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The Effectiveness of Active and Passive Teaching Methods on the Retention of Material Taught to the Naval Intelligence Officer's Basic Course (NIOC) Students for the Period of One Week

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THE EFFECTIVENESS OF ACTIVE AND PASSIVE TEACHING METHODS ON THE RETENTION OF MATERIAL TAUGHT TO THE NAVAL INTELLIGENCE OFFICER'S BASIC COURSE (NIOBC) STUDENTS FOR THE PERIOD OF ONE WEEK

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CHAPTER I

INTRODUCTION

Teaching methods employed by the Navy are antiquated and ineffective compared to methods recently developed and successfully used in academia. The command responsible for governing the employment of current teaching methodologies used in the Navy is the Chief of Naval Education and Training (CNET). Specifically, CNET mandates group-paced instructional methodology, which is taught to prospective Navy instructors at the Instructor Training School (ITS) in Newport, Rhode Island. Group paced instruction was designed to accommodate the wide range of training programs found in the Navy. Unfortunately, group-paced instruction is based on teaching and evaluating knowledge and comprehension which represent the lowest order thinking skills according to Bloom's cognitive taxonomy (Bloom, 1956). Ostensibly, group-paced methodology is not appropriate for all Navy training.

The Naval Intelligence Officer Basic Course (NIOBC), which is offered by the Naval and Marine Corps Training Center (NMITC), is one example of a course in which the group-paced instructional methodology is exceedingly inadequate. NIOBC is unlike most courses offered by the Navy and the requirements of the intelligence profession dictate that instruction must go beyond teaching and evaluating knowledge and comprehension. In order to train new Intelligence Officer accessions properly with the skills needed to successfully perform their jobs, NIOBC instructors must shift their teaching strategies to incorporate active/cooperative components. Research on active learning indicates that active teaching methodologies focus on higher order thinking skills like analysis, synthesis, and evaluation, which serve as the cornerstone of the intelligence profession.

In order to teach higher order thinking skills, NIOBC instructors must switch from employing passive teaching methods like lecturing to active teaching methods like cooperative learning exercises, e.g., paired reading. This shift in teaching methods is warranted because a commensurate shift in fundamental learning theory has occurred. The theory that students' minds are like blank slates, ready to be inscribed with knowledge, is no longer believed to be true by most experts in education. Subsequently, most experts subscribe to constuctivist theory, which postulates that nothing can be taught, rather true learning must be constructed. Given the necessity to teach higher order thinking skills in NIOBC, shifting to active teaching methodologies in a cooperative learning environment is one acceptable solution.

Statement of the Problem

The problem of this study is to compare the effectiveness of active and passive teaching methods on the retention of material taught to the Naval Intelligence Officer's Basic Course (NIOBC) students for the period of one week.

Research Goals

Based on the problem statement, the research hypothesis for this study is as follows:

H_1: Student Intelligence Officers taught using active teaching methods will attain higher academic scores and retain more information over the duration of the Naval Intelligence Officer Basic Course (NIOBC) than student Intelligence Officers taught using passive teaching methods.

Background and Significance

The researcher was a student in NIOBC from June 1993 to November 1993 and is currently serving as a NIOBC instructor. Additionally, before becoming a NIOBC instructor the researcher had to complete ITS. Before attending ITS, the researcher was enrolled in a Masters of Education Program at Old Dominion University. Due to the researcher's exposure to the education field, it was readily apparent that the teaching methods modeled by ITS were antiquated and ineffective in light of recent studies in pedagogy.

ITS was designed to teach prospective Navy instructors how to employ group-paced instructional methodology. According to the Officer Instructor Student Training Guides, the characteristics of group-paced instruction are: one instructor instructing a large group, the instructor presents the material, the material is developed for the average student, and the instruction is designed to teach knowledge or a skill. Clearly, this framework lends itself to passive instruction. The ITS guide accomplishes exactly what it was designed to do - teach knowledge or the development of a skill which represent the lowest order thinking skills. Given the nature of the Intelligence profession, the design of ITS is inadequate for the training of Naval Intelligence Officers.

Unfortunately, most lessons taught in NIOBC use a lesson format that consists of a lecture coupled with strategic questioning to test for understanding. Questioning and the ensuing discussions do not change the overarching nature of instruction, which is passive. Although questioning can elicit higher order thinking, most questioning in NIOBC focuses on testing for knowledge or comprehension. Lower cognitive level questioning occurs because that is what is modeled at ITS.

The main reason for this study was to determine if the NIOBC instructors employed the most effective teaching methods for the period of one week. Due to the fact that teaching methods employed in NIOBC are representative of the teaching methods employed by most classes taught in NMITC, results from this study might be applicable to other courses offered at NMITC. Although numerous studies have been conducted on the effectiveness of different teaching methods, few have been conducted in the military which introduces variables and limitations not normally found in public institutions.

Revisions to ITS do not keep up with advances in education. Constructivist theory, cooperative learning, and the utilization of multi-modal teaching methods represent a few commonly accepted advances in the field of education which have not broached naval education. The hope is that this study will draw attention to the need of changing instructional methodologies from passive to active. Previous research studies indicate that active teaching methodologies increase performance and improve attitude towards the overall learning process. As a result, it is the researcher's hope that this study will serve as the justification for NMITC to develop a tailored teaching methodologies program to augment and update what is taught at ITS.

Limitations

Limitations for this study revolve around the military environment. The study will run for approximately four months, covering two NIOBC classes, with a sampling size of approximately 50 students. All aspects of the study will be conducted at the Naval and Marine Corps Intelligence Training Center (NMITC) located in Dam Neck, Virginia. Lastly, all aspects of the study must be approved by the NMITC chain of command. Additional limitations are as follows:

- The research can not impinge upon ongoing training, i.e., the study must be incorporated into the course in its original format.
- The research design must be fair because the students are in a competitive environment.
- The research might affect student GPA, therefore, must be relevant to ensure appropriate participation.
- Data collection can not interfere with student training.

Assumptions

Assumptions for this study also revolve around the military environment.

1. The military environment does not impinge upon its member's ability to learn, and as a result, does not affect the research's applicability to education outside the military.

