THE EFFECT OF STUDY SKILLS TRAINING INTERVENTION ON UNITED STATES AIR FORCE AEROMEDICAL APPRENTICES

DISSERTATION

Submitted to the Graduate Council of the University of North Texas in Partial Fulfillment of the Requirements For the Degree of

DOCTOR OF PHILOSOPHY

By

John C. Griffith, B.S., M.S.A.

Denton, Texas

August, 1998

The study examined the effects of a study skills training intervention course on U.S. Air Force Aeromedical Apprentices with five main purposes. The first was to examine the relationship between study skills training and the number of times students required academic interventions outside of normal class time. The second purpose was to examine the relationship between study skills training and end of course averages. The third was to determine the relationship between study skills training and the amount of additional instruction, measured in time, students required. The fourth purpose examined the relationship between study skills training and graduation rates. The final purpose was to recommend areas for further research.

The population for this study consisted of 250 male and female enlisted Air Force Aeromedical students at the U.S. Air Force School of Aerospace Medicine at San Antonio, Texas. Subjects were randomly selected into a control and a treatment group. No significant differences existed between the control and the treatment groups at the \( p<0.05 \) level of significance prior to the beginning of the study.

Statistically significant post experiment findings indicated that students who received study skills training required fewer academic interventions outside of normal class time, achieved significantly higher end of course scores and required less time in
additional instruction outside of normal class time than students who did not receive training in study skills. Although not statistically significant, the relationship between study skills training and graduation rates indicated that students who received training in study skills graduated at a higher rate than students who did not receive training in study skills. Recommendations for further research include investigation of the effect of study skills intervention in adult technical and non-technical training environments and identification of the minimum number of study skills training sessions required for effective student adaptation.
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ACKNOWLEDGMENTS

As with any significant accomplishment, no one succeeds alone. I have had a great deal of help, guidance and support from university personnel, fellow students friends and family. Specifically, Dr. Ditzenberger, my major professor helped in guiding my studies. Dr. McCallon provided excellent instruction and outstanding guidance in statistics and research design. Dr. Boyd and Dr. Young served as effective mentors. Ms. Becky Yates provided exceptional guidance and support above and beyond expectations.

Ron Brown was an effective study partner and good friend for several years during this process. Dr. Joy Vroonland’s suggestions provided a basis for my dissertation topic. Dr. Squy Wallace gave me effective advice for undertaking the dissertation.

Many Air Force coworkers and supervisors supported me greatly including Colonel Worth Taylor, Colonel Donald Brown, Colonel Debbie Cavanaugh, Colonel Tim Morgan, Major Barry Evans, Ph.D., Capt Adolph Edward and Capt Lisa Yaeger. Additionally, several Air Force members helped me conduct the dissertation project at the School of Aerospace Medicine, Brooks Air Force Base TX to include Staff Sergeant Sheila Ellison and Staff Sergeant Claudio Castillo.

Lastly and most importantly, I could not have succeeded in this undertaking without the unconditional love and support of my wife Sonja and two children, Tina and J.R.
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CHAPTER 1

INTRODUCTION

Over 100 years ago, the first collegiate reading improvement experiment in the U.S. by Abell attempted to ascertain the value of teaching learning strategies to students (Stahl, Yurd, Henk, 1986). F. M. McMurry authored the first book on the subject in 1909 titled “How to Study.” He stated that it is “unnecessary to collect proof that young people do not learn how to study, because teachers admit that fact very generally.” Bad methods of study easily become a serious factor in adult life, acting as a great barrier to one’s growth and usefulness (McMurry, 1909). Since that time, our nation, universities, technical schools, teachers and students have concerned themselves with issues such as attrition, drop-out rates and failure rates. Teaching institutions have two missions. First, they are designed to help students achieve their potential. Secondly, teaching institutions design many sophisticated curricula to enable students to carry on the growth of different fields of knowledge and increase the graduate’s value as a productive part of our society. Much time and effort is given to ensure that the environment enhances learning, faculties are adept in transferring knowledge and course work is designed to enhance student understanding of the applicable field of knowledge.

Many teaching institutions have also included study skills training in their curriculum. Study skills are learned abilities for acquiring knowledge and competence. They are
skills for learning, tools for solving the learning problems that students encounter both in and out of the academic setting. They are as basic to the learning process as any other skills we can teach and learn (Marshak, 1984). Unfortunately, study skills training has been referred to as the “invisible curriculum” because educators have too often assumed that study skills develop automatically rather than needing direct instructional efforts (Polloway & Patton, 1989). Without good study skills, students may flounder even if the facilities, instruction, and course work design are effective. When students fail to reach their potential, effort, time and money are wasted, not to mention the loss of self esteem in the students who fail to reach academic goals. An excellent example of the cost of students failing to reach their potential can be found by examining U.S. Air Force technical training schools. Students in a technical training school have completed six weeks of basic training at Lackland Air Force Base, Texas and in most cases, have been transferred to a technical school where they will be trained on the fundamental aspects of their jobs. Air Force technical school curricula range from five weeks to over a year in length. Students who graduate then serve (at a minimum) the remainder of their four or six year tours at assignments worldwide. Students who attend these schools are being paid a salary of approximately $1000 per month. Their quarters, food and healthcare is paid for or subsidized by the government. If a student fails to complete a course of study in a technical training school, they may repeat the course, be reassigned to another technical school, or be removed from the Air Force altogether. The cost of this training is paid by U.S. taxpayers.
The School of Aerospace Medicine located at Brooks Air Force Base, San Antonio Texas, is an excellent example of an Air Force technical school that is committed to its mission of advancing knowledge of air-crew physiology. The school is located in a state of the art teaching facility with well-trained and dedicated instructors. The students are in a structured environment that is geared towards focusing their attention on course work. This structure includes living areas and food located within walking distance from class rooms, curfews designed to ensure adequate rest and a general environment that is designed to promote study. Air Force technical students do not have to deal with as many of the work and financial pressures most college students feel (Valeri-Gold, Callahan, Deming, Mangram & Errico, 1997). In other words, many environmental factors that enhance successful learning are controlled, however, the School of Aerospace Medicine still has an "attrition rate."

This generation of Americans is the first in our history to be overwhelmed by the amount of data available for consumption. The "Information Age" has necessitated the ability of people to sort through mounds of data to concentrate on the important information available (Gates, 1996; Gall, Gall, Jacobsoen & Bullock, 1990). This fact, coupled with our nation's changing economic behavior from a product to a service oriented society, dictates that people will change careers several times during their working years. This implies then, that people will have to learn different sets of skills to facilitate their career changes. In a changing world, an education is the best preparation for being able to adapt (Gates, 1996; Smith & Dowdy, 1989). The ability to quickly learn new information, new technology, new ways of doing almost anything will be one of the
most valuable commodities in the future (Gall, Gall, Jacobsoen & Bullock, 1990).

