

The third item of this group asked the students to predict, and then reflect on their level of enjoyment working with collaborative groups in this study. The item scale ranged from 1- “Strongly Disagree” to 6- “Strongly Agree.” The results indicated a significant difference between the pre-study questionnaire (M = 4.51, SD = 1.13) and the post-study questionnaire (M = 4.91, SD = 1.13), t (86) = -2.89, p = .003 (one-tailed).

The final item asked the students to predict, and then reflect on their level of preparation compared to their peers when working in collaborative groups during the study. The item scale ranged from 1- “Significantly Lower” to 6- “Significantly Higher.” The results indicated a significant difference between the pre-study questionnaire (M = 2.61, SD = .78) and the post-study questionnaire (M = 2.94, SD = .87), t (86) = -2.89, p = .003 (one-tailed). Table 10 summarizes the paired differences from the previous four questionnaire items.

Table 10

Paired Differences for Student Attitude Questions Pre- and Post-Study Questionnaires

Scale		*M*	Paired Differences *MD*	*SD*	*SEM*
1	Pre-I would rather work alone than in a group.	3.79	.35	1.66	.18
	Post-I would rather work alone than in a group.	3.45			
2	Pre- My overall experience with collaborative groups in the past has been:	2.77	.68	1.20	.13
	Post- My Overall experience with collaborative groups in MGT 300 was:	2.10			
1	Pre- I think I will enjoy working with a collaborative group on quizzes this semester.	4.51	-.40	1.32	.14
	Post- I enjoyed working with a collaborative group on quizzes this semester	4.91			
3	Pre- Compared to others in my group my preparation for class will be:	2.61	-.33	1.08	.11
	Post- Compared to others my preparation for class was:	2.94			

Note: Scale 1: 1/6= Strongly Disagree/ Agree 2/5= Moderately Disagree/Agree 3/4: Slightly Disagree/Agree
Scale 2: 1/6= Very Negative/ Positive 2/5= Negative/Positive 3/4: Somewhat Negative/Positive
Scale 3: 1/6= Significantly Lower/Higher 2/5= Lower/Higher 3/4: Somewhat Lower/Higher

Group efficacy. The next section of items on the questionnaires focused on the students' perceived and actual ability to function within the collaborative setting. Five items were included in the questionnaires that discussed how the students were able to give feedback, combine viewpoints, use others ideas, as well as taking and giving viewpoints on the subject matter. The scale on each of the collective efficacy items ranged from 1- "Strongly Disagree" to 6- "Strongly Agree." The group efficacy subscale appeared to have a good internal consistency, $\alpha = .81$.

The results of the paired samples t tests on the items produced one significant difference in the students' selections. The first item "I will be/was able to give feedback to other group members about my understanding of their ideas" was answered similarly on the pre-study ($M = 4.99$, $SD = .84$) and the post-study questionnaire ($M = 4.98$, $SD = .85$), $t(86) = .10$, $p = .46$ (one-tailed).

The second item set, "I will be/was able to combine group members' viewpoints to reach a shared idea" also resulted in a non-significant change from the pre-study ($M = 4.96$, $SD = .84$) and the post-study questionnaires ($M = 4.89$, $SD = .86$), $t(84) = .60$, $p = .27$ (one-tailed). The next item "I was able to constructively use other group members' evaluations of my idea" showed a slight yet insignificant decrease in answers from the pre-study ($M = 5.02$, $SD = .82$) and the post-study questionnaires ($M = 4.90$, $SD = .75$), $t(83) = 1.18$, $p = .12$ (one-tailed).

The fourth item, "I will be /was able to effectively take other group members' ideas into account in order to add to a group discussion" showed a significant decrease between the pre-study ($M = 5.09$, $SD = .83$) and the post-study questionnaire ($M = 4.86$, $SD = .95$), $t(84) = 1.78$, $p = .04$. The final item, "I was able to openly explain my opinions to other

group members" resulted in no change between the pre-study (M = 5.09, SD = .87) and the post-study questionnaires (M = 5.09, SD = .85), t (84) = .000, p = .50 (one-tailed). Table 11 summarizes the means, standard deviations, and standard errors for the five pairs of collective efficacy items.

Table 11

Paired Differences for Student Group Efficacy Questions: Pre- and Post-Study Questionnaires

			Paired Differences		
		M	*MD*	*SD*	*SEM*
Pair 1	Pre- I will be able to give feedback to group members about my understanding of their ideas	4.99	.011	1.04	.11
	Post- I was able to give feedback to group members about my understanding of their ideas	4.98			
Pair 2	Pre- I will be able to combine group members' viewpoints to reach a shared idea.	4.96	.071	1.08	.12
	Post- I was able to combine group members' viewpoints to reach a shared idea.	4.89			
Pair 3	Pre- I will be able to constructively use other group members' evaluations of my ideas	5.02	.12	.92	.10
	Post- I was able to constructively use other group members' evaluations of my ideas	4.90			
Pair 4	Pre- I will be able to effectively take other group member's ideas into account in order to add to a group discussion.	5.09	.24	1.22	.13
	Post- I was able to effectively take other group member's ideas into account in order to add to a group discussion.	4.86			
Pair 5	Pre- I will be able to openly explain my opinions to other group members	5.09	0.00	1.01	.11
	Post- I was able to openly explain my opinions to other group members	5.09			

Note: Scale 1: 1/6= Strongly Disagree/ Agree 2/5= Moderately Disagree/Agree 3/4: Slightly Disagree/Agree

Group potency. Three questionnaire items that addressed group potency were analyzed. These items were included in the questionnaires in order to gauge the students' perceptions/reactions to how their group would actually perform. The group potency subscale appeared to have a slightly below standard internal consistency, $\alpha = .68$.

The first item, "Compared to other groups, I think my collaborative group will score/scored higher than others because of our preparation" resulted in a significant difference between the pre-study ($M = 4.68$, $SD = .92$) and the post-study questionnaire ($M = 4.41$, $SD = 1.03$), $t\ (84) = 2.15$, $p = .02$ (one-tailed).

The next item "If my collaborative group performs poorly it is/was due to circumstances out of our control" did not indicate a significant difference between the pre-study ($M = 2.71$, $SD = 1.34$) and the post-study questionnaires ($M = 2.96$, $SD = 1.39$), $t\ (84) = -1.42$, $p = .08$. The final item, "My grades will be/were higher when working in a collaborative group than as an individual" also resulted in a significant difference between the pre-study ($M = 4.04$, $SD = 1.23$) and the post-study questionnaire ($M = 4.53$, $SD = 1.36$), $t\ (82) = -2.58$, $p = .006$ (one-tailed).

Qualitative Analysis

Qualitative data were collected in the questionnaires in order to provide depth to the students' responses. The responses from the open-ended questions addressed topics such as previous positive and negative experiences working in collaborative groups in the past and during the study. Other topics include future advantages and disadvantages of working in collaborative groups. Selected responses by question are displayed in the following table.

Table 12

Selected Responses to the Open-ended Questions on the Pre-study and Post-study Questionnaires

Question	Theme	Responses
"Please list your positive experiences when working with collaborative groups in the past at USA."	Sharing Ideas	"Idea-generating sessions are usually productive."
		"I have learned more from the group and I was more confident about my results than when I worked alone."
		"Sharing new ideas, problem solving, sharing an assignment, knowing each other."
		"Two heads are better than one is pretty much what I have found. If there is a question that one person is confused about, the group can help to explain it. There are also times when one person will have knowledge that no one else does, and they are able to share their thoughts as well as their experiences with the rest of the group. The social interaction also breaks up the "academic tension" in a room. Working together helps with communication and teamwork, and takes the emphasis off of our society's competitive nature."
		"Each person had different opinions and perspectives to bring to the group."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your positive experiences when working with collaborative groups in the past at USA."	Sharing Ideas	"Use the ability to share information"
		"When working on a group project, members are able to put their ideas together to come up with an even better one."
		"By working with other people you are more effective because one person may be able to answer a question that you have which alone would have taken you a long time to figure out."
		"As a group, we can compare ideas. The main advantage is that everyone adds a different perspective and working with a group allows you to see the bigger picture."
		"We were able to think of things that started turning the wheels in other students' heads. This made our assignment better than any individual assignment."
		"I was able to interact more with my classmates, and was able to take a new learning approach on the subject."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your positive experiences when working with collaborative groups in the past at USA."	Sharing Ideas	"1. Input from people with different perspectives. 2. A chance to receive quick feedback. 3. Interacting with different types of people." "When working in groups, you can pool the knowledge of all the members and feed off of each others' ideas." "Obviously, working in a group expands the perspectives and more input and help is available than just working alone." "Helped affirm the basics of what I've learned in class; allowed me to ask questions that could be answered or worked out with my peers rather than the professor; gained social skills and good relationships with other students." "As a group, we can compare ideas. The main advantage is that everyone adds a different perspective and working with a group allows you to see the bigger picture."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your positive experiences when working with collaborative groups in the past at USA."	Sharing Ideas	"I am able to have an outsider's opinion, or one in which I otherwise probably wouldn't have looked at myself. I also enjoy learning others' ways of studying and remembering the material. I have worked with students in the past whose experience or knowledge on the topic in particular was greater than mine and the opinions they brought into the group, helped not only the group as a whole, but me." "There are more people to catch mistakes or to make suggestions as well as contribute ideas one may not consider while working alone."

Question	Theme	Responses
“Please list your positive experiences when working with collaborative groups in the past at USA."	Sharing Responsibilities	"The task gets done faster and more accurately." "We divided the assignments out evenly and we all had a small portion." "It allows us to meet new people, when an assignment is to be done, we designate task to each person in the group based on their strengths."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your positive experiences when working with collaborative groups in the past at USA."	Sharing Responsibilities	"Positive experiences include: learning how to utilize people skills and effectively work together on a project and get a task done." "Work was usually spread out evenly and members could ask each other questions if they didn't understand something." "It spreads work throughout the group and creates a less workload for the individual. Multiple people bring up ideas that an individual may not have been able to think of on their own." "Collaborative groups have been a great source of motivation to me. They inspire me to get my work done on time and do it to the best of my ability since there are other people depending on me." "I have been lucky enough to get groups who usually want to work. We have all done our share and made a good grade!" "I like the amount of work that gets done working in groups rather than working alone."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your positive experiences when working with collaborative groups in the past at USA."	Sharing Responsibilities	"If the group is reliable, you are able to delegate tasks and make your role in the project less than if you were an individual."
		"Work gets done quicker, more feedback, more creative answers, different person's opinions that are valuable."
		"I made an A on infomercial in persuasion class could not have made that grade without help from group members."
		"Less work load, more creative ideas, and less stress in completing projects."