2. NIOBC students' backgrounds are varied and do not consist of a particular background or personality type.

3. Material taught in NIOBC is similar in nature to material taught at the college level.

4. A testing instrument can be devised to evaluate the hypothesis without interfering with the ongoing course.

Procedures

Research will be conducted using two NIOBC classes consisting of approximately 25 students in each class. Each class will be divided into two heterogeneous groups to ensure an equal distribution of ability, race, and gender. One lesson will be taught to each class with one half of the class receiving instruction using a cooperative learning methodology and the other half of the class receiving traditional lecture. The entire class will be evaluated for comprehension immediately following each lesson and at selected intervals throughout the course. Retention will be measured by the number of correct answers provided over the duration of the study.

Definition of Terms

Acronyms, Navy specific terms, and terms associated with cooperative learning are defined as follows:

Chief of Naval Education and Training (CNET) - the command which governs all aspects and is overall responsible for all training conducted within the Navy.

Cooperative learning – an instructional technique that requires students to work together in small, fixed groups on a structured task (Lindquist, 1997).

Navy and Marine Corps Training Center (NMITC) – according to the Shipboard Organization and Regulations Manual (SORM), NMITC provides basic and specialized intelligence training to Navy, Marine Corps, Coast Guard, civilian law enforcement agency, and foreign naval personnel, as directed, in support of the collection, analysis, processing, and dissemination of intelligence data, and the operation and maintenance of intelligence systems; to provide operational commanders with naval intelligence training services in support of intelligence systems, doctrine, and procedures; and to perform such other functions and tasks as may be directed by higher authority.

Naval Intelligence Officer Basic Course (NIOBC) – the course designed to prepare junior initial accession, lateral transfer U.S. Navy designated restricted line, Special Duty Intelligence (1630x), U.S. Marine Corps designated Air Intelligence Officer (0207), and new civilian intelligence employees for intelligence assignments. The curriculum stresses fundamental intelligence skills and knowledge. NIOBC is 22 weeks in duration, consisting of five phases and nine blocks of instruction in a building block sequence (NIOBC Course Description).

Instructor Training School (ITS) – the course designed to teach all prospective navy teachers how to instruct using the group-paced instructional methodology in addition to all the facets of the Navy training program.

Lesson Plan – the plan used by all Navy instructors to schedule the use of all other training materials. Lesson plans contain learning objectives that reflect knowledge and/or skills attained upon successful completion of the course, provide an outline of instructional materials to be taught in a logical and efficient manner, and provide specific equipment and instructional media requirements and guidance for conducting the course (NAVEDTRA 140).

Overview of Chapters

Navy teaching methods are based on group-paced instructional methodology which is not appropriate for the NIOBC curriculum, because it focuses on lower order thinking skills. The purpose of this study is to examine the effectiveness of both active and passive teaching methods to determine the best method for NIOBC. Although research points to the fact that active methods are more effective than passive methods, the military environment introduces unique variables and limitations which may affect the outcome of this study. This study will be conducted over the course of one third of one year, using two different classes, with an approximate sampling size of 50 students.

Chapter II is a review of literature focusing on the effectiveness of cooperative learning compared to traditional passive methods of instruction. Chapter III delineates the methods and procedures used to conduct the study. Chapter IV lists the findings of the study and lastly, Chapter V summarizes the study to include recommendations for future studies.

CHAPTER II

REVIEW OF LITERATURE

Cooperative learning has many definitions all of which share common attributes. According to Slavin (1995), cooperative learning is an instructional methodology involving heterogeneously grouped students working towards a common objective. Research over the past five decades has provided overwhelming evidence that cooperative learning enhances student performance in the classroom. Specifically, benefits of cooperative leaning include higher achievement, motivation, and retention along with other non-cognitive benefits including increased assertiveness, self-esteem, and goodwill towards other group members. Nevertheless, past studies rarely contained control groups and rarely eliminated extraneous variables which casts doubt on the results. Even today, the debate continues as to whether cooperative learning is effective at the college level.

Most cooperative learning definitions grew out of research conducted by Johnson et al. (1981, p. 47) who described an alternative to competitive and individualistic goal structures revolving around cooperation. Their research identified basic elements, which must be present in order for cooperation, used as a goal structure, to succeed. Basic elements include positive interdependence, face-to-face interaction among students, individual accountability, and the appropriate use of interpersonal and small-group skills. Positive interdependence and individual accountability are common among all researcher prerequisites for successful cooperative learning to occur.

Achievement

The most highly touted benefit of cooperative learning by education researchers is higher achievement. Ostensibly, higher achievement and motivation are intertwined. Higher achievement and motivation are normally present in a mutualistic relationship where the end result of one fuels the other. Most research on cooperative learning stems from early theories on motivation. Lewin (1935) first postulated a theory of motivation which focused on a state of tension as the causal agent for an individual to accomplish a specific goal. Lewin hypothesized that goal attainment is the impetus behind cooperative, competitive, and individualistic behavior. Deutsch (1949, p. 129) first described Lewin's behaviors as goal structures and finally Kelley and Thibaut (1969) used learning theory as their framework to redefine goal attainment as reward attainment. These were the three primary studies which served as the foundation for all future studies in cooperative learning.

Until 1981, there was a long-standing controversy over the benefits of cooperation over competition and individualistic goal environments. Johnson et al. (1981) reviewed numerous studies comparing the effectiveness of cooperative, competitive, and individualistic goal attainment environments. Using meta analysis, Johnson et al. concluded that cooperation, with or without intergroup competition, was significantly more effective in promoting higher achievement and productivity than competitive and individual efforts. Additionally, Johnson et al. found there was no difference between competitive and individualistic environments in promoting higher achievement.

Subsequently, research continues to reinforce the claim that cooperative learning results in higher achievement and motivation.

Motivation

Motivation and achievement must be examined together due to their synergistic nature. Johnson and Holubec (1993) found that students experience a higher sense of motivation when working with others. Graham et al. (1997, p. 149) found that high student interest was a byproduct of the cooperative learning environment. The effect of motivation on achievement in a cooperative environment can best be observed in the business world because money normally serves as the "tension" described by Lewin which forces people to engage in cooperative behaviors. Additionally money can readily be measured or quantified. Teams who enjoy success in the business world share several common traits including: size, skills, and goals. Successful teams are usually small, team members develop complimentary skills to ensure strength in all areas, and they possess a sense of community because all members share a common purpose and goals (Baloche, 1998, p. 8).