However, we cannot assume students know “how to learn” or know “what is important to learn,” (Christen & Murphy, 1985). The ability to sort out, and pick out the important pieces of information from data is at the heart of study skills training. Teaching institutions invest billions nationally every year to ensure students succeed. The levels of success achieved can still be enhanced even more by teaching study skills to students (Christen & Murphy, 1985; Polloway & Patton, 1989).

Background and History

From 1995 through 1997, Dr Joy Vroonland (Ph.D. University of North Texas) conducted classes that were designed to help military technical school students with their study skills. Vroonland and one assistant gave this training to approximately 3,400 students annually. All of these students were assigned to the 882nd Medical Training Group in more than 10 allied health professional courses. She believed that the teaching of her study skills course enhanced student performance facilitating student success. However, her opinions were not substantiated by any real statistical analysis. She could not show that the effects of study skill instruction made an impact because the course was taught to all students. Put another way, Dr. Vroonland felt that the teaching of her study skills course was making a positive impact on student performance and the mission of the 882nd Medical Training Group. However, no empirical evidence can be shown on the possible positive effects of the study skills training. Moreover, the possible
implementation of this study skills course throughout the Air Force depends on the results of an objective and well-designed study.

The amount of time, energy and resources put toward the education of technical school trainees demands a closer look at how we can give Air Force technical training students every advantage we can. The School of Aerospace Medicine was selected as the site of this study because of its proximity to the researcher and its size. An additional factor was that Dr. Vroonland has moved on to private practice and the foundation she built at the 882nd Medical Training Group at Sheppard Air Force Base was in question after her departure. The future of study skills training at Sheppard is in doubt because there is no real evidence documenting its success. It is the hope of the researcher that the results of this experiment will provide needed information regarding the effectiveness of a study skills training course for Air Force technical training schools.

Statement of the Problem

There is a perceived problem at the School of Aerospace Medicine with regard to student disenrollments, washbacks and failure rates. The school expends a great amount of resources, time and effort to ensure student success. The average cost to train one student in the three month Aeromedical Apprentice course is $12,500.00 (Schommer, 1998). Students who fail the course of study and are eliminated from the program cost thousands of taxpayer dollars with no realized gain by the government or the student. The purpose of the study is to determine the impact (if any) of study skills training on student performance.
Need of the Study

The need for students to employ effective study skills is not new. Almost 90 years ago, McMurry noted that most of those who stop school in the elementary grades leave simply because they want to, not because they must. Yet we know that any person who is successful must do considerable thinking, and must even take pleasure in it. Bad methods of study easily become a serious factor in adult life, acting as a barrier to one's growth and general usefulness. Our misleading way of study assumes that the whole of any subject becomes the sum of its details; and the subject has been supposedly mastered when all these bits have been learned (McMurry, 1909). A student who develops efficient study methods has, in a true sense, learned how to learn. He has not changed his innate capacity for learning, but rather discovered how to get the maximum mileage out of his ability (Hoover, 1989). The student becomes more effective academically because he has learned to concentrate, to organize the material he has learned, to employ the knowledge he has gained and to follow study with review and self testing (Devine, 1981).

Results of this research should provide valuable insights into the effectiveness of teaching study skills to students prior to and during technical training. This study may alter how other USAF technical training groups (who do not teach study skills to their students) view the value of teaching study skills to their students prior to the start and during technical training. Additionally, significant cost reductions could be obtained by making recommendations for future training programs. Further research examining the relationship between study skills and student success in the military training environment
has the potential of saving much time, effort and money for both the U.S. Air Force and
the individual students involved in the training process.

Purpose of the Study

The purpose of this study is to determine the difference in academic interventions, grades
attained, time spent in one-on-one instruction and graduation rates, between students who
receive study skills training prior to the start and during technical training and students
who do not receive study skills training prior to the start and during technical training.

Hypotheses

Study skills course intervention is hypothesized to reduce the number of academic
interventions beyond normal classroom instruction, improve higher end-of-course test
scores, reduce the time required for one-on-one instruction for student tutoring beyond
normal classroom instruction and reduce the attrition rate. The following research
hypotheses were examined.

$H_{a1}$: Students who receive study skills training, prior to the start and during the
Aeromedical Apprentice course, will require significantly fewer incidences
of academic interventions during the entire length of the course, than
students who do not receive training in study skills prior to the start and
during the Aeromedical Apprentice course.

$H_{a2}$: Students who receive study skills training, prior to the start and during the
Aeromedical Apprentice course will achieve significantly higher end-of-course scores than students who do not receive training in study skills prior to the start and during the Aeromedical Apprentice course.

**Hₐ₃:** Students who receive study skills training, prior to the start and during the Aeromedical Apprentice course, will require significantly less time spent in one-on-one instruction with their teachers than students who do not receive study skills training prior to the start and during the Aeromedical Apprentice course.

**Hₐ₄:** Students who receive study skills training, prior to the start and during the Aeromedical Apprentice course, will graduate at a significantly higher rate than students who do not receive study skills training prior to the start and during the Aeromedical Apprentice course.

**Limitations**

The study did not consider racial or ethnic differences in students as a separate variable since the Air Force does not consider race or ethnicity as a factor when recruiting or delivering instruction to Air Force members. The Air Force only considers race to ensure discrimination does not exist.

**Delimitations**

1. The sample of students was limited to DOD students attending the School of Aerospace Medicine, Aeromedical Apprentice Course, Brooks Air Force Base Texas, from December 1997 to May 1998.
2. One foreign student was excluded from this study due to differences in culture and educational experience as compared to American students.

Definition of Terms

**Academic Intervention**: One-on-one training session between the instructor and the student designed to enhance the student's understanding of previously taught material.

**AFQT or Air Force Qualification Test**: A composite score formed by combining four Armed Services Vocational Aptitude Battery (ASVAB) tests (areas are arithmetic reasoning, mathematics knowledge, paragraph comprehension, and word knowledge).

**ASVAB or Armed Services Vocational Aptitude Battery**: A 10-test multiple aptitude battery, used to select applicants for enlisted career specialties. The ASVAB serves as a classification tool for initial training and job assignment. This test is given to all Air Force enlisted members prior to and during enlistment to ensure they qualify to be in the Air Force.

**ASVAB or Armed Services Vocational Aptitude Battery General Score**: Overall ASVAB score that averages main components of the battery. The General Category is used to determine the overall potential of recruits and is specifically used to place recruits in medical career fields.

**Block of Instruction (or “Block”)**: Modules of instruction that make up an Air Force technical course. For example, an Air Force course may be made up of nine blocks. These blocks usually end with a block examination to ensure students have a firm understanding of what was taught during the “block of instruction.”
Control Group: The group of randomly selected students who did not receive training on study skills techniques prior to the start and during technical training.