Question	Theme	Responses
“Please list your positive experiences when working with collaborative groups in the past at USA."	Building Peer Relationships	"It helps networking, social interaction and group thinking usually yields better results than individual work."
		"Working in groups helps students ask more questions with peers, makes class more interesting, makes students responsible for more than just themselves."
		"More information, better methods of studying, new friends, made study buddies for the rest of semester."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your positive experiences when working with collaborative groups in the past at USA."	Building Peer Relationships	"Meeting new students and being able to network with students that aren't necessarily pursuing the same degree at USA." "It's interesting to hear students' perspectives from within the business major and other majors.” All may be right and different based on their thought process, views, and ideas of the world." "It allowed me to better understand the material, and also allowed me to meet new people." "I was able to interact more with my classmates, and was able to take a new learning approach on the subject." "Meet new people. Get new ideas. Better approach." "You start networking, get other people POVs, become more open-minded, sometimes others knowledge and understanding can help when you are confused." "Learn information from other students and helps you better prepare for upcoming tests in that particular class."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your negative experiences when working with collaborative groups in the past at USA."	Social Loafing	"Everyone not pulling their weight."
		"Usually, it degenerates predictably to 1 prime mover, possibly another contributor, and the rest are varying degrees of dead wood. The fact that they are purely peer groups means a lack of consequences for the free riders in the group, at least until peer reviews."
		"One time I ended up doing the whole project but all of the group members got the credit."
		"Some members in the group not taking responsibility."
		"Sometimes, group members leave all the work to one or a few. Slackers are definitely the ultimate downside to group work."
		"Some people didn't want to put in as much effort as they should have."
		"Sometimes getting all the work piled on top of someone when we are supposed to work together."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your negative experiences when working with collaborative groups in the past at USA."	Social Loafing	"Working on a group project for my American Literature class. I had to do a large percentage of the work on my own. It ends up being one or two people doing the work with the rest contributing minimally." "There is always at least one group member who has to be forced to participate. More work is usually assigned when working in teams and the students who genuinely care have to work harder than others in order to ensure satisfactory completion. This doesn't seem fair to students when others can slack off when they have to work harder. Professors claim "this is the way the real world works" and offer no compassion to the students that are demanded to work twice as hard. In the "real world" people that don't perform at a certain level are fired but in college they just get free credit." "One of the group members could be slacking and not pulling their part, but receive the credit."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your negative experiences when working with collaborative groups in the past at USA."	Social Loafing	"No one wants to work. Often they would much rather talk or not get to the point. In the past it has seemed like the few doing the work of the many. You cannot say collaborative effort most people will agree with whatever, anyone comes up with and often do not challenge the answer.” "People that cheat off my work, or don't do their part and expect full credit." "Workflow split unevenly throughout the group." "I have had many group members who did not want to do their part of the assignment leaving me to do it on my own which was much more work. I have also had people in my group who were hard to get a hold of and people who have dropped out of the class and didn't inform the group." "Some members of the group would just not show up for class or wouldn't participate in any research or information and the rest of the group has to make up for that person's part. And also, someone who never helped in any of the groups' preparations would take credit for some, or all, of the groups work."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your negative experiences when working with collaborative groups in the past at USA."	Lack of Teamwork/ Communication	"Sometimes it's hard to communicate with team members"
		"One person thinks he or she needs to be in control of the group and makes the whole group uncomfortable."
		"Many times people are too shy around each other and it ends up being a bunch of people working alone instead of an actual group project."
		"People being overdramatic, and controlling."
		"1. Some people don't interact or work well with others. 2. Opinions may differ."
		"Some do nothing, not everyone wants to participate, People do not agree, a lot of headache. Might as well do the work by yourself."
		"Trying to get everyone to pay attention and pull their own weight."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your negative experiences when working with collaborative groups in the past at USA."	Scheduling Difficulties	"Hard to motivate people to do the project and also hard to coordinate meeting times with everyone outside of class based on everyone's schedule."
		"Cannot meet with the group due to conflicting schedules."
		"Hard to schedule times to meet when everyone is so busy."
		"Sometimes some people in the group don't collaborate. If you are working on a group project that you will be graded it’s hard to be able to schedule a meeting time because everyone's schedules are different."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
“Please list your positive experiences when working with collaborative groups this semester in MGT 300."	Quiz Experience	"I felt more confident about some of the answers to the quiz questions when other members of the group also chose that answer."
		"Increased quiz grades."
		"I feel that having group members offer different perspectives to each question and discussing the options provides for a higher rate of success."
		"My average quiz grade was higher in the group, rather than alone."
		"The pleasure of having a different perspective. Quizzes seem less stressful. Enjoyed meeting new people.”
		"The team was able to consistently do well on group quizzes, keep up with classwork, and answer questions together about the class."
		“When we would have quizzes, most of my classmates knew the answer.”
		“You are able to get other opinions when you are not sure on an answer to question”

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list your positive experiences when working with collaborative groups this semester in MGT 300."	Quiz Experience	"Different people have different perspectives. By working in a group, I was able to see several different aspects of a situation. I did much better on quizzes when working in a group." "Our group did better on the group quiz as opposed to the individual one." "We were able to work together to decide on the best answer, and therefore get a better grade." "Discussion about answer choices. Different opinions about why the answer is correct." "We were able to reason together on what we know and do not know about certain questions. This allowed us to make more educated choices on the questions we were unsure of the answer." "If I didn't know something someone else usually did, that gave me a chance to learn it a second time." "We pooled our knowledge while taking quizzes." "When working together on quizzes I liked that we could put our heads together to come up with the best answer."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list your positive experiences when working with collaborative groups this semester in MGT 300."	Quiz Experience	"A positive was being able to discuss questions and answers when someone was not sure."
		"Working as a team to distinguish the right answer, learning how to debate and use process of elimination, and getting help on questions that stumped me."
		"Great feedback from other group members, worked together to find answers."
		"More brain storming on the answer, and better process of elimination."

Question	Theme	Responses
"Please list your positive experiences when working with collaborative groups this semester in MGT 300."	Peer Socialization	"Some things that I may have missed in the text my group partners can help me out because they remember reading it."
		"I enjoy learning how to work with different people."
		"I learned more from my group discussion."
		"It allows us to mingle and meet new people. And we are able to go through and discuss each answer and rule out the wrong ones in doing so. It provides kind of a mini study session."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list your positive experiences when working with collaborative groups this semester in MGT 300."	Peer Socialization	"I found it was easy to come to an agreement on answers and decisions in exercises rather than just answering them. The discussion was key and got to see many different perspectives" "Other students helped me in areas I was weak in." "I had the opportunity to talk to people in the class I probably otherwise would have never met." "It helped me realize the way I think may not always be correct. It also showed me how talking things out in a group can be helpful." "I really liked my group. We all became study partners and compared notes, very helpful! Not to mention if we missed we knew we had 4 other people we could contact." "It was interesting working with students having different backgrounds." "If someone was unable to complete the required reading than the group members could fill that person in on what the chapter was about."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list your positive experiences when working with collaborative groups this semester in MGT 300."	Peer Socialization	"When I wasn't sure of an answer, it was comforting to know that I had two other people who could help me reach an accurate answer."
		"Expanded my viewpoints and I got to know classmates better."
		"You get to share thoughts and ideas on the assignment and get a better understanding than working alone. You feel more confident about what you learned rather than unsure that you didn't retain anything properly."
		"Meeting new people and getting another group member's insight."
		"I was able to meet new people who brought different ideas on the subjects at hand."
		"I learned different ways of studying and how the other members of my team eliminated answers to a question, if they were not sure about the answer."
		"Was able to build new relationships in class. Was able to meet with a couple of my members to study for exams."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list your negative experiences when working with collaborative groups this semester in MGT 300."	Social Loafing	"One or two people did not come to class one day which happened to be the day we had a quiz. Their knowledge and input were lost that day." "The lack of participation by all in the group." "Some took a casual attitude." "Most of the time I feel like there was only two of us that studied out of my whole group." "If none of the group members have done the required reading than we were lost on the questions." "Not everyone showed up to class and not everyone participated in answers even when prompted for opinion." "People who did not study had nothing to contribute to the group work."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list your negative experiences when working with collaborative groups this semester in MGT 300."	Social Loafing	"Group was not always there, leaving gaps in our work. Group work was sometimes dominated by 1 or two people." "Sometimes some would not want to participate, but it was very seldom." "If you know the material then you give the answers to those that may not have studied at all." "There was more than one quiz that I was the only one who had done the readings so the others benefited. If it hadn't been a team quiz they wouldn't have done as well." "Some members did not participate as much as others, making the balance of work unfair."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list your negative experiences when working with collaborative groups this semester in MGT 300."	Lack of Teamwork/ Communication	"Some members wanted to settle for answers instead of actually thinking them through, which would have lost us points."
		"Lots of arguments and disagreements while working with them."
		"One member tried to dictate answers to us without discussion."
		"Strong personality types often get in the way of answering questions correctly because the stronger the personality, the stronger the opinion, even if those opinions are wrong."
		"Communication. Yes this was a positive but getting strangers to actually talk to another at first was difficult and grades did reciprocate this as we progressed."
		"When the majority of people agree on the wrong answer and you know the right one."
		"I feel like I did better working alone not having to debate over differing opinions. I think my scores overall reflect that."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list your negative experiences when working with collaborative groups this semester in MGT 300."	Lack of Teamwork/ Communication	"Sometimes we could not come to a conclusion because of different viewpoints within the group." "If all members of the group didn't agree on the answer, there wasn't any course for compromise and if we got the answer wrong, the people who hadn't agreed with that answer were also penalized, even though they may have been right." "They would change my answers and we would get a low score." "A negative to that is we did not agree on a majority of the answers most of the time, so at times we just went with the answer that had the most votes." "I didn't experience any negativity during my group encounters, except for one member not wanting to listen to anyone else's opinion or answer. He was the only person who could be right or know the answer." "My quiz grades were lower on group quizzes. I couldn't fully control what answers to put down My grade suffered due to group quizzes. The answer went to the majority."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list the ways that working with collaborative groups in MGT 300 will be an advantage to you in the future."	Communication/ Group Dynamics	"It helped to listen to everyone and make a decision regarding all the points and facts from the group."
		"It teaches us how to collaborate with others in the work force."
		"I have learned to accept different viewpoints on subjects."
		"It has helped me learn to manage people in a group who have different opinions in order to reach a consensus."
		"If the group dynamics work out well, it can be a tremendous time-saver to split tasks."
		"I will adopt the idea of working with groups and not always alone."
		"Helps develop reasoning skills. Sorting through everyone's ideas to come up with the right answer."
		"Helped build teamwork and communication skills."
		"It helped my social skills and being able to work as a team, and made me realize I can be more prepared for class."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list the ways that working with collaborative groups in MGT 300 will be an advantage to you in the future."	Communication/ Group Dynamics	"Made me realize that it is vital to communicate with people in your class. Different people take notes differently and hear things differently, this can really help you when it comes to test and exams. Having a comparison is HUGE!"
		"It will help me adapt when I have to work in groups in the future."
		"Working with groups tends to make people more open to different opinions and ideas. Having a broader scope concerning a situation often leads to higher developed solutions."
		"I've learned how to work with others on assignments and learned that I need to come to class prepared for the discussion of the day."
		"I will most likely work in a team environment at some point in my professional career."
		"In the job force many companies have implemented working in groups as opposed to individually."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list the ways that working with collaborative groups in MGT 300 will be an advantage to you in the future."	Communication/ Group Dynamics	"I learned how to meet and discuss business issues with people in my group. We all worked for one cause, which will help me in my work in the future." "It helped me open up more to others. I'm not really a talkative person and being in groups helped me improve my "people" skills." "It helped me learn how to come to a decision when all the members of a group don't agree." "Working in groups helps me try and be more prepared for class because I don't want to let my group down by not being prepared for the quizzes." "It will be easy to speak up in a group and voice my opinion." "I think that by working with groups this semester, it will help me to understand that there are opinions other than mine and that not everyone will agree with me. I also think it will help me to better myself for working with others in higher level classes and also in future jobs."