Not surprisingly, Johnson and Holubec's (1993, p. 4) elements of high quality small group cooperation share similar traits of successful groups in education. Small groups are inherent in Johnson's definition of the cooperative leaning environment and one basic element that all small groups must possess is positive interdependence. Positive interdependence can be achieved through a division of labor, mutual goals, or by the awarding of team rewards. The key to successful cooperation among small learning groups is that the students perceive that their rewards are contingent upon the dependence of their other group members and how they function as a whole vice individuals (Johnson et al., 1984, p. 8). When the environment shifts from cooperative to competitive the resultant effect on achievement is negative. Studies indicate that competition usually undermines or negates the positive effects achieved by cooperation including higher motivation (Amabile, 1983). As a result, students are often times more interested in their own achievement compared to others rather than the task or material itself (Nicholls, 1989).

Due to the overwhelming evidence that cooperative leaning and other non-traditional instructional methodologies proved to be more effective than passive lecturing, education experts pushed for change in education principles in the late 1980s. Several reports were issued by education groups based on a review of the past 50 years of education research (Gamson, 1991). One report issued by the Accounting Education Change Commission titled Proposition Statement No. 1 (AECC) promulgated the need for a fundamental change in the way accounting was being taught. The crux of this report was accounting students needed to be taught how to learn in an active, cooperative framework. This report was heavily founded in Constructivist theory calling for learning by doing. Additionally, Proposition Statement No. 1 delineated the skills required by accounting professionals which were communication, intellectual, and interpersonal skills. However, this report failed to articulate a specific plan for how the fundamental change would manifest itself in daily instruction at the college level (Bradford and Peck, 1997, p. 364).

Following a similar review of available education research, the American Association for Higher Education (AAHE) recommended "seven principles for good practice in undergraduate education" (Chickering and Gamson, 1987). The seven principles include: promoting student-faculty interaction, promoting student to student cooperation, promoting active learning, giving immediate feedback, emphasizing time on task, communicating high expectations, and respecting the wide spectrum of talents and ways of learning of students. According to Bradford and Peck (1997, p. 365) four of the seven principles affect motivation and performance and are closely interrelated. The principles, which are closely linked, are student-faculty interaction, immediate feedback, time on task, and communicating high expectations.

It can be inferred from Mckeachie et al. (1986) that student motivation is affected by the teacher's attitude towards the material. Additionally, providing prompt feedback to students usually results in more time being spent on the current assignment, which directly results in higher performance. Webb (1982, p. 421) found that both giving and receiving help contributed to higher achievement, whereas digression from the task at hand and passivity contributed negatively to achievement. These principles combined with the setting of high quality, attainable goals should yield higher performance over the setting of lower quality goals (Sorcinelli, 1991, p. 13).

Common criticisms of cooperative learning are that cooperative learning does not benefit minority and gifted students. Research has shown that minority students and children whose cultures are embedded with cooperation usually benefit more than non minority students and children with cultures in which cooperation is absent (Triesman, 1992, p. 363) (Kagan, 1980). Americans from Mexico and Africa enjoy greater success than any other group in a cooperative learning environment (Kagan, 1975, p. 643). Additionally, research indicates that gifted students actually benefit the most from a cooperative learning environment (Slavin, 1991, p. 68). As a result, cooperative learning affords teachers an instructional methodology that works with students of differing abilities, race and gender.

Retention

Cooperative learning appears to be the answer to everything that is wrong with education. Beyond the increases reported in achievement and motivation, cooperative learning positively affects nearly all facets of instruction. Researchers have concluded that cooperative learning increases both short and long term retention, forces the use of higher order thinking skills, ensures a minimum amount of study and exposure to material, and yields other non cognitive benefits including increased assertiveness, self esteem, and goodwill towards other group members.

Johnson and Holubec (1983) determined that students working in a cooperative environment experienced greater retention of information than students working in competitive or individualistic work environments. This research has been applied to almost every subject within the education field. One subject, considered challenging by most college students regardless of major, is organic chemistry. Organic chemistry requires the memorization of numerous organic compounds and reactions which can be difficult to learn with traditional study methods. Additionally, students who transcribe organic chemistry terms and reactions onto flashcards usually perform poorly because there is no underlying framework to associate the terms or reactions. Dougherty found that cooperative learning could be used to teach students how to organize and retain large numbers of facts (1997, p. 722). As a result, Dougherty employed a group study plan with an organized outline to serve as the framework for study along with two other writing exercises to test the effect of cooperative learning on retention.

Overall, Dougherty found that the creation of three cooperative, writing opportunities improved the probability of retention and successful recall. Cooperative study groups afforded the students the opportunity to discuss the material which also served as a verbal and aural reinforcement. Dougherty's study reinforced the theory that cooperative learning increases retention as measured by achievement.

Other Cognitive Benefits

Another added benefit of using cooperative learning is that students tend to develop skills which help them to become empowered thinkers and learners (Baloche, 1998, p. 146). In general, higher order thinking skills are used in a cooperative learning environment more than in a traditional lecture setting. Group work tends to elicit student evaluation and opinion, which represent the highest order thinking skills according to Bloom (1956). Contrarily, most passive lectures are bolstered by periodic checks for understanding which focus on knowledge and comprehension, which represent the lowest order thinking skills.

Non-cognitive Benefits

Graham et al. (1997) found that cooperative learning in a college marketing course forced students to actively participate or else they would be left out of the decision making process. As a result, formerly passive students became more assertive because their grade depended on their participation and because they received pressure from their peers. Additionally the critical thinking skill of persuasion was developed and honed in order to build a consensus within each group (Graham et al., 1997, p. 151)

As stated above, students tend to become more assertive in a cooperative learning environment mostly due to peer pressure. Other non-cognitive benefits have been reported by a majority of researches without controversy. Using the group investigative model, Lindquist (1997) found that self-esteem and interpersonal skill building were enhanced. Additionally, perceived achievement was greater using cooperative learning than if the students were subject to other instructional methodologies.

An increase in classroom goodwill is another common finding when studying the benefits of cooperative learning. Students believe that a cooperative learning environment promotes harmony within the class. In a study conducted by Lindquist (1997, p. 159) student attitudes on the cooperative learning process were inventoried. Regression studies indicate that those subjects who had no prior experience with cooperative learning did not think that cooperative learning would enhance classroom goodwill. Those students who were unfamiliar with the benefits or nature of the cooperative learning environment were less likely to perceive an improved attitude towards other group members.

Numerous additional benefits have been reported from using cooperative learning in the classroom. Cooperative leaning has the added benefit of teaching students how to be productive members of our democratic society. Group work involving discussion and cooperation is the foundation of democracy (Baloche, 1998). Additionally, teachers have discovered that cooperative learning saves time in the classroom (Graham et al., 1997), allows students to assume different roles (Hertz-Lazarowitz and Shachar, 1990), and ensures that students spend a minimum amount of study time on the material being taught (Dougherty, 1997, p. 725).