Course of Study: The entire 12 week Aeromedical Apprentice course taught at Brooks Air Force Base, San Antonio Texas.

Discharged: Completely released from the Air Force and any Air Force obligations. Students may be discharged from the Air Force for not satisfactorily completing a course of study.

Disenrolled: Students may be disenrolled when they have failed to maintain at least a 70% (minimum passing score) on two or more major areas of training and whose case has been approved (for disenrollment) by the course supervisor and the School Commander. Students who are disenrolled from training at the School of Aerospace Medicine are either cross-trained into another Air Force specialty (possibly requiring the completion of another technical school) or discharged from the Air Force.

End-of-course Score: The overall course grade as computed by the mathematical average of all of the block test scores attempted by the student.

Enlisted or Enlisted Members: Air Force members who will serve as technicians or technical managers. They serve in the airman and non-commissioned officer ranks.

One-On-One Individualized Instruction: Individualized training session specifically designed to enhance student understanding of previously taught material. This session is led by the instructor outside of normal class time due to test failure, request from the instructor or request from the student to improve student performance.
Post Test Only Control Group Design: A research design that uses random sampling to divide a sample into two groups. The treatment group was given a class in study skills techniques and the control group was not. Both groups were then evaluated at the end of the course on criteria applied equally to both groups.

Study Skills: Study Skills are learned abilities for acquiring knowledge and competence. They are skills for learning and tools to be used as a solution for some of the learning problems students encounter both in school and elsewhere in their lives (Marshak, 1884).

Study Skills Training Intervention: One 90 minute initial class (prior to the start of technical training) and a one hour refresher class (one month after instruction began) that covered five major areas; note taking, remembering, organizing study time, minimizing stress and test taking strategies. This intervention was provided only to the treatment group enrolled in the Aeromedical Apprentice course.

Treatment Group: The group of randomly selected students who received training on study skills techniques prior to the start and during the Aeromedical Apprentice course.

USAF Aeromedical Apprentice: Assists flight surgeons with the preventative, acute and emergency care of flight personnel and their families. Provides and maintains optimum patient care while performing emergency medical and nursing tasks. Performs portions of medical treatment, diagnostic and therapeutic procedures. May deploy with a flying squadron and provide forward area medical care in undeveloped bare base environments. Performs basic life support and triage in emergency situations. Operates medical emergency and transportation vehicles. Loads and unloads patients on various types of emergency vehicles and aircraft.
**Washbacks:** Students who have to repeat a phase or block of training due to some academic difficulty.
CHAPTER 2

REVIEW OF RELATED LITERATURE

Introduction

The review of literature will discuss the input, process, output, self monitoring and feedback steps involved in the study skills process. These concepts will be illustrated through a study skills model. The literature review will then discuss previous studies, differences between this study and previous studies and closes with a brief description of the treatment used in this study.

Study Skills Model

The National Commission on Excellence in Education (1983) stated that many students complete high school without disciplined and systematic study habits. This idea was highlighted in a 1984 study by Christian and Murphy demonstrating the idea that study skills are not taught in high school. Their survey included 479 students from three widely different high schools. In the survey, 74% indicated a desire to attend college, however 70% had not been trained in time management techniques. Additionally, 52% of the students indicated that they did not typically listen before they began to take notes, and 52% also indicated that they had no system for note taking during class. A surprising 44% indicated that they received no training on how to read a text book and 82% of the students reported that they studied less than three times per week.
Christian and Murphy concluded that the majority of the students in this survey were not adequately trained in study skills. None of the three schools had an organized curriculum concerning the teaching of study skills even though students seemed to want training in how to study. It cannot be assumed that students entering our universities or service’s medical technical schools have the appropriate level of study skills needed to succeed.

The issue of students “not knowing how to study” is not new. McMurry (1909) made a passionate argument in his book “How to Study and Teaching How to Study” that most people do not know how to study, causing many to fail. The focus of this research was based on the premise that students who are very much alike can have differences in performance which are directly related to their command of study skills. The grade a student gets at the end of a module or a term is not only based on their intelligence but also their ability to use a given set of study skills for differing subjects or courses (McMurry, 1909; Marshak, 1984). Study skills can be better understood by viewing a “Study Skills Model” shown in Figure 1;
Figure 1. Study Skills Model

The model shows four basic steps with a feedback loop used to evaluate the process of study skills and improve it if necessary. The first step is the input process of study skills and focuses on the receiving of information being learned. The second major step in study skills is the process of how the student assimilates data for later use. In this step, the student first determines whether the information should be memorized, if pertinent information needs to be gleaned from a large amount of information, or if the student should focus on a specific technique, (such as algebraic formulas) to be used to solve certain types of problems. After the student decides the learning strategy, he or she needs to apply the basic study skill techniques which involve effective note taking, remembering, organizing study time, minimizing stress and test taking strategies. The third step in this model is the output the student receives (usually in the form of grades).
It is at this point that the student employs “self monitoring” (step four of the model) in answering the question, “did the results match expectations.” The student then makes any necessary changes based on the results (grade) for future study.

Input

The “Input” step in the model offered earlier encompasses the social environment, physical environment, the student’s listening and reading skills, student motivation and the teacher’s perception of student behavior and interaction. In other words, just because a student sits before a teacher who is talking or holds a book that is factual, we cannot assume learning will instantly take place. Student motivation to learn is a significant factor that, if not present, can negatively enhance student performance, (Serna, 1989; McMurry, 1909). Social factors ranging from family history of successful education to socioeconomic impairments bared by the student can have a negative effect on a student’s readiness to learn, (Valeri-Gold, Callahan, Demming, Managaram & Errico, 1997). Even the physical layout of the classroom (otherwise termed as part of a positive training climate) can have an impact on student interaction impacting the initial input of information, (Griffith, 1986; Sullivan, Wircenski, Arnold, & Sarkees, 1990).

Listening and reading (seeing) are the primary sources of input for students and comprise the two most frequently used senses most students use to learn new information (Smith & Dowdy, 1989). One of the first studies conducted in the area of listening was by Rankin in 1926. His research examined how people engage in daily listening. He found that people in general devote 45% of their time in listening as compared with only 30% in speaking, 16% in reading and 9% in writing. He concluded that people take in the
most information from listening. Wilt later did a study in 1958 finding that elementary school children spend as much as 60% of their time listening. According to Devine (1981) hundreds of studies focusing on the teach-ability of listening skills have shown that these skills can be markedly influenced by instruction. A good example of this was a study of 600 fifth grade students conducted by Mary Hallow in 1955. Half of the students were taught five study skills in listening, summarizing, drawing inferences, recalling facts in sequence, and remembering facts accurately. The other half of the 600 students did not receive this training. Hallow found that the differences between the two groups were statistically significant. Her conclusion was that fifth-grade students could be taught to listen better (Hallow, 1955). Irwin conducted a similar study in 1952 with college freshmen at Michigan State University with similar results to Hallow’s study (Devine, 1981).