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list the ways that working with collaborative groups in MGT 300 will be an advantage to you in the future."	Academic Skills	"You learn how other people learn/study which gives you new ways to learn/study."
		"Working in groups helps me understand the material better because I get to talk about it with my group members."
		"Helped to develop social skills in the classroom atmosphere."
		"It is less stressful to work in a group. Also, peoples' different perspectives allow for a better understanding of the material."
		"I will be able to recall information easier due to key points we talked about."
		"It allows me to be more prepared before class. So, I will not be the only one not knowing the information."
		"It will allow me to realize that I need to consciously think of every possible outcome."
		"The knowledge gained helped me understand the concepts better"

(Table 12 Continues)

Table 12 Continued

Question	Theme	Responses
"Please list the ways that working with collaborative groups in MGT 300 will be a disadvantage to you in the future."	Reliance on other's efforts	"I was able to rely on others to know the information that I didn't understand and still do well on the quizzes, so relying on others instead of figuring out the answers myself"
		"I might rely too heavily on group members."
		"Can rely on others too much for guidance."
		"May show a tendency to not pay as close attention due to relying on others."
		"-Groupthink"
		"Relying on others use of information means studying less."
		"It may slow the learning of the concepts that I could potentially just do on my own."

Summary

This chapter presented the results of the study. The results of the quantitative and qualitative analyses were communicated by research question and hypothesis. The hypothesis associated with research question 1 predicted that groups would perform better than the individuals in overall academic achievement. The statistical analysis found that there was a statistically significant difference in academic achievement on the

quizzes but not on the exams. The collaborative groups performed significantly better on the quizzes than students did on the individual quizzes.

The second hypothesis predicted that the collaborative groups would be more confident in their quiz answers than the individuals. The analysis also produced a statistically significant result. The collaborative groups scored significantly higher than the individual groups in their quiz confidence scores. The quiz confidence score results were corroborated with the pre-study and post-study questionnaire in which the students predicted and reflected that their confidence level was higher as a group.

Hypothesis 3 focused on student study time. The analysis produced a statistically significant difference regarding study time. The results showed that the students studied less than expected for the class. However, when asked specifically during the post-study questionnaire if the quizzes increased, decreased, or unaffected their study habits, the students' most frequent answer was that the quizzes did not affect their study habits.

Hypothesis 4 predicted that the students' retention of learned material would improve as a result of the testing effect. The statistical analysis did not show any conclusive statistically significant results.

Hypothesis 5 predicted that student attitudes on collaborative testing would positively change as a result of their participation in the study. The results contradicted each other with the analysis showing a significant reduction in experience but an increase in enjoyment. The analysis also showed a significant difference in the students' expectations of preparation compared to their peers in the pre-study and post-study questionnaire.

Qualitative data were also captured and documented within the chapter. The students expressed their opinions on previous collaborative experiences and reflected on the study.

The qualitative data proved to be very informative and provides an illustration for the quantitative data collected.

The students were asked to list their positive experiences when working in the past. The responses included comments on topics such as sharing ideas, sharing responsibilities and building peer relationships. Some examples are:

- "I have learned more from the group and I was more confident about my results than when I worked alone."
- "Sharing new ideas, problem solving, sharing an assignment, knowing each other."
- "Each person had different opinions and perspectives to bring to the group."
- " When working on a project, members are able to put their ideas together to come up with an even better one."
- "The task gets gone faster and more accurately."
- "It allows us to meet new people , when an assignment is to be done, we designate tasks to each person in the group based on their strengths."

The students were also asked to list their negative experiences when working with groups in the past. The responses included comments on topics such as social loafing, scheduling difficulties and lack of teamwork. Some examples are:

- "Everyone not pulling their weight"
- "Usually, it denigrates, predictably, to one prime mover, possibly another contributor, and the rest are varying degrees of deadwood. The fact that they are purely peer groups means a lack of consequences for the free riders in the group, at least until peer reviews."

- “Sometimes group members leave all the work to one or a few. Slackers are definitely the ultimate downside to group work.”
- "There is always at least one group member who has to be forced to participate. More work is usually assigned when working in teams and the students who genuinely care have to work harder than others in order to ensure satisfactory completion. This doesn't seem fair to students when others can slack off when they have to work harder. Professors claim "this is the way the real world works" and offer no compassion to the students that are demanded to work twice as hard. In the "real world" people that don't perform at a certain level are fired but in college they just get free credit."
- "One person thinks he or she needs to be in control of the group and makes the whole group uncomfortable."
- "People being overdramatic, and controlling."
- "Hard to motivate people to do the project and also hard to coordinate meeting times with everyone outside of class based on everyone's schedule."
- "Sometimes some people in the group don't collaborate. If you are working on a group project that you will be graded it’s hard to be able to schedule a meeting time because everyone's schedules are different."

The students were asked to list their positive experiences when working in collaborative groups in this study. The responses included comments on topics such as quiz experience and peer socialization. Some examples are:

- "Increased quiz grades."
- "I felt more confident about some of the answers to the quiz questions when

other members of the group also chose that answer."

- "My average quiz grade was higher in the group, rather than alone."
- “The pleasure of having a different perspective. Quizzes seem less stressful. Enjoyed meeting new people.”
- “You are able to get other opinions when you are not sure on an answer to question”
- “We were able to reason together on what we know and do not know about certain questions. This allowed us to make more educated choices on the questions we were unsure of the answer.”
- “It allows us to mingle and meet new people. And we are able to go through and discuss each answer and rule out the wrong ones in doing so. It provides kind of a mini study session.”
- “I found it was easy to come to an agreement on answers and decisions in exercises rather than just answering them. The discussion was key and got to see many different perspectives”
- “I really liked my group. We all became study partners and compared notes, very helpful! Not to mention if we missed we knew we had 4 other people we could contact.”

The students were asked to list their negative experiences when working in collaborative groups in this study. The responses included comments on topics such as a lack of teamwork and social loafing. Some examples are:

- “The lack of participation by all in the group.”
- “One or two people did not come to class one day which happened to be the

day we had a quiz. Their knowledge and input were lost that day."

- "Most of the time I feel like there was only two of us that studied out of my whole group."
- "Not everyone showed up to class and not everyone participated in answers even when prompted for opinion."
- "Lots of arguments and disagreements while working with them."
- "One member tried to dictate answers to us without discussion."
- "When the majority of people agree on the wrong answer and you know the right one."
- "A negative to that is we did not agree on a majority of the answers most of the time, so at times we just went with the answer that had the most votes."
- The students were asked to list the ways that working in collaborative groups in this study will be an advantage in the future. The responses included comments on topics such as improved communication skills within a group and future academicachievement. Some examples are:
- "I learned how to meet and discuss business issues with people in my group. We all worked for one cause, which will help me in my work in the future."
- "Work with employees better. Better problem solving skills in the work force."
- "It will be easy to speak up in a group and voice my opinion."
- "It helped me learn how to come to a decision when all the members of a group don't agree."

- “Working in groups helps me try and be more prepared for class because I don't want to let my group down by not being prepared for the quizzes.”
- “You learn how other people learn/study which gives you new ways to learn/study.”
- “Helped to develop social skills in the classroom atmosphere.”
- “I will be able to recall information easier due to key points we talked about.”

Finally, the students were asked to list the ways that working in collaborative groups in this study will be an disadvantage in the future. The responses included comments on topics such as a reliance on others efforts rather than their own. Some examples are:

- “Can rely on others too much for guidance.”
- “-Groupthink”
- “It may slow the learning of the concepts that I could potentially just do on my own.”
- “I was able to rely on others to know the information that I didn't understand and still do well on the quizzes, so relying on others instead of figuring out the answers myself”

The students qualitative responses are critical to understanding the quantitative data collected from the questionnaires. Overall, the feedback was positive towards collaborative learning and testing with only a few responses on how the experience will be a hindrance to the students in the future.

Chapter V – Discussion

Collaborative learning and repeated testing have been used as instructional strategies in numerous studies, articles, and classrooms (Johnson & Johnson, 1999; Roediger & Karpicke, 2006) . However, they have seldom been used together to determine effectiveness. In addition, studies have not examined the effects of collaborative, repeated testing on undergraduate business students. The purpose of the current study was to investigate the effects of collaborative learning and the testing effect on student achievement and confidence of undergraduate business students. This chapter will summarize the results of the study, define the limitations, provide implications for instructional design, and provide suggestions for future research.

Summary of Results

A discussion of the results for each dependent variable, including possible reasons for the findings, is presented below.

Summary of academic achievement. For the current study, academic achievement was measured two ways. The first was the comparison of the collaborative groups' scores on the eight quizzes given throughout the study versus the students' scores on the quizzes taken individually. The second measurement was the difference in performance on the two examinations between the students who had taken the quizzes as individuals and those who had taken the previous four quizzes as collaborative groups.

The quizzes consisted of 10 multiple-choice questions related to the lecture and reading

assignments in the course syllabus. The exams covered the material included on the quizzes as well as other information shared in the lectures and reading assignments.

The difference in performance between the collaborative groups and the individuals when taking the quizzes was statistically significant. The collaborative groups scored significantly higher in the first four quizzes. The collaborative groups also scored significantly higher in the second four quizzes when the groups switched treatments.

Factors that contributed to the results can be inferred from the qualitative data that was shared by the students. The students were able to share their thoughts within the post-survey questionnaire, which included statements about the ability to share ideas, cover deficiencies, as well as participate in fruitful debate to come to a consensus. Although the students also stated that social loafing and difficult teammates did exist, the positive difference in scores illustrates the advantages of working within collaborative groups.

The exam scores did not produce a significant difference in scores. The collaborative groups did not show a larger level of proficiency in understanding the material. Factors that could have played a role in this finding include the possibility that the testing effect is equal across groups because each student used the information derived from their quiz performance to adjust their studies accordingly. If that is the case, then the testing effect may be the dominant factor and not collaboration. Collaboration may only give an immediate advantage when taking the quizzes.

Summary of learner confidence. One of the major differences between this study and previous studies on collaborative testing is the inclusion of confidence and its effects on the students. Each quiz included an 11^{th} question that gauged how confident either the individual or the group was in their answers. Confidence can be an important factor in the

acceptance of collaborative learning and the students' perception in their ability to succeed.