Problems with Past Studies

Although extensive research exists on the positive benefits of cooperative learning among primary and secondary education, the benefits of the cooperative learning environment at the college level are still being debated (Ravenscroft et al., 1995, p. 97). Additionally, there is a lack of controlled experiments in a cooperative learning environment. As a result, very few studies have been conducted in the absence of extraneous variables, which may serve as causal agents for reported outcomes. Additionally, there has been little research conducted on how cooperative learning affects long-term retention. Most studies use the term retention synonymously with recall and as a result the duration of the study affords the testing of short-term recall only. Long term memory or retention is a better indicator of true learning, however, the aforementioned benefits of cooperative learning, regardless of whether or not they are temporary, will always be viewed positively.

Several recent studies are worth highlighting because they are representative of the research currently being conducted. Graham et al. (1997) conducted a cooperative learning experiment using participatory examinations to eliminate a bimodal grade distribution in a college marketing class. The effects of cooperative learning on high achievers were attitudes changed from negative to positive, personal satisfaction rose, and achievement increased over the course of one semester. Additionally, the teacher experienced a savings in time because the students resolved most of their issues themselves.

Cooperative learning is extending beyond general education into every field of academia. One experiment, which was conducted by Lindquist (1997), is typical of research being conducted on cooperative learning. In simple terms, Lindquist taught a lesson using traditional, passive lecture and then administered a test. Lindquist then used the cooperative learning structure to teach a second lesson and then administered a test. Both tests were compared and a conclusion was drawn. Lindquist found that the lesson taught in the cooperative learning environment yielded higher achievement than the lesson taught using passive lecture.

Although, the results clearly indicate that achievement was higher for the lesson taught cooperatively, this might be attributed to the fact that the first lesson provided the background for the cooperative lesson. Since a person's background affects how and to what degree a person learns, the researcher does not truly know that the results can be attributed to the instructional methodology alone. Vygotsky's (1978) information processing theory supports higher achievement using cooperative learning because cooperative leaning increases a person's background or schema thereby increasing that person's potential for learning. This theory also serves as a possible explanation why achievement was higher on the second test independent of the teaching methodology. The first lesson may have simply expanded the group's background or schema for the second lesson. As a result, higher scores would be expected because the learning potential was higher due to the first lecture.

Kogut conducted another study of interest on cooperative learning in General Chemistry (Kogut, 1997, p. 720). Kogut's experiment used three and five credit hour courses which shared the same material. The main difference was number of hours of instruction and the traditional student profiles. Over the past ten years, students who registered for the three credit hour class were more prepared for college level chemistry than the students who registered for the five credit hour course. This was determined by examining student profiles to include Math SAT scores and a chemistry placement examination. The three credit hour course was taught using traditional methods, which served as the control group while the five credit hour course was taught using cooperative learning. In this experiment, students taking the five credit hour course scored significantly higher than students taking the three credit hour course. This result was unprecedented because over a ten year period student achievement was the reverse of the above results. This experiment is significant because Kogut possessed over ten years of student statistics to derive his conclusions. Unfortunately, Kogut's study involved two groups receiving different amounts of instruction on the same material. Kogut points out that when the amount of instruction is the only variable, students from the three credit hour course outperform students from the five credit hour course.

The only way to truly eliminate the possibility that time of instruction was not the causal agent for increased achievement would be to teach two heterogeneous classes with the same number of hours of instruction. Another problem with this experiment was that grouping of students was not done heterogeneously. Bolhemeyer and Burke (1987, p. 36) identified the optimal team number of four members by the instructor to ensure an equal mix of ability, gender, and race. Kogut's experiment used groups which were formed primarily on student schedules (1997, p. 720).

It is clear that cooperative learning, as an instructional methodology, is responsible for numerous benefits at all levels of education. Teachers of most subjects in education regardless of subject difficulty are now utilizing cooperative learning. Even though extensive research exists on cooperative learning, many studies lacked control groups and did not eliminate extraneous variables. Additionally, the effects of cooperative learning at the college level are still being studied. As a result, this design will try to eliminate all the shortcomings listed above.

CHAPTER III

METHODS AND PROCEDURES

The methods and procedures used for this experiment are delineated in this chapter. Contents of this chapter include the composition of the population, research variables, instrument design, classroom procedures, methods of data collection, and statistical analysis. The population for this experiment consisted of 150 students from six NIOBC classes. Research variables were limited wherever possible to add to the validity of the data. No traditional instrument was used to carry out the research, rather a series of objective tests served as the source for the data collected. Lastly, statistical analysis was conducted using the t-test.

Population

The population of this study consisted of approximately 150 students. Out of this population, a sample consisting of 50 students from two NIOBC classes was chosen. Six NIOBC classes are convened annually, therefore, two classes equate to one third of the NIOBC student throughput per year. Due to the fact that NIOBC is a sequential course, using a building block framework, the second NIOBC class was taught two months after the first class. Furthermore, each class was divided in half to form control and experimental groups. The groups were divided using the previous block of instruction's grades to ensure a heterogeneous distribution of academic performers.

NIOBC students include both Navy and Marine Corps officers ranging from 0-1 (Ensign or 2nd Lt) to 0-3 (Lieutenant or Captain). All students have earned, at a minimum, a Bachelor's degree in addition to completing an officer accession program. Due to increased competitiveness throughout the military service, roughly 40% of the NIOBC students have earned a postgraduate degree. Additionally, both classes have an average of 2.5 years of prior military service.

Research Variables

Research variables have been minimized wherever possible to increase the validity of this experiment. The only variable consciously introduced into the experiment is the instructional methodology. All other controlled variables have been eliminated to the best of the researcher's ability. Length of instruction, content, organization, testing method, and instructor are the same for both the control and experimental groups. Uncontrollable variables such as student motivation and attitude of the class have not been eliminated, but minimized by quality instruction. Uncontrollable variables or variables controlled by the class have a negligible affect compared to the controlled variables listed above.

Instrument Design

No traditional instrument was used to conduct this experiment, rather a series of objectives tests were administered to collect the data. Two of the three objective tests are located in Appendices A and B. The third objective test is not available due to classification.