The teaching of reading skills was the origin of study skills training, (McMurry, 1909). Underlining while reading is the most used study technique for many college students (Policastro, 1975; Ellis, 1997). Underlining is just one step removed from passive reading loosely defined as reading with almost no level of comprehension. A study at the Ramapo College highlighted three points. First, students underline too much. The average text book is 400 pages. If only 20% of each page was highlighted or underlined, it would result in eighty pages of reading while turning all the pages in the book. Ellis (1997) recommends highlighting less than 10% of reading materials. Secondly, the underlined or highlighted section will lose its relevance at a later time and the student will need to read surrounding material to get the gist of the main points, requiring extra time.
and effort (Ellis, 1997). Lastly, underlining is a passive activity and has the effect of deferring the active learning process to some future point.

Study skills training evolved out of efforts in teaching students how to read. Studying through directed printed material includes the art of reconstructing in one's own mind the pictures, thoughts, associations and emotional patterns which a writer tries to convey through words (Kahn, 1974; Ellis 1997). Sargent, Huus & Anderson (1971) made a significant distinction between reading narrative materials such as a story, and reading a text book when studying a lesson. Sargent et al. argue that reading a text book to discover specific information involves selection of important information from unimportant information and is very different than reading a narrative story from "cover to cover". In 1909, McMurrry wrote one of the first books on study skills training and recommended the habit of reading with some system and making brief notes regarding the contents of the books. Later authors of study skills texts reiterated Sargent et al. and McMurrry's ideas. Somerville (1954), Mace (1969), Robinson (1970), Ellis (1997) Clemmons, (1995) and Archer & Gleason (1996) recommended that students look over the table of contents, the chapter and section headings to discern any structure, logical sequence and sense of direction in what the author is covering. These authors also advised students to skim ahead to see if a general perspective emerges which may give a clue as to what the author's main ideas are, paying particular attention to the very beginning where most writers indicate their basic purposes.

Reading requires skimming to get an idea of the whole chapter or book, then more selective reading to extract the most important information and includes skipping
information that is not important. Reading requires the extraction of important
information from the rest, moving from an outline to detail of important points of the
reading (Mace, 1969; Ellis, 1997).

Several authors have indicated that summarizing data after reading is critical to
retention, and later, recall for the important information read by the student. Somerville
(1954), Robinson (1970) and Ellis (1997) indicated that the best time to draw up a
summary is immediately after the reading or lecture. The longer a student waits, the less
accurate the student's recollection will be. One of the best ways in which the material
students read can be connected with a variety of helpful matters is through discussion
(Somerville, 1954; Kahn, 1974; Ellis, 1997).

Students need to have an organized perception of what they study and the material
which is presented can be organized in different ways. Students need to be selective
realizing that some information is more relevant. Items studied need not all be
remembered with the same degree of accuracy. Some items are more important than
others. Since students cannot observe everything, they must observe what is most
important (Mace, 1969).

As a rule then, it is a serious error for a student to distribute his time and energy
somewhat equally over a lesson or a chapter or a book. There are times when he should
advance rapidly and even skip, as well as other times when he should ponder carefully
and review much (McMurry, 1909; Ellis, 1997). It is economical to determine the gist of
the thought, the spirit and substance of the whole, before giving careful attention to the
minor parts (McMurry, 1909).
An example of a reading strategy that incorporates these ideas is the SQ3R system originally developed by Robinson in 1970. SQ3R stands for survey, question, read, review and recite. Robinson (1970) and Sargent et al. (1971) recommended that students survey the headings and summarize quickly to get the general ideas that will be developed in the assignment. Question is the step where the student jots down questions that he or she wants answered. After the student has surveyed the material and identified relevant questions, the student will actually read while remaining focused on the questions he or she wants answered and skimming less important information. The student will then review each section emphasizing the understanding of the author’s main purpose and the main points of the reading. Lastly, the student will recite the material by explaining it to someone else, answering questions in writing, or summarizing the information in writing (Devine, 1981; Clemmons, 1995; Ellis, 1997).

The most important factor in identifying important information is that it gets done by the student. Different methods used such as SQ3R and summarization have been shown to improve student performance. The key is not the method used, but the fact that the student uses a method at all. Students who use a given method have been shown to have better retention and do better on exams than students who used no method at all (Garrison and Gray, 1955; Bizinkauskas, 1970; Devine, 1981).

The successful input of information on any given subject presupposes that a student is willing and eager to learn. Student motivation, possibly impacted by environmental factors, affects listening and reading skills. McMurry (1909) stated that study does not normally take place unless students feel a need to study. In other words, students have to
be motivated to learn and most of this motivation must come from within the student. The best single guarantee of effective study is a deep, direct interest in the work at hand, an interest similar in kind to that which children have in play (McMurry, 1909; Somerville, 1954; Ellis, 1997). Most well-informed adults who have little push are not lazy by nature; they have merely failed to fall in love with worthy aims. This is often partly because education has been allowed to mean little more than the collection of facts (McMurry, 1909). This is due in great part to how we are taught as children. According to custom, young people are expected to acquire knowledge now, and they learn to use knowledge they have learned later in life. McMurry argues that children should discover their wants first and study to satisfy them. This is the way in which man has progressed from the beginning—outside of educational institutions—and it seems the normal order. The responsibility for asking questions and discovery slowly moves from the student to the teacher in many academic settings. It inhibits people from thinking on their own (McMurry, 1909).

Aim and purpose need to both be present in students. Their efforts must have focus. Students who are motivated will keep studying in one way or another. The aim and purpose will ensure their efforts are effective (Somerville, 1954).

In most teaching environments, the teacher asks the questions, guides the answers, highlights the main points and guides the general path of study. This type of study is heavily dependent on the teacher for success. When students study alone, they must ask the questions, select sources for information, identify the main points and identify correct
answers. Students generally do not develop the skill to perform all of these tasks on their own resulting in poor study habits (McMurry, 1909).

McMurry sites two studies that highlight the above idea. The first study involved 842 sixth and seventh-grade geography students who were given a lesson in a textbook and told to find the main topic and main ideas to the lesson. Seven hundred and ten students in this study gave incomplete or unsatisfactory answers. This indicated that they had no clear knowledge of the principle things to be done in mastering an ordinary textbook lesson in geography. The second study involved 828 students who were asked to find the subject of a certain lesson that was given to them; 301 students stated the subject fairly well. The remaining 527 students gave incorrect answers. Only 301 students were able to discover the most important fact in the lesson. Yet, determining the subject and the leading facts are among the main things that any one must do in mastering a topic (McMurry, 1909; Ellis, 1997). Critical thinking and learning are intimately linked (Ellis, 1997).