There was a statistically significant difference in the confidence scores of the two treatment groups. Individuals were significantly less confident in their answers than the collaborative groups. The academic achievement scores back the statistical analysis of confidence. In addition, the analysis of the questions included in the pre-study and post-study questionnaires corroborated the results of the confidence quiz question.

In the questionnaires, the students both predicted and reflected that they would be more confident as a collaborative group. One factor that contributes to this is the ability for the group to cover for the individual's deficiencies. Once again, this was mentioned frequently within the qualitative responses on the pre- and post-study questionnaires. There were very few responses that pointed out that the collaborative group may be susceptible to "groupthink" which may lead to a false sense of confidence.

Summary of study time. One of the benefits of the testing effect is the notion that students would utilize the frequent testing as a studying tool and a way to prepare themselves for the exam. Hypothesis 3 stated that the students' perceptions of study time would be less as a result of the testing effect. The statistical analysis produced differing results. The first statistical test focused on a questionnaire item that asked how many hours the students expected to study per week for the class. This answer was compared to a question in the post-study questionnaire that asked the students to state how many hours that they actually studied.

The comparison produced a statistically significant result. The students studied significantly less than expected. However, the differing result is due to the answers

provided on a subsequent question. The question asked the students specifically if the quizzes increased, decreased, or did not alter the time spent studying. Out of 85 possible answers, 29 students either increased the amount of time that they studied and 34 did not change their study habits at all.

Also, the analysis of affected study habits by demographic information did not result in any statistically significant differences. There are numerous factors that could play a role in the seemingly opposite result. In can be inferred that the students did actually study less but it was due to other factors and not the quiz itself. Also, the quizzes could have affected the students' study habits because it provided an indication of how much information that was not retained by the lectures which resulted in more focused studying.

The qualitative data included statements on how working in collaborative groups improved study habits. Many of the students stated that they increased their studying because they felt responsible for their group. The students also reported that they discussed study habits, as well as arranged group study sessions while in the collaborative groups.

Summary of retention. Repeated testing's main objective is to increase levels of retention. The students through repetitious exposure of the material, should be able to retain the information better than if they were not exposed to the treatment at all. Hypothesis 4 stated that the retention would be increased as a result of repeated testing.

In this study, five previous semesters of management 300 were used as a control group in order to compare performance on the exams to the students who participated in this study. The five previous semesters used the same textbook and syllabus. The class

structures and lecture base were the same. The analysis did not show a statistically significant difference between the current study's participants and the control group. In addition, neither treatment group scored significantly better than each other compared to the control group on either examination.

Summary of attitudes. The fifth and final hypothesis stated that student attitudes towards collaborative learning as well as perceptions of group efficacy and potency will improve throughout the semester. Business students will work in collaborative teams frequently during their academic and professional careers. This study attempted to capture how the students perceived collaborative learning from previous experiences and compare it to their perceptions after the conclusion of the study.

Group potency and efficacy were also analyzed because the belief on how well the individual will function personally within the group, as well as the ability for the group to perform as a whole is integral to positive attitudes on collaboration. The individual must be confident that the group is greater than the sum of its parts.

The data analysis produced differing results. The first questionnaire item of interest asked the students if they prefer working alone or in a group. The comparison did not produce a statistically significant result. However, the students' responses to the item did shift towards a preference for group work. The next analysis focused on how the students felt about previous collaborative learning experiences compared to the experience in this study. The analysis produced a significant result however, the result showed that the students felt that this experience was more negative than prior collaborative experiences.

This result contradicted the significant difference in the next item that was analyzed. The students were asked to respond to the statement that they would/ did enjoy working with

collaborative groups during the study. In this case, the statistically significant result showed that the students enjoyed working in collaborative groups more during this study than in the past.

This difference could be a result of students not taking well to the collaborative tests but enjoying the group experience. The qualitative responses were dominated with student reflections on how they benefited from the socialization that occurred when in collaborative groups. There were a number of students that found the group dynamic as far as the quizzes were concerned to be frustrating. However, the ability to gain information on study habits and relationships that may benefit outside of this study may have given the students an overall more positive feeling.

The group efficacy items did not show any significant differences. However, when analyzing the responses the mean scores were all on the positive level. The students believed that they could function well within the collaborative groups. The items that asked the students to gauge their ability to give feedback, combine viewpoints, accept constructive criticism, and be able to take others opinions into account all scored favorably.

The analysis of the group potency items resulted in two statistically significant results. The students' score on the item that gauged their perception that their group would outperform other groups because of superior preparation produced a significantly negative difference. The students perception on their group's preparation compared to others fell slightly but was still favorable. The second significant change in score confirmed that the students were aware that their quiz scores were higher as a collaborative group. The students predicted that this would be the case in the pre-study questionnaire but significantly increased their score on the post-study questionnaire.

Conclusion of Results

The statistical analysis in this study produced mixed results. Academic achievement on the quizzes was significantly better for the collaborative groups. However, the students' performance on the exams was not significantly different between the two treatment groups. Although the difference in performance on the quizzes was expected by the students themselves, the presumption that the scores would carry over to the exams did not hold true.

Confidence scores on the quizzes were also significantly different between the two treatment groups. The students believed that they would be more confident in their answers to the quizzes when asked in the questionnaires. This shows that the students believe that the collaborative group will produce better results than the individual. Study time was significantly lower than expected but it cannot be concluded that the decrease was a direct result of the testing effect.

The students were asked specifically if the quizzes affected their study time. There was no significant difference in study time and the majority of students either increased or did not change their study habits. No significant differences were produced when comparing the study time results with demographics collected from the questionnaire.

The analysis of retention did not produce any significant results as well. There were no significant differences between the students included in the current study and the control group, which consisted of test scores from five previous semesters. The lack of significant differences implies that in this case, the testing effect does not aid retention as measured in this study.

The analysis of student attitudes produced differing results. There was no significant difference on the item that asked students to rate whether they would rather work alone or

in a group. Even though a six-Point Likert-scale was used, the answers on this item were decidedly neutral with means of 3.79 and 3.45 respectively, on the pre-study and post-study questionnaires. However, the trend does show a more favorable opinion to group work. There was a significant difference in the comparison of the students' experiences with collaborative groups previously and after the current study. The students believed that the current study was significantly more negative than prior experiences.

However, if you compare the result of the analysis of the item that asked the students to rate their level of enjoyment working with collaborative groups in this study, the post-study scores were significantly higher than the pre-study scores. Both scores were favorable. Once again, using a six-point Likert-scale, the students agreed to moderately agreed that they enjoyed working in collaborative groups.

No significant differences were observed in the group efficacy questions but the students did answer favorably on each of the questions. The students believed that they could function within the group with effective communication and positive debate. The group potency items also produced significant differences. The students, who positively believed that their group efforts would produce good results in the pre-study questionnaire, were confirmed during the study and indicated it on the post-study questionnaire.

When analyzing the qualitative answers on the questionnaires the students seem to debunk their answers on the collaborative experience as a whole. The students enjoyed the interaction, socialization, and the ability to learn from their peers. There were negative responses but they centered on students that did not pull their weight. This was to be expected, as social loafing is common in some collaborative groups.

Most importantly, the business students stated that working in collaborative groups would prepare them for their future careers. It was noted that collaborative experiences give insight on how to consider others ideas and points of view. The student's realize that the business environment frequently uses collaboration to attain organizational goals and they must adapt to that environment to succeed.

Implications for Instructional Design

The current study has implications for instructional design. First, the study gives insight into the effectiveness of collaborative learning. Students were receptive to collaborative learning and the experience of working within collaborative groups. The instructional designer can make collaborative activities a part of the curriculum .

The students in this study performed well as a collaborative group on the quizzes. They were more confident in their answers and scored significantly higher than when they took the quizzes as individuals. The collaborative quiz can be used as a tool to review concepts within peer groups. Although it was not proven in this study that collaborative testing significantly aids retention, the immediate value of peer-based learning and elaboration of the topic was useful to the students.

Within the qualitative data, the students stated that the peer-learning processes allowed the students to identify their deficiencies and form new ways of studying the material. The conversation also allowed the students to arrange times outside of the classroom to form groups in order to prepare for the examinations.

The major implication for instructional designers is the use of collaborative learning and testing techniques outside of higher education. The students in their qualitative remarks acknowledged that the experience in collaborative groups will help them

transition into the business environment. It was also noted that the business environment requires working within groups as well. Interestingly, the students did not state that learning is often conducted as a collaborative group in the business environment.

Training and development is a key component of successful organizations. The effective training of staff and management is critical for growth of employees and the business as a whole. Often when new procedures or tasks are introduced, team-based learning is employed. The boost in confidence, when students quiz as a collaborative group rather than as individuals, can aid the effectiveness of training and the retention level of the material. Confidence, which is one of the four components of the ARCS model, which is commonly used to design instruction, is an important to the end user of the training program when using the knowledge in real-world contexts.

The instructional designer may use collaborative learning and testing as a way to aid the employees in their new task. The ability of the peer group to share ideas, concerns, and best practices will reduce the learning curve and increase immediate levels of productivity.

Limitations of the Study

The results of the data analysis were affected by the limitations, which must be accounted for. The limitations include sample size, the lack of a current control group, time, and the lack of follow-up qualitative data.

One limitation of the study was the lack of a traditional control group. Although, data from other classes were used to compare retention of the material, it does leave room for extraneous variables. The lack of a control group that participated in the same class experience as the treatment groups would have strengthened the research design of the

study and may have provided more conclusive results.

Another limitation of the study was sample size. Ideally, the sample size would be at least 100. However, because each student had to take all eight quizzes plus the two exams to qualify for the study, it reduced the sample to 87 from a possible 192. A larger sample size may have produced more variation between treatment groups and strengthened the data.

Time was also a limitation. It was decided to conduct the study within the first half of the semester in order to complete the treatments before the university drop date. This was decided in order to preserve the sample size. When looking at previous semesters of Management 300, it was noted that a substantial amount of students dropped the class, which may affect the sample size. In order to account for the reduction in the sample, the process was hastened. This resulted in an increase in activity. Ideally, the treatments would have been given over the course of the semester with six quizzes before the midterm and six quizzes before the final. If the sample decreased to unacceptable levels, then the study would be repeated over multiple semesters. In this case, that was not a possibility.

The final limitation of note was the lack of focus groups to address key findings in order to gain more insight. It would have been beneficial to speak to the students about the effectiveness of the quizzes and their opinions on their effect on the class experience. Unfortunately, time was not available to do this and the study suffered as a result.

Recommendations for Further Research

The use of repeated collaborative testing should be studied further. Although the literature as well as the current study's findings suggest that collaborative testing can be

beneficial, the strength of the findings can be debated. The ability to use effective learning strategies is essential to instructional design and instructional design professionals. However, the dismissal of ineffective instructional strategies can be just as important.