Classroom Procedures

Both NIOBC classes were divided into control and experimental groups. The control group of the first NIOBC class (98030) was taught a lesson on combat assessment using traditional, passive lecture in the morning and immediately tested. The experimental group was taught the same lesson using active teaching methods to include a paired reading, cooperative review, and group practical exercise in the afternoon and immediately tested. Both the control and experimental groups of the first NIOBC class were tested again on Day 4 and Day 7. Approximately two months later, the second NIOBC class (98040) was taught and tested using the above schedule except the time of day was reversed to determine if time of day affected the results.

Methods of Data Collection

Tests were the same for both control and experimental groups but differed according to the day they were administered. Test 1 was administered on Day 1 immediately after the lesson was taught. Test 2 was administered on Day 4 and Test 3 was administered on Day 7 and was interspersed into a comprehensive examination.

All tests were constructed as objectively as possible. Each test contained an equal mix of true false, matching, and fill-in-the-blank questions. Additionally each test contained an equal mix of broad and specific questions. Academic performance for each student was calculated as a raw score and the mean was derived for each group.

Statistical Analysis

The mean of each test was calculated for both control and experimental groups from the first and second NIOBC classes. T-tests were conducted on the two sample means for both control and experimental groups from the first and second NIOBC classes. Class scores were analyzed separately to determine if the results were repeatable and also to increase the sample size. Additionally, three tests spread out over one week afforded the opportunity to conduct trend analysis over an intermediate time period.

Summary

Although this experiment did not employ a known instrument to collect data, the series of tests used were designed to eliminate controllable, extraneous variables. The only controllable variable that was manipulated was the method of instruction, active or passive. In order to measure how the method of instruction affected student academic retention, an instrument was created consisting of a series of three objective tests administered over one week to both control and experimental groups. Additionally, the experiment was repeated approximately two months later to verify the results and to add to the data collected.

CHAPTER IV

FINDINGS

Report of Findings

Data was collected from two NIOBC classes (98030 and 98040), with each class being treated as a separate experimental iteration in order to determine if the results were repeatable. Each class was split into heterogeneous control and experimental groups in order to eliminate ability, race, and gender biases. NIOBC class 98030 was comprised of 19 students and the distribution was ten and nine students in the control and experimental groups respectively. NIOBC class 98040 was comprised of 23 students and the distribution was 11 and 12 students in the control and experimental groups respectively. Retention was measured by determining the raw scores for three objective tests. Additionally, raw scores were converted to a percentage correct out of 100 points calculated by multiplying the raw score divided by the total number of points possible by 100.

In addition to determining raw scores for three objective tests, the means for the block (PP CUM) and overall course (NIOBC CUM) were calculated. The experiment was conducted during the Power Projection (PP) block of instruction which is one of nine blocks of instruction comprising the overall course. PP CUM and NIOBC CUM were calculated to ensure that the results could not be attributed to an unequal distribution of academic talent in either the control or experimental groups.

NIOBC 98030 control and experimental groups' results are listed in TABLES 1 and 2. The mean for Test 1 was 84.6% and 87.7 % for the NIOBC 98030 control and experimental groups respectively. The mean for Test 2 was 65.0% and 77.6 % for the NIOBC 98030 control and experimental groups respectively. The mean for Test 3 was 80.8% and 90.7 % for the NIOBC 98030 control and experimental groups respectively. The mean for the block (PP CUM) was 93.4% and 92.7 % for the NIOBC 98030 control and experimental groups respectively. Lastly, NIOBC Cumulative (NIOBC CUM) was 95.1% and 94.9 % for the NIOBC 98030 control and experimental groups respectively.

TABLE 1. NIOBC 98030 Control Group (Passive Lecture)

STUDENT	SSN	RAW #1	TEST #1 (%)	RAW #2	TEST #2 (%)	RAW #3	TEST #3 (%)	PP CUM	NIOBC CUM
Albon	5724	26.0	96.3	30.0	83.3	3.0	25.0	91.6	95.9
Dumont	5408	24.0	88.9	25.0	69.4	10.5	87.5	96.0	95.4
Gibson	1875	24.0	88.9	20.0	55.6	10.5	87.5	91.0	93.7
Hall	8955	19.0	70.4	20.0	55.6	9.0	75.0	93.3	93.3
Leese	5889	25.0	92.6	28.0	77.8	11.0	91.7	94.1	96.5
McClellan	3670	25.0	92.6	16.0	44.4	11.0	91.7	94.4	93.7
Metzger	3940	24.0	88.9	29.0	80.6	12.0	100.0	96.6	97.2
Shone	7961	20.5	75.9	24.0	66.7	11.5	95.8	91.4	93.6
Tolch.	2191	18.0	66.7	27.0	75.0	9.0	75.0	93.7	95.2
Walsh	8825	23.0	85.2	15.0	41.7	9.5	79.2	91.6	96.0

TABLE 2. NIOBC 98030 Experimental Group (Cooperative Exercise)

STUDENT	SSN	RAW #1	TEST #1 (%)	RAW #2	TEST #2 (%)	RAW #3	TEST #3 (%)	PP CUM	NIOBC CUM
Carey	O831	26.0	96.3	33.0	91.7	10.5	87.5	94.4	95.7
Dudas	9646	21.0	77.8	24.0	66.7	11.5	95.8	91.7	96.3
Earle	6585	23.0	85.2	26.5	73.6	12.0	100.0	94.3	93.2
Fraser	2720	23.0	85.2	24.0	66.7	11.0	91.7	89.0	91.9
Holmes	7855	25.0	92.6	29.5	81.9	12.0	100.0	95.7	97.6
McShall	5559	25.0	92.6	31.5	87.5	9.5	79.2	93.3	95.2
Westland	3274	23.0	85.2	28.0	77.8	12.0	100.0	95.3	97.2
Wilson	3687	22.0	81.5	32.0	88.9	11.5	95.8	91.7	95.5
Wright	6978	25.0	92.6	23.0	63.9	8.0	66.7	89.1	91.9

The mean, standard deviation (SD), and t-test results for NIOBC 98030 control and experimental groups are listed in TABLE 3. T-test values indicate that the means of the control group Tests 1-3, PP CUM, and NIOBC CUM are equal to the means of the experimental group Tests 1-3, PP CUM, and NIOBC CUM at the .05 level of significance.