Teachers hold a huge responsibility for the learning process in the classroom. However, some of the duties they are expected to perform may be unrealistic. For example, their perceptions of their interactions with students. Many instructors believe that their perception of student interaction is reality. However, if this perception is untrue, learning can be compromised. Griffith (1996) conducted a qualitative study that looked at three instructors who were all trained in the art of teaching. Each instructor was observed in the classroom and his/her interactions with students were recorded. Each instructor was then asked to record (on a seating chart) which students they had
interactions with during the class. This data was compared to observations of their interaction. A modified seating chart was developed comparing the interaction instructors thought took place with observed interactions that actually took place. Each instructor was then interviewed using the emic approach. Some specific findings were:

1. All three instructors were only about 50% accurate in remembering which students they had interacted with during the class.

2. Instructors indicated that they were concerned about not remembering their interactions with students.

3. All three instructors had some difficulty understanding why they could not remember who they interacted with during the class.

4. The instructors were concerned with the pattern of interactions (specifically, the areas of the room that exhibited more student/teacher interaction). For the three instructors, at least forty percent of the students that the instructors had no interaction with, sat on the very ends of rows, or in the back row. For two of the three instructors, this percentage was even higher at fifty percent.

5. The results of this study indicate that instructors do not remember interactions with their students as well as they think they do (Griffith, 1996).

Obviously, teachers cannot assume full responsibility for the education of students. Once students receive "input" of the information, they need to process it using appropriate study skills. Teachers can only provide the opportunity for learning to take place. Students require a positive attitude to learn how to study well. Successful students tend to be motivated and study more effectively (Kahn, 1974; Ellis, 1997). The most
recognizable study skills employed by students are outlined in the second step of the study skills model, the process step.

**Process**

The process step includes making a decision regarding what to do with the information once it is received by the student. That is, whether to memorize it, to select out important information or to learn a technique that could be transferred to problems of a similar type. Students can then use the five fundamental study skills tools, note taking, remembering, organizing study time, minimizing stress and the use of test taking strategies.

Study skills take time and practice to develop. Not only are effective use of study skills important in the classroom, they are important to enhance the potential of each student as well. The amount of education (facilitated by effective study skills) people possess has a direct correlation to their lifetime income (Kahn, 1974; Ellis, 1997).

Specific skills taught in courses enable a student to think and study about a given topic. Students are encouraged to plan, categorize, analyze and problem solve information as it relates to a specific subject. Study skills training focuses on learning how to develop thinking skills and habits as they relate to the performance of learning many different tasks, not just learning a specific task such as a math problem (McMurry, 1909 and Gall, Gall, Jacobsoen & Bullock, 1990). One of the first decisions a student makes is what to do with information presented. Students have three basic options when deciding what to do with information that is presented to them. These options are memorization, selection or technique transfer, (McMurry, 1909).
Memorization, Selection and Technique Transfer.

Some information needs to be learned verbatim such as how to spell words or memorize a bible verse. This information is memorized since mastering all parts of the information is very important. Children in grade school typically memorize a great deal of what they learn. As the coursework gets more sophisticated, students have to transition from memorization to interpreting the information presented and selecting out important information. This skill is used throughout their life as people are faced with more information than they can possibly digest without eliminating what is unimportant (Gates, 1996; McMurry, 1909). The transition from attempting to master all of the facts presented to eliminating what is not important and merely mastering what is determined as important can be very difficult for the student (McMurry, 1909). A good example of this argument can be found by watching students “study” a chapter. Students who read a chapter from beginning to end, spending an equal amount of time on all areas of the material, are not selecting out important information. McMurry (1909) and Ellis (1997) argue that reading a chapter as just described is a carryover from study habits students learned as children when memorization and mastery of all material presented were important. Surveying material and developing questions to be answered before actually reading a chapter are the initial steps of selecting important information from information that is less important or not important (Ellis, 1997; McMurry, 1909; Robinson, 1970). Robinson’s SQ3R method and Ellis’ Muscle Reading technique emphasize surveying and developing questions before actually reading the material. The reading is followed up by reviewing and reciting learned information. These concepts are applied to listening to
lectures as well. Ellis (1997) and McMurry (1909) emphasize listening for cues from the speaker which will identify main themes or concepts. Both authors note that students will be unable to keep up if they attempt to record every word. This is because all words spoken by the lecturer are not equally important. The last option the students has in deciding what to do with incoming information is Technique Transfer.

Technique Transfer occurs when a student learns a particular set of rules and uses the set of rules on a specific set of problems (McMurry, 1909). Gagne', Briggs & Wager (1992), call this strategy higher order rules used for problem solving. To use this strategy, students need to recognize the problem, classify it and then apply a set of pre-learned rules to solve it. This strategy is used when solving algebra problems or in the case of medical emergency technicians, when using an algorithm to assess a patient.

The effective use of the appropriate learning strategy, (memorization, selection or technique transfer), used to handle incoming information is a key factor in how well a student will be able to learn new material. The learning strategy a student uses sets the stage for how they will use the tools associated with effective study skills. These tools include note-taking, remembering, organizing study time, minimizing stress and test taking strategies (Ellis, 1997).

Note Taking.

The art of note taking implies that the student can listen or read effectively and is able to identify the major points being taught in the lesson. It is usually more important to follow the thought and fix the logic of the matter clearly in mind, then to try to record a large amount of detail. Students should listen to verbal cues for important points
Notes should be organized logically, with only as much detail as necessary (McMurry, 1909; Somerville, 1954; Ellis, 1997). Notes should be taken in outline form (Somerville, 1954; Ellis, 1997). Drawings of models or semantic mapping showing relationships assist students in learning relationships between ideas concepts and words (Devine, 1981; Novak, 1984; Schewel, 1989; Ellis, 1997). In technical courses, students should make and keep master lists with definitions and page numbers for reference to texts. Technical courses are designed using previously learned principles and terminology necessitating the mastery of terms (Devine, 1981).