To further explore the uses of collaborative testing and the testing effect, recommendations for further study are listed below:

- Either incorporate focus groups or incorporate qualitative questions to understand the students' reactions to collaborative testing. Because of time and structure, the use of focus groups was not possible. The need to include open-ended questions that addressed the quizzes specifically was not anticipated. As a result, important data were not collected and the study suffered as a result. These techniques should be used in the future to better triangulate and elaborate on the data.
- The study should be conducted within professional contexts. It is possible to replicate this study during training on many different levels. This learning strategy may be very effective in business environments especially when new tasks or duties are introduced. Repeated testing, both collaborative and individual may be useful in one-day seminars or six-week management training programs. Confidence is important for task execution and an important component for motivation. The significance of confidence as it relates to this study may translate to business organizations.
- In addition, the study can be lengthened in order for the students to experience a greater amount of collaborative testing and better indoctrinate them to the

strategy. The study may provide better results over the course of an entire semester. Also, using two or more semesters consecutively will also allow researchers to identify more concrete results.

- Another future study could examine the progression of quiz scores throughout the semester. A longitudinal study that identifies if the students have an upward trend in scores as they progess and become more comfortable with repeated testing.

Summary

This chapter presented a discussion of the results of the study. Although there were statistically significant results in academic achievement, confidence, and attitudes, the degree of significance is still up for debate.

The analysis of academic achievement produced a statistically significant result on the quizzes. The collaborative groups scored significantly higher on the quizzes than when the students took the quizzes as individuals. The analysis of the examination scores did not produce a significant difference. Neither group differentiated themselves from the other on the examinations. This could be due to the use of repeated testing preparing the students equally for the examinations. The immediate impact was felt on the quizzes with the superior scores by the collaborative group but after an identification of study needs, the scores evened out on the examinations.

Learner confidence was significantly higher for the collaborative groups. The students in the pre-study questionnaire indicated that this would be the case. The qualitative answers provided insight on the students ratings and scores. The students wrote that the group dynamic and the use of conversation to explore topics strengthened

their answers and their confidence that it was correct.

Student attitudes were a mixed on the use of collaborative learning and testing. The key item on the questionnaires asked the students if they would prefer to work alone or in a group. The comparison of scores from the pre-study and post-study questionnaires did not produce a statistically significant result however, it did trend to a larger preference for group work.

The students also rated this experience significantly lower than previous collaborative work that they have experienced. This result could be as a product of the recency effect. Also, the use of repeated testing may have played a role in this rating. However, a follow up question was not included in the post-study questionnaire and should be included in future research.

However, when the students were asked if they enjoyed working with collaborative groups in this study the ratings were significantly higher than predicted in the pre-study questionnaire. The qualitative data collected also showed that the students enjoyed the experience and believed that it was positive in general and can have beneficial effects in the future.

Another significant difference on the student attitude items include a significantly lower rating when the students were asked to rate their groups expected/ actual preparation compared to other collaborative groups. The students post-study ratings indicated that they did not believe that their group's effort was as strong as the other groups in their section.

Retention was not increased as a result of the repeated testing either as an individual or as a collaborative group. It was stated in the academic achievement section that the

examination scores were not significantly different between the two groups. In addition, when the examination scores were compared to five previous semesters of management 300 students, the scores were not significantly higher or lower than this study. In this case, improved retention cannot be implied as it was measured in this study.

An examination of the limitations of the study revealed that sample size, time, and the lack a traditional control group might have affected the results. However, the limitations should allow for further research in order to determine a more optimal path in the future.

Future research can include the use of repeated collaborative testing in a business environment. Also, the study can be spread out over the entire semester. The study's questionnaires and the inclusion of focus groups can be used to capture data that were not included within this study.

This study evaluated the effects of collaborative learning and repeated testing on student achievement and confidence of undergraduate business students. Despite the limitations and the opposite results within the data, certain statements can be made.

Business students understand and acknowledge that collaboration is an important part of their future careers and the experience of working in groups can help their transition to that environment. The students are more confident when working in groups. Students are accepting of collaborative groups and consider the experience with their peers much more positive than negative. Finally, the jury is still out on the effectiveness of repeated testing as a learning tool. This study and further studies will continue to add to the literature and hopefully define this instructional strategy further.

REFERENCES

References

Altbach, P. G., Gumport, P. J., & Berdahl, R. O. (Eds.). (2011). *American higher education in the twenty-first century: Social, political, and economic challenges.* Baltimore, MD: JHU Press.

Amlund, J. T., Kardash, C. A., & Kulhavy, R. W. (1986). Repetitive reading and recall of expository text. *Reading Research Quarterly, 21*, 49-58.

Ang, C., & Zaphiris, P. (2008). Social learning in MMOG: An activity theoretical perspective. *Interactive Technology and Smart Education, 5*(2), 84-102.

Baird, D. E., & Fisher, M. (2005). Neomillennial user experience design strategies: Utilizing social networking media to support "always on" learning styles. *Journal of Educational Technology Systems, 34*(1), 5-32.

Baker, D. F. (2001). The development of collective efficacy in small task groups. *Small Group Research, 32*, 451-474.

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs, N.J: Prentice Hall.

Bandura, A. (1988). Organizational application of social cognitive theory. *Australian Journal of Management*, 275-302.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*(1), 1-26.

Bandura, A. (2004). Role of affective self-regulatory efficacy in diverse spheres of psychosocial functioning. *Sage Family Studies Abstracts, 26*(3), 6-22.

Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science, 1*(2), 164-180.

Bliese, P. D., & Jex, S. M. (1999). Incorporating multiple levels of analysis into occupational stress research. *Work & Stress, 13*(1), 1-6.

Bloom, B. S. (1984). The new direction in educational research: Alterable variables. *Singapore Journal of Education, 6*(1), 1-6.

Brandt, F. J., & Ellsworth, N. J. (1996). Effects of cooperative learning on the academic achievement and self-esteem of urban adolescents with learning disabilities. *Learning Disabilities: A Multidisciplinary Journal, 7*(1), 9-13.

Bransford, J. (2000). *How people learn: Brain, mind, experience, and school.* Washington, DC: National Academy Press.

Breedlove, W., Burkett, T., & Winfield, I. (2007). Collaborative testing, gender, learning styles, and test performance. *The International Journal of the Scholarship of Teaching and Learning, 4*(1).

Butler, A. C. (2010). Repeated testing produces superior transfer of learning relative to repeated studying. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 36*(5), 1118-1133.

Carlson, S. (2005). The net generation goes to college. *The Chronicle of Higher Education, 52*(7), 34.

Chan, C. K., McDermott, K. B., & Roediger, H. L. (2006). Retrieval induced facilitation: Initially nontested material can benefit from prior testing. *Journal of Experimental Psychology, 135*, 533-571.

Cherian, J., & Jacob, J. (2013). Impact of self efficacy on motivation and performance of employees. *International Journal of Business and Management, 8*(14), 80.

Chiocchio, F., & Essiembre, H. (2006). Cohesion and performance: A meta-analytic review of disparities between project teams, production teams, and service teams. *Small Group Research, 40*(4), 382-420.

Chu, R. J., & Chu, A. Z. (2010). Multi-level analysis of peer support, internet self-efficacy and e-learning outcomes–The contextual effects of collectivism and group potency. *Computers & Education, 55*(1), 145-154.

Cohen, S., & Bailey, D. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management, 23*(3), 239-290.

Cueso, J. (1992). Cooperative learning vs. small-group discussions and group projects: The critical differences. *Cooperative Learning and College Teaching*, 5-10.

Cuseo, J. (2007). The empirical case against large class size: Adverse effects on the teaching, learning, and retention of first-year students. *Journal of Faculty Development, 21*(1), 5-21.

Damon, W., & Phelps, E. (1989). Critical distinctions among three approaches to peer education. *International Journal of Educational Research, 13*(1), 9-19.

Davies, T. (2000). Confidence! Its role in the creative teaching and learning of design and technology. *Journal of Technology Education, 12*(1), 50-72.

Dillenbourg, P. (1999). What do you mean by collaborative learning? *Collaborative-learning: Cognitive and Computational Approaches*, 1-19.

Duderstadt, J. J. (2000). New roles for the 21st-century university. *Issues in Science and Technology, 16*(2), 37-44.

Dunlowsky, J., & Rawson, K. A. (2012). Overconfidence produces underachievement: Inaccurate self evaluations undermine students' learning and retention. *Learning and Instruction, 22*, 271-280.

Durham, C. C., Knight, D., & Locke, E. A. (1997). Effects of leader role, team-set goal difficulty, efficacy, and tactics on team effectiveness. *Organizational Behavior and Human Decision Processes, 72*(2), 203-231.

Durham, C. C., Locke, E. A., Poon, J. M., & McLeod, P. L. (2000). Effects of group goals and time pressure on group efficacy, information-seeking strategy, and performance. *Human Performance, 13*(2), 115-135.

Dyer, J., & Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review, 23*(4), 660-679.

Felder, R., & Brent, R. (2007). Cooperative learning. *Active Learning: Models from the Analytical Sciences*, 34-53.

Feltz, D. L., & Lirgg, C. D. (1998). Perceived team and player efficacy in hockey. *The Journal of Applied Psychology, 83*(4), 557-564.

Finn, B., & Metcalfe, J. (2007). The role of memory for past test in the underconfidence with practice effect. *Journal of Experimental Psychology, 33*(1), 238-244.

Gallimore, R., & Tharp, R. (1990). Teaching mind in society: Teaching, schooling, and literate discourse. *Vygotsky and Education: Instructional Implications and Applications of Sociohistorical Psychology*, 175-205.

Gibbs, G., & Simpson, C. (2004). Conditions under which assessment supports students' learning. *Learning and Teaching in Higher Education, 1*(1), 3-31.

Giraud, G., & Enders, C. (2000, April). The effects of repeated cooperative testing in an introductory statistics course. *Paper Presented at the Annual Meeting of the American Educational Research Association,* San Diego, CA.

Giuliodori, M. J., Lujan, H. L., & DiCarlo, S. E. (2008). Collaborative group testing benefits high- and low-performing students. *Advances in Physiology Education, 32*(4), 274-278.

Giuliodori, M. J., Lujan, H. L., & DiCarlo, S. E. (2009). Student interaction characteristics during collaborative group testing. *Advances in Physiology Education, 33*(1), 24-29.

Glover, J. A. (1989). The "testing" phenomenon: Not gone but nearly forgotten. *Journal of Educational Psychology, 81*(3), 392-399.

Goddard, R. D., Hoy, W. K., & Hoy, A. W. (2004). Collective efficacy beliefs: Theoretical developments, empirical evidence, and future directions. *Educational Researcher, 33*, 1-13.

Griffin, M. A., Neal, A., & Parker, S. K. (2007). A new model of work role performance: Positive behavior in uncertain and interdependent contexts. *Academy of Management Journal, 50*(2), 327-347.

Haberyan, A., & Barnett, J. (2010). Collaborative testing and achievement: Are two heads really better than one? *Journal Of Instructional Psychology, 37*(1), 32-41.

Hansen, R. (2006). Benefits and problems with student teams: Suggestions for improving team projects. *Journal of Education for Business, 82*(1), 11-19.

Helmericks, S. G. (1993). Collaborative testing in social statistics: Toward gemeinstat. *Teaching Sociology, 21*(3), 287-297.