TABLE 3. NIOBC 98030 Statistical Analysis

	CONTROL GROUP					EXPERIMENTAL GROUP				
	TEST #1 (%)	TEST #2 (%)	TEST #3 (%)	PP CUM	NIOBC CUM	TEST #1 (%)	TEST #2 (%)	TEST #3 (%)	PP CUM	NIOBC CUM
MEAN	84.6	65.0	80.8	93.4	95.1	87.7	77.6	90.7	92.7	94.9
SD	10.1	14.9	21.4	1.97	1.4	6.1	10.5	11.4	2.5	2.1
t-test	0.78	0.26	0.47	0.11	0.43	0.78	0.26	0.47	0.11	0.43
.05 ACCEPT (A) REJECT (R)	A	A	A	A	A	A	A	A	A	A
EQUAL (E) UNEQUAL (U)	E	E	E	E	E	E	E	E	E	E

NIOBC 98040 control and experimental groups' results are listed in TABLES 4 and 5. The mean for Test 1 was 83.3% and 87.75% for the NIOBC 98040 control and experimental groups respectively. The mean for Test 2 was 72.5% and 73.6% for the NIOBC 98040 control and experimental groups respectively. The mean for Test 3 was 94.7% and 92.7 % for the NIOBC 98040 control and experimental groups respectively. The mean for the block (PP CUM) was 93.8% and 93.9 % for the NIOBC 98040 control and experimental groups respectively. Lastly, NIOBC Cumulative (NIOBC CUM) was 94.6% and 95.0 % for the NIOBC 98040 control and experimental groups respectively.

TABLE 4. NIOBC 98040 Control Group (Passive Lecture)

STUDENT	SSN	RAW #1	TEST #1 (%)	RAW #2	TEST #2 (%)	RAW #3	TEST #3 (%)	PP CUM	NIOBC CUM
Billingsley	5543	24.0	88.9	30.0	83.3	12.0	100.0	98.0	98.4
Boone	9703	26.0	96.3	28.0	77.8	11.0	91.7	95.1	95.4
Brice	1956	20.5	75.9	21.0	58.3	12.0	100.0	92.2	91.8
Brown	2441	16.0	59.3	27.0	75.0	12.0	100.0	96.2	94.9
Cover	6238	21.0	77.8	31.0	86.1	10.0	83.3	93.3	94.0
Cox	8588	21.0	77.8	22.0	61.1	11.0	91.7	86.3	91.4
Doumitt	3527	27.0	100.0	28.0	77.8	10.0	83.3	91.5	93.8
Polson	6829	21.5	79.6	26.0	72.2	12.0	100.0	93.2	91.6
Richard	7244	22.0	81.5	24.0	66.7	12.0	100.0	96.7	97.4
Rutecki	7034	22.5	83.3	25.0	69.4	12.0	100.0	92.5	95.6
Starr	2891	26.0	96.3	25.0	69.4	11.0	91.7	96.4	96.6

TABLE 5. NIOBC 98040 Experimental Group (Cooperative Lesson)

STUDENT	SSN	RAW #1	TEST #1 (%)	RAW #2	TEST #2 (%)	RAW #3	TEST #3 (%)	PP CUM	NIOBC CUM
Aquino	3185	26.0	96.3	26.0	72.2	9.0	75.0	95.8	97.2
Castleber	1613	25.0	92.6	23.0	63.9	12.0	100.0	91.3	90.9
Desa	6944	23.5	87.0	27.0	75.0	12.0	100.0	94.9	96.1
Gandy	4082	27.0	100.0	30.0	83.3	11.0	91.7	96.3	96.3
Lehmann	9849	19.0	70.4	26.0	72.2	7.5	62.5	89.7	94.0
Lytton	1071	24.0	88.9	29.0	80.6	12.0	100.0	97.1	98.2
Morrel	7442	21.0	77.8	29.0	80.6	12.0	100.0	95.4	95.1
Price	4424	25.5	94.4	29.0	80.6	12.0	100.0	93.9	96.6
Pulgar	2811	21.5	79.6	30.0	83.3	10.0	83.3	92.3	93.6
Ramirez	2748	23.0	85.2	30.0	83.3	12.0	100.0	91.5	94.7
Samuel	258	21.0	77.8	15.0	41.7	12.0	100.0	91.9	93.3
Simon	993	27.0	100.0	24.0	66.7	12.0	100.0	96.6	94.2

The mean, standard deviation (SD), and t-test results for NIOBC 98040 control and experimental groups are listed in TABLE 6. T-test values indicate that the means of the control group Tests 1-3, PP CUM, and NIOBC CUM are equal to the means of the experimental group Tests 1-3, PP CUM, and NIOBC CUM at the .05 level of significance.

TABLE 6. NIOBC 98040 Statistical Analysis

	CONTROL GROUP					EXPERIMENTAL GROUP				
	TEST #1 (%)	TEST #2 (%)	TEST #3 (%)	PP CUM	NIOBC CUM	TEST #1 (%)	TEST #2 (%)	TEST #3 (%)	PP CUM	NIOBC CUM
MEAN	83.3	72.5	94.7	93.8	94.6	87.5	73.6	92.7	93.9	95.0
SD	11.6	8.7	6.7	3.3	2.4	9.6	12.0	12.6	2.5	2.0
t-test	0.94	0.26	0.47	0.11	0.43	0.94	0.26	0.47	0.11	0.43
.05										
ACCEPT (A) REJECT (R)	A	A	A	A	A	A	A	A	A	A
EQUAL (E) UNEQUAL (U)	E	E	E	E	E	E	E	E	E	E

Summary

NIOBC 98030 and 98040 control and experimental groups' raw data and t-test values were listed above. T-test values were calculated to determine if there was a significant difference between the means of the control and experimental groups' test scores. Means for the experimental group are higher for all objective tests with the exception of NIOBC 98040 Test 3. However, t-test values indicate there is no statistical difference between any of the means for the three objective tests, PP CUM, and the overall NIOBC CUM.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The problem of this study was to determine the effect of passive lecture compared to cooperative exercises on Naval Intelligence Officer retention of NIOBC information. The population of the study consisted of six NIOBC classes and approximately 150 students of which a sample of 2 NIOBC classes and approximately 50 students were chosen. Each class was divided into control and experimental groups; the control group received passive lecture and the experimental group engaged in a cooperative exercise. Additionally, each class was treated as a separate experiment to determine if the results were repeatable. No traditional instrument was used, rather a series of three objective tests were used to measure retention. Tests were given on Day 1 immediately after the lesson was taught, on Day 4, and finally on Day 7. Statistical analysis was performed to determine if there was a significant difference between the means of the control and experimental groups' tests.