An ongoing debate involves whether students should use tape recorders in the classroom to record lectures thereby enhancing learning and retention. Bizinkauskas (1970), used tape recorders to improve eighth grade student retention of key words, phrases, sentences, and ideas. His results were similar to Palmatier (1968), that although taping lectures was not dramatically more effective than using other methods without a tape recorder, systematic note taking of one kind or another is better than passive reading or listening. Outlining information while listening to a lecture or reading course material is very useful in recording main ideas and subordinate ideas. Outlining is most effective when the information being taught (or written in a text) has been arranged in an organized fashion. Marginal comments and coding systems that are made by the student will have more meaning and be remembered more easily because the student had to process the information and reiterate the information in his or her own terms (Devine, 1981; Ellis, 1997). Summarizing is a technique that can be used with disorganized or poorly organized material. It requires the learner to “get in the mind” of the author or lecturer.
Summarizing is one of the best student methods for review. It leads to improved ability to condense information forcing a student to distinguish between main and supporting information. Summarizing aids in recalling the main points of reading or listening (Devine, 1981; Ellis, 1997). When students listen to a lecture passively, they are merely following the thoughts of someone else, which is very different from thinking for themselves (Somerville, 1954; Ellis, 1997). Students should take notes when the notes will help them to understand the subject and when information is likely to be needed at a later date and would be easy to forget (Somerville, 1954). Students should spend some time immediately following the lecture in making a summary. This helps to fill in gaps and tie major thoughts together (reinforcing the idea of active learning or active repetition). Students can and should check their notes against each other’s notes (Somerville, 1954; Mace, 1969; Robinson, 1970; Kahn, 1974).

Remembering.

Various mnemonic systems that have been so widely advertised have usually been nothing more than plans for the mechanical association of facts (McMurry, 1909; Mace, 1969; Ellis, 1997). Students should ask themselves, “with what am I associating this fact or idea?” (McMurry, 1909). Good memorizing is really good thinking, and improvement in memory is mainly improvement in attention and in the method of thinking (McMurry, 1909). Two conditions should be met for drill to be used for memorization, when the student believes the drill will help achieve the desired goal and the duration of drilling is short. (McMurry, 1909). The more precisely students have defined and located something, the more contexts and connections in which students think of it, the more
students have discussed and explained it, the more easily students are able to recall it on any given future occasion. In ordinary remembering, where students wish to bring something back at will, two things are important, the intensity or depth of the original experience, and the number of subsequent repetitions or recollections of it (Somerville, 1954; Mace, 1969; Ellis, 1997). Novak (1984) adds that information is easier to remember and recall if is viewed by the learner as meaningful, usable and consistent.

The process of remembering and understanding important information is greatly facilitated by the consciousness of inter-connections and relations between the separate units. Understanding something is seeing just how the constituent parts fit together and how they are related to one another (Somerville, 1954; Ellis, 1997). Those who tried to get the meanings, rather than commit to memory by rote, do well on tests (Kahn, 1974). To associate or study the connection between the facts is the preferred method of study because facts are built up into a stable system of ideas in virtue of intelligible and self-explanatory relations. Understanding the "whole" of the information to be studied before identifying important parts aids the remembering of written or verbal lessons (Mace, 1969; Ellis, 1997). Students should summarize what they have heard or read. The more sensory organs a student uses to remember something, the more likely the material will be retained (Somerville, 1954; Ellis, 1997).

The difference between active and passive memory is determined by the use of what has been learned. Passive learning is when a person reads or hears information, but does not employ the ideas through writing or speaking. Active learning involves the employment of information shortly after it has been read or heard. Active learning
facilitates remembering. People learn by doing and learn by expressing (Mace, 1969; Ellis, 1997).

Organizing Study Time.

One of the most overlooked aspects of effective study centers around organizing study time. When studying a subject, students should also plan ample time out of the class room for study. For every hour spent in reading or attending lectures, two hours should be spent in writing essays or otherwise making use of the information gained (Mace, 1969). It is important not only to schedule study time, but to schedule deadlines for the accomplishment of specific portions of study. This can be done by viewing the syllabus and identifying deadlines for the study of certain portions of course-work based on the date of their discussion (Somerville, 1954; Mace, 1969; Ellis, 1997). Setting aside time to study also implies that students schedule non-study activities with family and friends with the understanding that all will respect the times the student designates for study (Somerville, 1954). Ellis (1997), Archer & Gleason (1996) and Walters & Siebert (1993) recommend the use of a long-term planning schedule which lists all of the days of the week for at least the entire term or semester to ensure that students can plot deadlines for projects and note test dates. Use of a long-term schedule will allow students to plan ahead better when organizing their time for study. This makes use of the strategy of working backward from the future (or deadline) to the present. When constructing a schedule, students should divide things they need to do into three categories; things that need to be accomplished, things students want to do and things that do not need to be done at all. Students should also leave time for emergencies in their schedule (Somerville,
Ellis (1997), Walter & Siebert (1993) and Kahn (1974), also believe that the basics of self management are; setting priorities, avoid doing less important things, saying “no” when possible and starting and stopping specific activities at predetermined times. Students should keep track of their study progress (self monitoring) and reward themselves for successes.

Minimizing Stress.

Most authors on the subject of study skills training agree that managing stress is important for student success. Eysenck and Calvo (1992) conducted a study that gave direct evidence of reduced working memory capacity due to elevated levels of stress. Ellis (1997) reports that depression and anxiety are common among students and that suicide is the second leading cause of death of young adults between ages 15 and 25. Rawl (1984), Ellis (1997) and Gall, Gall, Jacobsen & Bullock (1990) indicate that good diet, adequate rest and exercise are very helpful in reducing the amount of stress students feel. They also advise students to avoid harmful substances. Ellis (1997) and Stirling, (1996) go one step further by encouraging students to consider the worst thing that could happen because of a test failure and the fact that the potential negative event should be put in perspective with life’s other negative events. Hopefully then, the student will realize that a test failure is not really the “end of the world.”

Test Taking Strategies.

Test taking strategies can be divided up into two areas, what to do before the test and what to do during a test. At the beginning of a course, students should be sure that they know when and where tests will be given and the materials that they will be tested on
(Somerville, 1954; Kahn, 1974; Rawl, 1984; Ellis, 1997). When calculating the amount of time for review, students should not count the number of days before the test, but the number of hours actually available for study. This is a more accurate description of how much time the student actually has to prepare (Somerville, 1954; Ellis, 1997). Cramming for examinations usually does not help because the student's mind is not clear at test time (Somerville, 1954; Mace, 1969).

When actually taking the test, students should avoid sitting near friends during the test eliminating any unneeded distraction. They should also be aware of how much time is allotted for the test and should wear a watch (Somerville, 1954). Students should have all needed supplies for taking the test to include enough paper, two sharpened pencils, two erasers and what ever else they might need. They should always have a back up regarding supplies in case the first pencil, calculator or pen fails (Kahn, 1974). The test should be fully reviewed. The student should proportion the amount of time available with the different sections of the test. Each section should be allotted a given time with a bit of a margin for emergencies and some time at the end of the test session for the student to re-read the test as a final check-up (Somerville, 1954; Mace, 1969; Rawl; Ellis, 1997). Rawl (1984) and Ellis (1997) argue that it is wiser to answer the easier questions first and the most difficult ones last. Rawl (1984) and Ellis (1997) caution students to watch for key words in questions such as “never” and “always” and consider eliminating those choices that imply absoluteness on multiple choice tests. Rawl (1984) also states that students should make a light mark in the margin by questions that are difficult and return to them after all easy questions have been completed. After all questions have been answered, the
student should re-read over each question and each answer carefully to ensure intended responses were accurately put on the test answer sheet. Students should not try to be the first person to complete the test. They should use all of the time available to ensure the test reflects the student's best effort (Kahn, 1974; Rawl, 1984). Students should be unafraid to ask the instructor to clarify any questions that are not understood (Kahn, 1974; Ellis, 1997). Under no circumstances should students consider cheating. Cheating is wrong under any circumstances (Somerville, 1954).