Hickey, D. T. (1997). Motivation and contemporary socio-constructivist instructional perspectives. *Educational Psychologist, 32*(3), 175-193.

Hu, J., & Liden, R. C. (2011). Antecedents of team potency and team effectiveness: An examination of goal and process clarity and servant leadership. *The Journal of Applied Psychology, 96*(4), 851-862.

Ignash, J. (1997). Who should provide postsecondary remedial/developmental education? *New Directions for Community Colleges, 100*, 5-20.

Ioannou, A., & Artino Jr, A. R. (2010). Learn more, stress less: Exploring the benefits of collaborative assessment. *College Student Journal, 44*(1), 189-199.

Jacoby, L. L., Wahlheim, C. N., & Coane, J. H. (2010). Test-enhanced learning of natural concepts: Effects on recognition memory, classification, and metacognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 36*(6), 1441-1451.

Jameson, D. (2007). Competition in the classroom. *Business Communication Quarterly, 70*(2), 212-216.

Jex, S. M., & Bliese, P. D. (1999). Efficacy beliefs as a moderator of the impact of work-related stressors: A multilevel study. *The Journal of Applied Psychology, 84*(3), 349-361.

Johnson, D. W., & Johnson, R. T. (1987). *Learning together and alone: Cooperation, competition and individualization.* Englewood Cliffs, NJ: Prentice-Hall.

Johnson, R., & Johnson, D. (1994). An overview of cooperative learning. In J. Thousand, A. Villa, & A. Nevin (Eds.), *Creativity and collaborative learning: A practical guide to empowering students and teachers* (pp. 31-44). Baltimore, MD: Brookes Press.

Johnson, D., & Johnson, R. (1999). Making cooperative learning work. *Theory into practice, 38*(2), 67-73.

Johnson, D. W., & Johnson, R. T. (1998). Cooperative learning and social interdependence theory. In R. Tindale, L. Heath, J. Edwards, E. J. Posavac, F. B. Bryant, Y. Suarez-Balcazar, & J. Myers (Eds.), Theory and research on small groups (pp. 9-35). New York, NY: Plenum Press.

Johnson, D., Johnson, R., & Smith, K. (2007). The state of cooperative learning in postsecondary and professional settings. *Educational Psychology Review, 19*(1), 15-29.

Johnson, D. W., Johnson, R. T., Stanne, M. B., & Garibaldi, A. (1990). Impact of group processing on achievement in cooperative groups. *The Journal of Social Psychology, 130*(4), 507-516.

Jung, D., & Sosik, J. (2003). Group potency and collective efficacy: Examining their predictive validity, level of analysis, and effects of performance feedback on future group performance. *Group & Organization Management, 28*(3), 366-391.

Kapitanoff, S. (2009). Collaborative testing: Cognitive and interpersonal processes related to enhanced test performance. *Active Learning in Higher Education, 10*(1), 56-70.

Karpicke, J. D. (2009). Metacognitive control and strategy selection: Deciding to practice retrieval during learning. *Journal of Experimental Psychology, 138*(4), 469-486.

Karpicke, J. D., & Blunt, J. R. (2011). Retrieval practice produces more learning than elaborative studying with concept mapping. *Science, 331*, 772-775.

Karpicke, J. D., & Roediger, H. L. (2007). Repeated retrieval during learning is the key to long-term retention. *Journal of Memory and Language, 57*, 151-162.

Karpicke, J. D., Butler, A. C., & Roediger, H. L. (2009). Metacognitive strategies in student learning: Do students practice retrieval when they study on their own? *Memory, 17*, 471-479.

Keller, J. (1979). Motivation and instructional design: A theoretical perspective. *Journal of Instructional Development, 2*(4), 26-34.

Keller, J. (1987). Development and use of the ARCS model of motivational design. *Journal of Instructional Development, 10*(3), 2-10.

Keller, J., & Suzuki, K. (2004). Learner motivation and e-learning design: A multinationally validated process. *Journal of Educational Media, 29*(3), 229-239.

Kelley, C. M. (1999). Subjective experience as a basis of objective judgments: Effects of past experience on judgments of difficulty. *Attention and Performance, 17*, 515-536.

Kornell, N., & Bjork, R. A. (1997). The promise and perils of self-regulated study. *Psychonomic Bulletin & Review, 14*(2), 219-224.

Kroon, M. B., Van, K. D., & Rabbie, J. M. (1992). Group versus individual decision making: Effects of accountability and gender on groupthink. *Small Group Research, 23*(4), 427-458.

Kuhn, D., & Dean, D. (2004). A bridge between cognitive psychology and educational practice. *Theory into Practice, 43*(4), 268-273.

Leight, H., Saunders, C., Calkins, R., & Withers, M. (2012). Collaborative testing improves performance but not content retention in a large-enrollment introductory biology class. *Life Sciences Education, 11*(4), 392-401.

Little, B. L., & Madigan, R. M. (1997). The relationship between collective efficacy and performance in manufacturing work teams. *Small Group Research, 28*(4), 517-534.

Lusk, M., & Conklin, L. (2003). Collaborative testing to promote learning. *The Journal of Nursing Education, 42*(3), 121-124.

Lyle, K. B., & Crawford, N. A. (2011). Retrieving essential material at the end of lectures improves performance on statistics exams. *Teaching of Psychology, 38*(2), 94-97.

MacGregor, J., Cooper, J., Smith, K., & Robinson, P. (2000). Strategies for energizing large classes: From small groups to learning communities. *New Directions for Teaching and Learning.* San Francisco, CA: Jossey-Bass.

Macneil, C. (2001). Supervisor as a facilitator of informal learning in work teams. *Journal of Workplace Learning, 13*(6), 246-253.

McDaniel, M., & Callender, A. (2008). Cognition, memory, and education. *Learning and memory: A comprehensive reference*, 2, 235-244.

Meseke, J., Nafziger, R., & Meseke, C. (2008). Facilitating the learning process: A pilot study of collaborative testing vs individualistic testing in the chiropractic college setting. *Journal Of Manipulative & Physiological Therapeutics, 31*(4), 308-312.

Meseke, J., Nafziger, R., & Meseke, J. (2010). Student attitudes, satisfaction, and learning in a collaborative testing environment. *Journal Of Chiropractic Education*, *24*(1), 19-29.

Miller, T. M., & Geraci, L. (2011). Unskilled but aware: Reinterpreting overconfidence in low-performing students. *Journal of Experimental Psychology*, *37*(2), 502-506.

Nie, Y., Lau, S., & Liau, A. K. (2011). Role of academic self-efficacy in moderating the relation between task importance and test anxiety. *Learning and Individual Differences*, *21*(6), 736-741.

Ormrod, J. (2008). *Human Learning* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Ortiz, A., Johnson, D., & Johnson, R. (1996). The effect of positive goal and resource interdependence on individual performance. *The Journal of Social Psychology, 136*(2), 243-249.

Pineda, A. P. (2013). Total quality management in educational institutions: Influences on customer satisfaction. *Total Quality Management, 2*(3), 31-46.

Prussia, G. E., & Kinicki, A. J. (1996). A motivational investigation of group effectiveness using social-cognitive theory. *Journal of Applied Psychology, 81*(2), 187.

Pyc, M. A., & Rawson, K. A. (2010). Why testing improves memory: Mediator effectiveness hypothesis. *Science, 330,* 335.

Rao, S. P., Collins, H. L., & DiCarlo, S. E. (2002). Collaborative testing enhances student learning. *Advances in Physiology Education*, 37-41.

Reid, D. H., Schuh-Wear, C. L., & Brannon, M. E. (1978). Use of a group contingency to decrease staff absenteeism in a state institution. *Behavior Modification, 2*(2), 251-266.

Riggs, M. L., & Knight, P. A. (1994). The impact of perceived group success-failure on motivational beliefs and attitudes: A causal model. *Journal of Applied Psychology, 79*(5), 755.

Riggs, M. L., Warka, J., Babasa, B., Betancourt, R., & Hooker, S. (1994). Development and validation of self-efficacy and outcome expectancy scales for job-related applications. *Educational and Psychological Measurement, 54*(3), 793-802.

Roediger, H. L., & Butler, A. C. (2011). The critical role of retrieval practice in long-term retention. *Trends in Cognitive Sciences, 15*, 20-27.

Roediger, H., & Karpicke, J. (2006). The power of testing memory: Basic research and implications for educational practice. *Perspectives on Psychological Science, 1*(3), 181-210.

Roediger, H. L., Putnam, A. L., & Smith, M. A. (2011). Ten benefits of testing and their applications to educational practice. In J. Mestre, & B. Ross (Eds.), *Psychology of learning and motivation: Cognition in education* (pp. 1-36). Oxford: Elsevier.

Sandahl, S. S. (2009). Collaborative testing as a learning strategy in nursing education: A review of the literature. *Nursing Education Perspectives, 30*(3), 171-175.

Shoemaker, C. A. (2010). Student confidence as a measure of learning in an undergraduate principles of horticultural science course. *HortTechnology, 20*(4), 683-688.

Slavin, R. (1977). Classroom reward structure: An analytical and practical review. *Review of Educational Research, 47*(4), 633-650.

Slavin, R. (1995). *Cooperative learning: Theory, research, and practice.* Boston, MA: Allyn and Bacon.

Slavin, R. E. (1980). Cooperative learning. *Review of Educational Research, 50*(2), 315-342.

Slavin, R. E., Wodarski, J. S., & Blackburn, B. L. (1981). A group contingency for electricity conservation in master-metered apartments. *Journal of Applied Behavior Analysis, 14*(3), 357-363.

Smrt, D., & Karau, S. (2011). Protestant work ethic moderates social loafing. *Group Dynamics, 15*(3), 267.

Spink, K. (1990). Sport psychology group cohesion and collective efficacy of volleyball teams. *Journal of Sport and Exercise Psychology, 13*(3), 301-311.

Stahl, R. (1994). The essential elements of cooperative learning in the classroom. *ERIC Digest*. Retrieved October 15, 2012, from http://www.ericdigests.org/1995-1/elements.htm

Twigg, C. A. (2003). Improving learning and reducing costs: New models for online learning. *Educause Review, 38*(5), 28-38.

Twigg, C. A. (2009). Using asynchronous learning in redesign: Reaching and retaining the at-risk student. *Journal of Asynchronous Learning Networks, 13*(3), 147-155.

Van Boxtel, C., Van der Linden, J., & Kanselaar, G. (2000). Collaborative learning tasks and the elaboration of conceptual knowledge. *Learning and Instruction, 10*(4), 311-330.

Vojdanoska, M., Cranney, J., & Newell, B. R. (2009). The testing effect: The role of feedback and collaboration in a tertiary classroom setting. *Applied Cognitive Psychology*, 1183-1195.

Vroom, V. H. (1969). The consequences of social interaction in group problem solving. *Organizational Behavior and Human Performance, 4*(1), 77-95.

Vygotsky, L. S. (1977). The development of higher psychological functions. *Russian Social Science Review, 18*(3), 38-51.