Conclusions

Looking at the means presented in Tables 1 and 2 and 4 and 5, it appears that the cooperative lesson resulted in higher grades in all tests taken by NIOBC 98030 and 98040 with the exception of NIOBC 98040 Test 3. Additionally, higher grades can not be attributed to smarter students because the control groups possessed the same or higher mean block grade (PP CUM) and overall course grade (NIOBC CUM). After statistical analysis was conducted, it was determined that all the means were statistically equal therefore there was no statistical difference on retention between the results achieved from either traditional lecture or cooperative exercise. As a result, the hypothesis that student Intelligence Officers taught using active teaching methods will attain higher academic scores than student Intelligence Officers taught using passive teaching methods is rejected at the .05 level of significance.

Although statistically there was no difference in retention, the researcher noticed a difference in classroom performance throughout the lesson. Students who were engaged in cooperative exercise were able to answer all the review questions asked immediately following the lesson, while students who received the passive lecture struggled to answer the same review questions. The researcher believes that the disparity between the raw means and statistical analysis was caused by problems with experimental design.

Recommendations

Based on the findings and conclusions drawn, the following recommendations are offered to improve the experimental design:

1. Increase the population size and length of study. An increased population will add to the validity of the study especially when conducting statistical analysis. Increasing the length of study will provide some data on intermediate and long term retention which is currently unavailable.

2. Eliminate the Chief of Naval Education and Training (CNET) mandated review at the end of the lesson. Eliminating the review will provide more accurate data because the review must cover all testable material. As a result, the control group's passive lecture ended with an active review that may have biased the control group's results.
3. Improve the testing instrument. The three objective tests employed as the testing instrument were not as objective as originally believed. The researcher showed a bias towards the control group during grading, specifically with fill-in-the-blank questions. The range of synonyms accepted for fill-in-the-blank questions was larger for the control group than the range of synonyms accepted for the experimental group. Ostensibly, this can be fixed by using questions that are completely objective like multiple choice with one correct answer and three blatantly incorrect answers, TRUE/FALSE, and fill-in-the-blank where only the exact technical word is accepted.
4. Ensure control group course cumulative grades (NIOBC CUM) are equal or higher than the experimental group course cumulative grades (NIOBC CUM). Dictating group composition will eliminate the argument that the control group performed better academically because the control group is more academically talented as evidenced by their higher overall course grades (NIOBC CUM). Dictating group composition can be facilitated by switching one or two students without affecting the heterogeneity of the groups.
5. Lastly, the researcher was unable to stop students from studying the material after Test 1 because Tests 2 and 3 are given on days 4 and 7 respectively. Additionally, Test 3 is embedded in the block final examination. As a result, it is unknown how individual student study affected the outcome of this experiment. This variable can

be eliminated by making the material non-testable which will eliminate student motivation to study.

BIBLIOGRAPHY

Accounting Education Change Commission (AECC). (1990). Objectives Of Education For Accountants: Position Statement Number One. *Issues in Accounting Education*, 1, 168-195.

Amabile, T. (1983). The Social Psychology of Creativity. New York: Sringer-Verlag.

Baloche, L. (1998). The Cooperative Classroom: Empowering Learning. New Jersey: Prentice Hall.

Bloom, B. S. (1956). Taxonomy of Educational Objectives; The Classification of Educational Goals, By A Committee Of College And University Examiners. New York: D. McKay Co.

Bohlmeyer, E., and Burke, J. (1987). Selecting Cooperative Learning Techniques: A Consultive Strategy. School Psychology Review, 16, 36-40.

Bradford, B. M., and Peck, M. W. (1997). Achieving AECC Outcomes Through the Seven principles for Good Practice in Undergraduate Education. *Journal of Education for Business*, 72(6), 364-368.

Deutsch, M. (1949). A Theory of Cooperation and Competition. *Human Relations*, 2,129-152.

Gamson, Z. F. (1991). A Brief History of the Seven principles for Good Practice in Undergraduate Education. *New Directions for Teaching and Learning*. 47 (Fall), 5-12.

Graham, R., Graham, B., and Whiting, V. (1997). Cooperative Learning: The Benefits of Participatory Examinations of Marketing Classes. *Journal of Education for Business*, 72 (3), 149-152.

Hertz-Lazarowitz, R., and Shachar, H. (1990). Teacher's Verbal behavior in Cooperative and Whole-Class Instruction. In S. Sharan (Ed.), Cooperative Learning: Theory and Research. New York: Praeger

Johnson, D., Johnson, R. (1984). The Impact of Cooperative, Competetive, and Individualistic Experiences on Minority Individuals' Educational and Career Success. (Report No. CLC 001). Arlington, VA: Office of Naval Research.

Johnson, D., Johnson, R., and Holubec, E. (1993). Circles of Learning: Cooperation in the Classroom. Edina, MN: Interaction Books.

Johnson, D., Maruyama, G., Johnson, R., Nelson, D., and Skon, L. (1981). Effects of Cooperative, Competitive, and Individualistic Goal Structures on Achievement: A Meta-Analysis. *Psychological Bulletin*, 89, 46-62.

Kagan, S. (1980). Cooperation-Competition, Culture, and Structural Bias in Classrooms. In S. Sharan (Ed.), Cooperation in Education. Provo Utah: Brigham Young University.

Kagan, S. and Zahn, G. (1975). Field Dependence and the School Achievement Gap Between Anglo-American and Mexican-American Children. *Journal of Education Psychology*, 67, 643-650.

Kelly, H., and Thibaut, J. Group Problem Solving. In Lindzey and E., Aronson (Eds.) (1969). The Handbook of Social Psychology. Reading, Mass.: Addison-Wesley.

Kogut, L. S. (1997). Using Cooperative Learning to Enhance Performance in General Chemistry. *Journal of Chemical Education*, 74, 720-722.

Lewin, K. (1935). <u>A DynamicTheory of Personality</u>. New York: McGraw Hill.

Lindquist, Tim, L. (1997). An Experiment Test of Cooperative Learning with Faculty Members as Subjects. *Journal of Education for Business*, 72 (3), 157-163.

McKeachie, W. J., Pintrich, P.R., Lin, Y., and Smith, D.A. (1986). <u>Teaching and Learning in the College Classroom: A Review of the research Literature</u>. Ann Arbor: University of Michigan.

Nicholls, J. (1989). <u>The Competitive Ethos and Democratic Education</u>. Cambridge, MA: Harvard University Press.