Output, Self Monitoring and Feedback

The output of this process is usually represented in the form of grades (which measure the quality of performance) in an academic setting. The student will know whether or not they have successfully passed the test and should also compare their test grades with their expectations (Ellis, 1997). This self-monitoring procedure will allow the student to make necessary changes in order to match performance with outcome and is the key to the feedback loop in the study skills model.

The study skills model illustrates the study skills process. Students receive input mostly via sight or sound. Students then must process the information. They make initial decisions regarding what to do with the new information. After they decide to memorize it (master all of the data as presented), select out important parts or concentrate on learning “higher order rules” (technique transfer) they attempt to capture the information through note taking and remembering. They also should organize their time, minimize their own personal stress and employ effective test taking strategies. The output of the process is the grades students receive. Students should then self monitor their entire
study skills process by comparing how the results of their efforts measure up with 
expectations of their own performance. This self monitoring provides insight and 
incentive to make any necessary changes to study habits and techniques.

The Study Skills Model, shown at the beginning of the chapter, is an effective way of 
viewing the process of study. The study skills model is a continuous process which 
includes the input a student receives, effective processing of that information, output in 
the form of grades and a self monitoring step that measures performance in light of 
expectations. Adjustments are then made, (if necessary) to improve the application of 
effective study skills enhancing the quality of the output.

Previous Studies

Zimmerman and Pons (1986) did a study involving two groups of high school 
sophomores. The first group of forty students was in an advanced achievement track 
based on standardized test scores and recommendations from counselors and teachers. 
The second group of students was in the lower academic track. Zimmerman and Pons' 
study involved surveying the 80 students with regard to their use of 14 learning strategies. 
These strategies were examples of defined learning skills. These skills included self 
evaluation, organizing and transforming, goal setting and planning, seeking information, 
keeping records and monitoring, environmental structuring, self consequences, rehearsing 
and memorizing, asking people for help, asking teachers for help, asking adults for help, 
reviewing tests after they have been taken (double checking answers), reviewing 
textbooks, and lastly, systematically reviewing all materials to prepare for special projects 
or tests. In 13 of 14 categories, Zimmerman and Pons noted a significant positive
correlation between the use of study skills and high achievement (Gall, Gall, Jacobsen & Bullock, 1990).

Entwistle (1960) reviewed 19 studies on the effectiveness of study skills instruction dating back to the 1930s. She concluded that some type of improvement occurs after study skills training although the level of improvement varies. Bednar and Weinberg (1970) reviewed 23 studies that looked at different programs for low achieving college students. Of these 23 studies, 16 showed significance and 6 studies showed improvement that was not statistically significant. The remaining study showed no difference. Nine of these studies followed the students for three or more months after the treatment. However, only three showed positive effects. Although study skills training improved student grades, positive effects seemed to be short lived (Gall, Gall, Jacobsen & Bullock, 1990).

Kirschenbaum & Perri (1982) reviewed 33 studies of programs to improve the performance of college students. Several of the studies had "multi-component" treatments such as study skills training, behavior modification and self-regulatory skills. Kirschenbaum & Perri concluded that the treatment options that were most effective involved study skills training and self-regulatory skills.

Prather conducted a study at the U.S. Air Force Academy (1983) involving 24 students who had the lowest GPA at the midpoint of their third semester. Half the cadets received a treatment consisting of study skills training and directive counseling from their class committee, squadron officer, and the Cadet Counseling Center. The other half received only direct counseling. Students in the treatment group received a 30-minute briefing that
contained information about 12 different study techniques covering a wide range of learning tasks. Students would then return to the instructor every two weeks for a 15-minute session to review how they had implemented their study skills techniques. Most students had four such sessions with their instructor. Cadets in the treatment group showed an average improvement of .54 points in their GPA for that semester. The 12 Cadets who were in the control group (received just direct counseling) improved their GPA by an average of .02 (Prather, 1983).

Differences from Previous Studies

This study on the effects of study skills training intervention on United States Air Force Aeromedical Medicine Apprentices represents a departure from previous studies involving the teaching of study skills to students because it involves military students in a military technical school setting. Previous studies by Smith and Dowdy (1989), Zimmerman and Pons (1986), Christen and Murphy (1985), and Valeri-Gold et al. (1997) have focused on high school or college student settings. Prather (1983) conducted a study at the U.S. Air Force Academy involving 24 students with low grade averages. These studies all assert, in one form or another, that study skills need to be taught to students to enhance their probability of success. Sterling (1996 unpublished dissertation) focused on test anxiety asserting that test anxiety was a factor that could be modified to enhance military student success. Sterling's study was conducted in a military technical school. The major differences between this study and previous studies are that it involved a military technical school setting, focused specifically on the effects of teaching study
skills using random sampling (not targeted groups), and followed student progress for at least three months.

This research investigated students in a military technical school setting who were required to complete a course of study to graduate and begin duty as Aeromedical Apprentice Technicians throughout the U.S. Air Force. An experimental treatment in the form of study skills training intervention was given to students who were randomly selected. This experiment used a post test only control group design (Yount, 1990).

Treatment

The treatment in this experiment was developed by a board certified psychologist at Sheppard Air Force Base. Dr. Vroonland developed the study skills course to reduce student failures and washbacks and enhance student performance. This course was given to over 3,400 students in the span of a year-and-one-half. Dr. Vroonland believed that student performance improved greatly because of their exposure to this study skills training. However, no empirical evidence was gathered to assess the actual effectiveness of the course. The researcher modified the course based on the review of literature for this study, four years of experience as an instructor and two years experience as a course supervisor. The treatment (Study Skills Course) was based on the study skills model discussed earlier and emphasized five major areas:

1. Note Taking
2. Remembering
3. Organizing Study Time
4. Minimizing Stress

5. Test Taking Strategies

The class was taught in a 90-minute session prior to the start of the Aeromedical Apprentice course. Additionally, a one-hour follow up session was given to students one month after they began technical training in the Aeromedical Apprentice course. It was intended to put the students in the correct frame of mind to approach their studies in an effective fashion. The class was interactive as the students were encouraged to participate and express their feelings.