Wang, F., & Burton, J. (2010). Collaborative learning problems and identity salience: A mixed methods study. *Journal of Educational Technology Development and Exchange, 3*(1), 1-12.

Webb, N. (1982). Student interaction and learning in small groups. *Review of Educational Research, 52*(3), 421-445.

Wei, F., & Chen, G. (2006). Collaborative mentor support in a learning context using a ubiquitous discussion forum to facilitate knowledge sharing for lifelong learning. *British Journal of Educational Technology, 37*(6), 917-935.

Wheeler, M. A., & Roediger, H. L. (1992). Disparate effects of repeated testing: Reconciling Ballard's (1913) and Bartlett's (1932) results. *Psychological Science, 3*, 240-245.

Wheeler, M. A., Ewers, M., & Buonanno, J. F. (2003). Different rates of forgetting following study versus test trials. *Memory, 11*(6), 571-580.

Wood, L. N., & Dixon, P. (2011). Stakeholder analysis: Using the jigsaw method for ethical dilemmas in business. *Asian Social Science, 7*(4), 77.

Wood, R., & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of Management Review, 14*(3), 361-384.

Wooley, A. (2009). Means vs. ends: Implications of process and outcome focus for team adaptation and performance. *Organization Science, 20*(3), 500-515.

Yager, S., Johnson, R., Johnson, D., & Snider, B. (1986). The impact of group processing on achievement in cooperative learning groups. *The Journal of Social Psychology, 126*(3), 389-397.

Zaromb, F. M., & Roediger, H. L. (2010). The testing effect in free recall is associated with enhanced organizational processes. *Memory & Cognition, 38*, 995-1008.

Zimbardo, P. G., Butler, L. D., & Wolfe, V. A. (2003). Cooperative college examinations: More gain, less pain when students share information and grades. *The Journal of Experimental Education, 71*(2), 101-125.

APPENDICES

Appendix A- Pre-study Questionnaire

Past Experiences with Collaborative Groups

This semester in MGT 300 you will taking your in-class pop quizzes as either individuals or as a collaborative group. A collaborative group is defined as a group of individuals that share thoughts, ideas, and perceptions in an attempt to form a consensus. Collaborative groups are used in academics, business, political, and social settings. This section of the questionnaire will inquire about past collaborative group experiences.

2) Please type in your last name.

3) Please type in your first name.

4) Which section of MGT 300 are you currently enrolled?

- ☐ Section 101 8:00-9:15
- ☐ Section 102 9:30-10:45
- ☐ Section 103 11:00-12:15
- ☐ Section 104 12:30-1:45

5) How much do you agree with this statement: "Given a choice, I would rather work alone than in a group."

● Strongly disagree ● Moderately disagree ● Slightly disagree ● Slightly agree ● Moderately agree ● Strongly agree

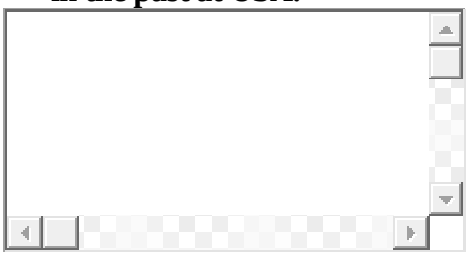
6) How many classes have you taken that have utilized collaborative groups?

- 0
- 1-2
- 3-4
- 4-5
- 6 or more

7) My overall experience with collaborative groups in the past has been:

- Very Negative
- Negative
- Somewhat Negative
- Somewhat Positive
- Positive
- Very positive

8) Please list your <u>positive</u> experiences when working with collaborative groups in the past at USA.



9) Please list your <u>negative</u> experiences when working with collaborative groups in the past at USA.

Expectations when working in collaborative groups this semester

This semester you will be taking in class pop quizzes as a collaborative group. You will work together to form a consensus. This section of the questionnaire will gauge your expectations about working in collaborative groups.

10) How many quizzes or tests have you taken as a collaborative group?

- 0
- 1-2
- 3-4
- 5-6
- 7 or more

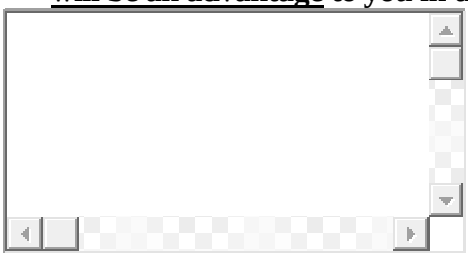
11) I think I will enjoy working with a collaborative group on quizzes this semester.

Strongly disagree Moderately disagree Slightly disagree Slightly agree Moderately agree Strongly agree

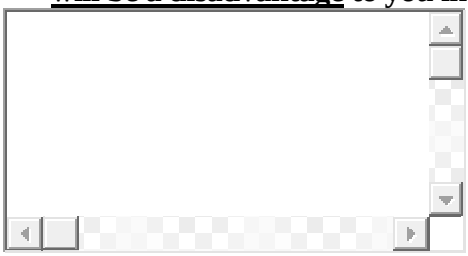
12) Compared to others in my group my preperation for class will be:

Significantly Lower Somewhat Lower Lower Higher Somewhat Higher Significantly Higher

13) Please list the ways that working with collaborative groups in MGT 300 <u>will be an advantage</u> to you in the future.



14) Please list the ways that working with collaborative groups in MGT 300 <u>will be a disadvantage</u> to you in the future.



Expectations on Individual Quizzes

Think about your ability to do well on the individual quizzes in MGT 300 this term. When answering the following questions, think about your own personal skills and abilities.

15) I am confident in my ability to perform well on the individual quizzes this term.

● Not confident at all ● Somewhat Confident ● Confident ● Very Confident

16) There are some individual quizzes that I will not score well on.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree ● Slightly Agree ● Moderately Agree ● Strongly Agree

17) When my performance on the individual quizzes is poor it is due to my lack of preparation.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree ● Slightly Agree ● Moderately Agree ● Strongly Agree

18) On a 10 item individual quiz, how many questions on average, do you expect to miss?

● 0 ● 1 ● 2 ● 3 ● 4 ● 5 ● 6 ● 7 ● 8 ● 9 ● 10

Group Functioning

This section adresses your confidence in your ability to work in a collaborative group setting this term in MGT 300.

19) I will be able to give feedback to other group members about my understanding of their ideas

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree ● Slightly Agree ● Moderately Agree ● Strongly Agree

20) I will be able to combine group members' viewpoints to reach a shared idea.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree ● Slightly Agree ● Moderately Agree ● Strongly Agree

21) I will be able to constructively use other group members' evaluations of my idea.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree ● Slightly Agree ● Moderately Agree ● Strongly Agree

22) I will be able to effectively take other group members' ideas into account in order to add to a group discussion.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree ● Slightly Agree ● Moderately Agree ● Strongly Agree

23) I will be able to openly explain my opinions to other group members.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree ● Slightly Agree ● Moderately Agree ● Strongly Agree

Group Effectiveness

Please answer the following questions about how successful you think your collaborative group will be in MGT 300.

Please mark the answer that best relects the extent to which each statement is true.

24) My collaborative group will be confident in our answers on the quizzes.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

25) Compared to other groups I think my collaborative group will score higher than others because of our preparation.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree ● Slightly Agree ● Moderately Agree ● Strongly Agree

26) If my collaborative group performs poorly it is due to circumstances out of our control.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree ● Slightly Agree ● Moderately Agree ● Strongly Agree

27) My grades will be higher when working in a collaborative group than as an individual.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree ● Slightly Agree ● Moderately Agree ● Strongly Agree

28) On a 10 item quiz, how many questions on average, do you expect to miss as a group?

● 0 ● 1 ● 2 ● 3 ● 4 ● 5 ● 6 ● 7 ● 8 ● 9 ● 10

Study Time

29) Overall, how many hours do you expect to study each week for MGT 300?

- 0
- 1-2
- 3-4
- 5-6
- 7+

30) How many hours do you expect to study each week for individual quizzes?

- 0
- 1-2
- 3-4
- 5-6
- 7+

31) How many hours do you expect to study each week for collaborative quizzes?

- 0
- 1-2
- 3-4
- 5-6
- 7+

Demographics

32) Please select your age group

- 18-20
- 21-23
- 24-26
- 27-29
- 30-32
- 33+

33) Are you Male or Female?

- Male
- Female

34) Please mark your race. If you would like not to respond please make that selection.

- Asian/Pacific Islander
- Black/African-American
- Caucasian
- Hispanic
- Native American/Alaska Native
- Other/Multi-Racial
- Decline to Respond

35) What is your class standing?

- Freshman
- Sophomore
- Junior
- Senior

36) What is your expected major?

- Accounting
- Finance
- Management
- Marketing
- General Business
- Economics
- Other
- Undecided

37) What is your expected grade in MGT 300?

- A
- B
- C
- D
- F

38) What is your current collegiate GPA?

- Less than 2.0
- 2.0-2.49
- 2.5-2.99
- 3.0-3.49
- 3.5-4.0

Thank You!
I could not accomplish this study and my academic endeavors without all of your help. Thank you so much for participating.

Appendix B- Post-study Questionnaire

This Semester's Experiences with Collaborative Groups

This semester in MGT 300 you took your in-class pop quizzes as either individuals or as a collaborative group. A collaborative group is defined as a group of individuals that share thoughts, ideas, and perceptions in an attempt to form a consensus. Collaborative groups are used in academics, business, political, and social settings. This section of the questionnaire will inquire about past collaborative group experiences.

1) Please type in your last name.

2) Please type in your first name.

3) Which section of MGT 300 are you currently enrolled?

- Section 101 8:00-9:15
- Section 102 9:30-10:45
- Section 103 11:00-12:15
- Section 104 12:30-1:45

4) How much do you agree with this statement: "Given a choice, I would rather work alone than in a group."

- Strongly disagree
- Moderately disagree
- Slightly disagree
- Slightly agree
- Moderately agree
- Strongly agree

5) How many classes have you taken that have utilized group or team work in your academic career (as defined above)?

- 0
- 1-2
- 3-4
- 4-5
- 6 or more

6) My overall experience with collaborative groups this semester in MGT 300 was:

- Very Negative
- Negative
- Somewhat Negative
- Somewhat Positive
- Positive
- Very positive

7) Please list your positive experiences when working with collaborative groups this semester in MGT 300.

8) Please list your negative experiences when working with collaborative groups this semester in MGT 300.

Reflections working in collaborative groups this semester

This semester you took class pop quizzes as a collaborative group. You worked together to form a consensus. This section of the questionnaire will gauge your reflections about working in collaborative groups.

9) I enjoyed working with a collaborative group on quizzes this semester.

● Strongly disagree ● Moderately disagree ● Slightly disagree

● Slightly agree ● Moderately agree ● Strongly agree

10) Compared to others in my group my preperation for class was:

● Significantly Lower ● Somewhat Lower ● Lower ● Higher

● Somewhat Higher ● Significantly Higher

11) Please list the ways that working with collaborative groups in MGT 300 <u>will be an advantage</u> to you in the future.