Ravenscroft, S. P., Buckless, F. A., McCombs, G. B., and Zuckerman, G. J. (1995). Incentives in Student Team Learning: An Experiment in Cooperative Group Learning. *Issues in Accounting Education*, 10, 97-109.

Slavin, R. (1995). <u>Cooperative Learning</u>. Boston: Allyn and Bacon

Slavin, R. (1991). Are Cooperative Learning and Untracking Harmful to the Gifted. *Educational Leadership*, 48(6), 68-71.

Sorcinelli, M. D. (1991). Research Findings on the Seven Principles. New Directions for Teaching and Learning, 47 (Fall), 13-25.

Treisman, U. (1992). *College Math Journal*, 23(5), 363-372

Vygotsky, L. (1978). Mind in Society: the Development of Higher Psychological Processes. Cambridge, MA: Harvard University Press.

Webb, N.M. (1982). Student Interaction and Learning in Small Groups. *Review of Educational Research*, 52, 421-445

APPENDICES

Appendix A

COMBAT ASSESSMENT TEST #1 **Name:**______________________

1. (2 PTS) What is the goal of combat assessment? (include <u>both</u> parts)

2. (3 PTS) The <u>three</u> components of combat assessment are _____________, _____________, and _____________.

3. (1 PT) T/F Combat assessment is the final step in the Joint Targeting Cycle.

4. (1 PT) T/F The first phase BDA report is usually based on multiple source data.

5. (3 PTS) The <u>three</u> terms used to assign confidence to the physical damage assessment are _____________, _____________, and _____________.

6. (1 PT) Key factors in determining the extent of physical damage include: (circle one answer)

   (a) Target type and size
   (b) Warhead type and size
   (c) Warhead detonation location
   (d) all of the above
   (e) none of the above

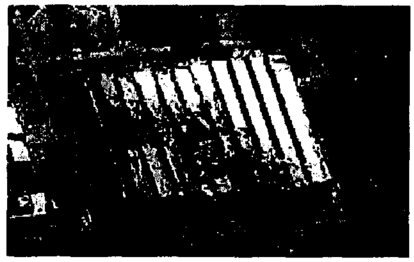
7. (5 PTS) Match the physical damage definition (Column A) with the correct percentage of the target element area damaged (Column B):

COLUMN A	**COLUMN B**
NO DAMAGE	75 to 100 percent
MODERATE DAMAGE	15 to 45 percent
LIGHT DAMAGE	0 percent
SEVERE DAMAGE	Up to 15 percent
DESTROYED	45 to 75 percent

8. (1 PT) The Reattack Recommendation (RR) follows directly from both BDA and ______ to make a determination of what needs to be done next.

9. (1 PT) What is the physical damage definition associated with the building in the image below?

(a) Destroyed
(b) Severe Damage
(c) Light Damage
(d) No Damage



10. (1 PT) T/F Confidence levels are assigned to functional damage definitions when there is little to no inference involved.

11. (1 PT) The type of weapon ________ employed is a critical requirement to determine the full extent of physical damage to a target.

12. (1 PT) Define functional damage.

13. (2 PTS) A key step in functional damage assessment is identifying and establishing the installation or target's critical _________ and their __________.

14. (1 PT) In addition to determining the above, what must be **quantified** (pre-attack) to ensure the wartime functional damage assessment is adequately stated.

15. (1 PT) T/F Recuperation time to repair or replace the target's critical element(s) is determined for the first time during the target system assessment.

16. (1 PT) Target system assessment determines the functional damage of the entire target system based on the ____________ level of physical and functional damage to the individual targets/facilities that make up the system.

17. (1 PT) Besides no observable damage, what are two weapon signatures that can be observed from using an airburst weapon?

Appendix B

COMBAT ASSESSMENT TEST #2 **Name:**______________________

1. (1 PT) T/F Part of the combat assessment process is determining future courses of action.

2. (1 PT) T/F Battle Damage Assessment (BDA) and Munitions Effects Assessment (MEA) are performed exclusively by intelligence officers, whereas the Re-attack Recommendation (RR) is made by operators alone.

3. (1 PT) T/F Combat assessment is the most important step in the Joint Targeting Cycle.

4. (3 PTS) The BDA process determines the effectiveness against the objective through _____________, _____________, and _____________.

5. (1 PT) Which of the following is **<u>NOT</u>** a re-attack option?

   (a) new objectives
   (b) new targets
   (c) different munitions
   (d) new delivery tactics

6. (3 PTS) List <u>three</u> sources used to perform BDA.

7. (1 PT) _____________ _____________ assessment is a fused, all source product addressing a more detailed description of physical damage, an assessment of functional damage, and an initial target system assessment.

8. (1 PT) List <u>one</u> of the two main publications on BDA.

9. (1 PT) T/F Physical damage assessment estimates the qualitative extent of physical damage.

10. (1 PT) T/F The confirmed confidence level can be used with SLAM video.

11. (1 PT) A building which has sustained 33% damage should be assigned the ____________ damage definition.

12. (1 PT) Which does **<u>NOT</u>** affect the extent of physical damage?

    (a) warhead impact angle
    (b) warhead guidance
    (c) warhead detonation location
    (d) target dimensions

13. (3 PTS) What <u>three</u> locations can a warhead detonate in relation to a target.

14. (2 PTS) Airburst fusing is also known as __________ __________ or __________.

15. (2 PTS) Instantaneous fusing (also known as ____________), may result in clear indications of weapon effects to the target and/or ____________.

16. (1 PT) In certain situations, the weapon may detonate in close proximity to the target and achieve the desired level of damage from fragmentation, but no scorching or physical deformation to the target is apparent. When this situation is "believed" to have occurred due to mission reporting of observed detonation, but with no confirmation on imagery or aircraft cockpit video, ____________ damage may be assessed.

17. (1 PT) Confidence levels indicate _____________ of the physical damage assessment.

18. (1 PT) T/F Functional damage assessment only uses the possible and probable confidence levels.

19. (2 PTS) What two characteristics determine the weapon's position or location within the target when it detonates?

20. (1 PT) What publication is used to determine recuperation times?

21. (7 PTS) Identify the correct confidence levels:

Confidence level	
____________	Requires considerable inference.
____________	95% certainty
____________	No inference involved.
____________	>50% likelihood that the damage assessment is accurate.
____________	Visually assured with a 77% likelihood that the damage assessment is accurate.
____________	Little inference.
____________	SLAM video with a 30% likelihood the damage assessment is accurate.
____________	FLIR and imagery resulting in a 45% likelihood the assessment is accurate.