12) Please list the ways that working with collaborative groups in MGT 300 <u>will be a disadvantage</u> to you in the future.

Reflections on Individual Quizzes

Think about your ability to do well on the individual quizzes in MGT 300 this term. When answering the following questions, think about your own personal skills and abilities.

13) I was confident in my ability to perform well on the individual quizzes this term.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

14) There were some individual quizzes that I did not score well on.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

15) When my performance on the individual quizzes was poor it was due to my lack of preparation.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

16) On a 10 item individual quiz, how many questions on average, did you miss?

● 0 ● 1 ● 2 ● 3 ● 4 ● 5 ● 6 ● 7 ● 8 ● 9 ● 10

Group Functioning

This section adresses your confidence in your ability to work in a collaborative group setting this term in MGT 300.

17) I was able to give feedback to other group members about my understanding of their ideas

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

18) I was able to combine group members' viewpoints to reach a shared idea.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

19) I was able to constructively use other group members' evaluations of my idea.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

20) I was able to effectively take other group members' ideas into account in order to add to a group discussion.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

21) I was able to openly explain my opinions to other group members.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

Group Effectiveness

Please answer the following questions about how successful you think your collaborative group was in MGT 300.

Please mark the answer that best relects the extent to which each statement is true.

22) My collaborative group was confident in our answers on the quizzes.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

23) Compared to other groups I think my collaborative group scored higher than others because of our preparation.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

24) If my collaborative group performs poorly it was due to circumstances out of our control.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

25) My grades were higher when working in a collaborative group than as an individual.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

26) On a 10 item quiz, how many questions on average, did you miss as a group?

● 0 ● 1 ● 2 ● 3 ● 4 ● 5 ● 6 ● 7 ● 8 ● 9 ● 10

Study Time

27) Overall, how many hours did you expect to study each week for MGT 300?

● 0

● 1-2

● 3-4

● 5-6

● 7+

28) How many hours did you study each week for individual quizzes?

- 0
- 1-2
- 3-4
- 5-6
- 7+

29) How many hours did you study each week for collaborative quizzes?

- 0
- 1-2
- 3-4
- 5-6
- 7+

30) Did taking the quizzes in class increase, decrease, or not affect at all the time studying for the exams?

- Increase Study Time for Exams
- Decrease Study Time for Exams
- The Quizzes Did Not Affect My Study Habits.

31) The quizzes prepared me for the tests by showing me what I needed to focus my studies on.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

32) Overall, the quizzes made me more confident in my ability to score well on the quiz.

● Strongly Disagree ● Moderately Disagree ● Slightly Disagree

● Slightly Agree ● Moderately Agree ● Strongly Agree

Demographics

33) Please Type In Your Age

34) Are you Male or Female?

● Male ● Female

35) Please mark your race. If you would like not to respond please make that selection.

● Asian/Pacific Islander ● Black/African-American ● Caucasian ● Hispanic ● Native American/Alaska Native ● Other/Multi-Racial ● Decline to Respond

36) What is your class standing?

● Freshman

● Sophomore

● Junior

● Senior

37) What is your expected major?

● Accounting

● Finance

● Management

● Marketing

● General Business

- Economics
- Other
- Undecided

38) What is your expected grade in MGT 300?

- A
- B
- C
- D
- F

39) What is your current collegiate GPA?

- Less than 2.0
- 2.0-2.49
- 2.5-2.99
- 3.0-3.49
- 3.5-4.0

Thank You!

I could not accomplish this study and my academic endeavors without all of your help. Thank you so much for participating.

Appendix C- Institutional Review Board Approval

UNIVERSITY OF SOUTH ALABAMA

irb@usouthal.edu

TELEPHONE: (251) 460-6308
CSAB 138 - MOBILE, AL. 36688-0002
FAX: (251) 461-1595

INSTITUTIONAL REVIEW BOARD
February 6, 2013

Principal Investigator:	Adrian Grubb, B.S. BA		
IRB # and Title:	IRB PROTOCOL: 13-017 [361029-1] The Effects of Collaborative Testing and The Testing Effect on Student Achievement and Confidence of Undergraduate Business Students.		
Status:	APPROVED	Review Type:	Expedited Review
Approval Date:	1/28/2013	Submission Type:	New Project
Initial Approval:	1/28/2013	Expiration Date:	January 27, 2014
Review Category	Category: 45 CFR 46.110 (7): Research on individual or group characteristics or behavior		

This panel, operating under the authority of the DHHS Office for Human Research and Protection, assurance number FWA 00001602, has reviewed the submitted materials for the following:

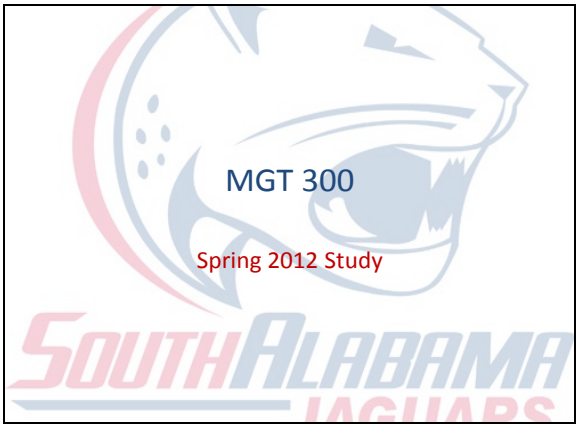
1. *Protection of the rights and the welfare of human subjects involved.*
2. *The methods used to secure and the appropriateness of informed consent.*
3. *The risk and potential benefits to the subject.*

The regulations require that the investigator not initiate any changes in the research without prior IRB approval, except where necessary to eliminate immediate hazards to the human subjects, and that **all problems involving risks and adverse events be reported to the IRB immediately!**

Subsequent supporting documents that have been approved will be stamped with an IRB approval and expiration date (if applicable) on every page. Copies of the supporting documents must be utilized with the current IRB approval stamp unless consent has been waived.

Notes:

Appendix D- Study Presentation



The Study

- "The Effects of Collaborative Testing and the Testing Effect on Student Achievement and Confidence of Undergraduate Business Students."
- This research study will investigate the effects of:
  - collaborative, repeated testing (The Testing Effect) on:
    - student achievement,
    - efficacy,
    - confidence, and
    - attitude.

What is the "Testing Effect?"

- Tests are normally used to assess students' proficiency and understanding of material taught in class.
  - In Higher Education
    - Normally Administered Two to Four Times
    - Count for a large portion of the grade
    - Student's are heavily dependant on their success on tests.

What is the "Testing Effect?"

- Roediger and Karpicke
  - Suggested that frequent testing can be more effective as a learning tool to aid students' retention.
  - Define the testing effect as the enhancement of student learning utilizing assessment rather than repeated studying

So then…"What's Collaborative Testing?"

- Collaborative Learning
  - Students must work in groups to complete tasks collectively toward academic goals.
- Collaborative Testing:
  - The process of taking a test collectively, including the analysis, discussion, and agreeing on one answer formed by consensus.

So… "What's the Point?"

- In this class we will be using your class quizzes to evaluate if collaborative testing is effective.
- There will be a total of eight unannounced quizzes.
  - Four as an Individual
  - Four as a Collaborative Group

"Collaborative Groups?"

- I have randomly assigned each student to a group of five or six
  - There are 7 groups in this section
  - The groups will not only take quizzes together but will participate in other group assignments throughout the semester

" What will the quizzes cover?"

- The 10 question quiz will be based on the lectures and reading assignments listed in the syllabus.
  - Multiple Choice Questions
  - Answers keys posted on the Sakai site
  - Some Questions Will Be Included on the Exams
  - Group Scores will be Assigned to Everyone in the Group that Attended Class That Day.

Confidence Scores

- These quizzes differ in one way:
  - I want to know how confident you are in your answers.
    - Individual
    - Group
  - Please be as honest as possible.

Confidence Scores

- How confident are you or your team in the answer given?*
  - a. I did not know it and I have to guess
  - b. I am not sure, but I assume something
  - c. I am not sure, but I think I know it
  - d. I know it

Survey

- There will be two online surveys
  - The link will be sent to your jagmail address
  - Also posted on Sakai site.
  - You will have two weeks to complete it.
  - Questions are designed to get your perceptions of: collaborative testing and working in groups.

Survey

- The second survey will be sent to you after the second exam.
  - The questions are designed to get your reflections on collaborative testing, working in groups, and overall perceptions

Appendix E- Consent Form

The Effects of Collaborative Testing and The Testing Effect on Student Achievement and Confidence of Undergraduate Business Students.

Adrian Grubb, Principal Investigator 251-721-0622

Dr. Litchfield, Faculty Advisor 251-380-2861

College of Education University of South Alabama

August 29, 2013

Purpose

The purpose of this study is to examine the effects of collaborative testing and the testing effect on student achievement and self-efficacy of undergraduate business students. This research will be used as a component of my dissertation projects for the requirements of a Ph.D. in Instructional Design at the University of South Alabama. You are being asked to participate so I may learn more about the effectiveness of these strategies.

Procedures

As a participant, you will complete a questionnaire at the beginning of the study and again at the end. The questionnaires will take about 10 minutes to complete. The questionnaire is focused on prior experiences with collaborative learning, self-efficacy, as well as group efficacy.

Risks

There are no physical or psychological risks beyond what you would normally expect to encounter as students on campus.

Benefits

The potential benefits for instructors and students are increased knowledge of the learning strategies examined in the study.

Compensation

There will not be financial compensation for participation in this study.

Confidentiality

All information collected in this study will be kept strictly confidential, except as may be required by law. However, there is a limit to the confidentiality that can be guaranteed due to the technology itself. Your grades will be accessed and used as a part of the data collection process. If any publication results from this research, you will not be identified in any way.

Disclaimer/ Withdrawal

You agree that your participation in this study is voluntary and that you may withdraw at any time without jeopardizing your class status, grade, or standing with the University of South Alabama.

Subject Rights

You understand that if you wish to obtain further information regarding your rights as a research subject, you may contact the USA Institutional Review Board by telephoning (251) 460-6308. You also understand that if you have any questions pertaining to your participation in this study, you may contact the researcher by phone at (251)721-0622 or e-mail agg602@jagmail.southalabama.edu. You may also contact Dr. Brenda Litchfield at (251) 380-2861.

Age Confirmation

The legal age of majority in the state of Alabama is 19. You must be at least 19 years of age to participate in this study.

1) Formal Consent
By completing the questionnaire, you are agreeing to participate in the research. If you would like a copy of this document you may print a copy for your records.*

( ) I Agree

( ) I Do Not Agree

BIOGRAPHICAL SKETCH

Biographical Sketch

Adrian Gerard Grubb was born on September 1, 1979 in New Orleans, Louisiana. In 2006, he received his Bachelor of Science in Business Administration from the University of South Alabama. Adrian has over 12 years of managerial experience specializing in training and development. Adrian currently resides in Mobile, Alabama with his wife Christie and two sons Braeden and Evan.