The content of the study skills course offered as the treatment in this study is well founded in the literature. A description of what was taught to the treatment group was previously identified in the discussion of the Study Skills Model earlier in this chapter. A copy of the slides used to teach the study skills course to the treatment group is located in Appendix E.
CHAPTER 3

METHODS AND PROCEDURES

Research Design

This experiment used the post test only control group design (Campbell & Stanley, 1963; Yount, 1990). This design used a treatment group and a control group. The treatment group received study skills training and was measured on four dependent variables. The control group was measured on the same four dependent variables, but received no treatment (study skills training).

The experimental control used in this study was random assignment and the use of the disguised experiment technique (Kirk, 1995). Subjects were randomly assigned to two groups, the treatment and control group. Randomization is one of the chief tenants of inferential statistics and is a critical way of neutralizing the possible effects of nuisance variables, greatly increasing the probability that the sample will be representative of the population as a whole and minimizing bias (Hinkle, Wiersma & Jurs, 1994; Kirk, 1995). Kerlinger (1986) indicated that randomization is the only method that controls for all possible extraneous variables allowing the researcher to consider the treatment and control group statistically equal. In effect then, the design of this experiment is expressed as follows (Campbell & Stanley, 1963; Yount, 1990):
Treatment Group  \( R \times O_1 \)

Control Group  \( R \quad O_2 \)

The statistical analysis used in this experiment was regression analysis. The aptitude of all students in this experiment had already been measured by the Armed Services Vocational Aptitude Battery Test General Score which was used as a covariate in the experiment. Use of the covariate should reduce the amount of unknown error making this design even more powerful (Yount, 1990). The directional hypotheses were tested using regression analysis at the \( p<0.05 \) level.

Ethical Standards

Informed consent was obtained from the University of North Texas human subjects review board. Written approval was obtained from the Commander, School of Aerospace Medicine, Brooks Air Force Base Texas where the study was conducted. This report was made available to the School of Aerospace Medicine and the United States Air Force to further knowledge regarding the effects of study skills training. The study was designed to be as unobtrusive as possible with its only possible impact being improvement of student performance and improved methods for student retention. No student was “worse off” due to their involvement in this study nor was the mission of the School of Aerospace Medicine negatively impacted in any way.

Independent Variables

The main independent variable was a study skills intervention consisting of a 90-minute study skills course and a one hour follow-up session four weeks after the start of technical training. This study skills course was developed by a board certified
psychologist and modified using information gained during the literature review for this study. The course was taught by a U.S. Air Force certified instructor with over four years of teaching experience.

The second independent variable used in this study was student ASVAB General test scores. These scores were designed to show student aptitude. The main purpose for using ASVAB General test scores in this study was to show that the treatment and control groups were similar and to reduce the amount of unknown error making the design even more powerful (Yount, 1990).

Dependent Variables

Maring, Shea and Warner (1987) recommended that evaluating a study skills program on the basis of a single variable such as grade point average is inappropriate. Therefore, four dependent variables were chosen for this experiment. These variables were: number of academic interventions for individualized instruction, end-of-course test scores, time spent in one-on-one instruction for student individual assistance, and graduation rates.

The dependent variables involving extra time devoted to students who needed help beyond normal course time, (number of academic interventions for individualized instruction and time spent in one-on-one instruction for student individual assistance) were reported through the instructors to the researcher through weekly updates during the experiment. End-of-course scores and graduation rates were reported upon course completion.
Restatement of Null Hypotheses

Study skills course intervention was hypothesized to reduce the number of academic interventions beyond normal classroom instruction, improve higher end-of-course test scores, reduce the time required for one-on-one instruction for student tutoring beyond normal classroom instruction and reduce the attrition rate. The following null hypotheses were examined.

H0₁: There will be no significant difference in the number of academic interventions, individualized instruction or other counseling external to the course during the entire length of the course between students who are trained in study skills and students who do not receive training in study skills prior to the start and during the Aeromedical Apprentice course.

H0₂: There will be no significant difference in end-of-course scores between students who are trained in study skills and students who do not receive training in study skills prior to the start and during the Aeromedical Apprentice course.

H0₃: There will be no significant difference in the amount of time spent in one-on-one instruction for student individual assistance during the entire length of the course between students who are trained in study skills and students who do not receive training in study skills prior to the start and during the Aeromedical Apprentice course.
$H_{04}$. There will be no significant difference in the graduation rate between students who are trained in study skills and students who do not receive training in study skills prior to the start and during the Aeromedical Apprentice course.

Population

The population was approximately 250 male and female Aeromedical Apprentice students. All students had graduated from high school and completed Basic Military Training at Lackland Air Force Base Texas prior to enrollment in the Aeromedical Apprentice course.

Student Mix

The student mix at the School of Aerospace Medicine can vary widely. It can be more easily explained by viewing the entry requirements of recruits who come into the service. All recruits who come into the Air Force must have a high school diploma or equivalent (GED). This requirement then places recruits at a similar educational level with freshman students entering public colleges or community colleges. Recruits must also have attained an acceptable minimal score on the Armed Services Vocational Battery, (ASVAB) test. Recruits who do not attain this minimum score can still enlist in the Army or Navy due to slightly lower requirements. All students must also be physically able to enlist in the military, thereby eliminating people with physical handicaps. This requirement makes the military population different than our nation’s population as a whole. Certainly, students who have physical disabilities can attend college.
Military recruits must have also taken the Oath of Enlistment pledging most importantly to obey the orders of those appointed over them and that they are willing to "give their life" if necessary. After taking this oath, military recruits are sent to six weeks of Basic Training at Lackland Air Force Base in San Antonio, Texas. It is at Basic Training where recruits learn customs and curiosities, drill, the importance of following orders and begin to assimilate into the Air Force. At the end of Basic Training, the recruits are met with individually to decide which job they will perform while in the Air Force. The selection is based on three factors, what the Air Force needs, ASVAB scores and recruit preference. Once this decision is made, an agreement is signed and the recruit is issued orders to the base that offers the appropriate technical school. This process exemplifies why a military technical school population is different than the American population from which it originates.

Once students report to their base for technical school training, they are assigned to a room and usually have one room mate. They are paid as Air Force members for the duration of the training. Their meals are provided and laundry, grocery services and financial services are available within walking distance. Students attend class from 8 a.m. to 4 p.m. Monday through Friday, excluding holidays. The main duty for recruits is to succeed in their technical training.

Sample

A total of 90 people were used in the sample. One foreign service student who attended the course during the study was not part of the sample due to differences in culture and educational experiences as compared to American students. A major tenet of
the experiment was that the control and treatment groups did not differ in any significant way. Since the population was relatively small, the researcher elected to take a sample size greater than 30% of the overall population to ensure adequate statistical power. This exceeded the minimum of 20% of the population for an adequate sample size as advocated by Gay (1987) for small populations. The sample was broken into two groups (treatment and control) of 45 subjects each.

**Procedures**

**Random Sampling**

The subjects were randomly selected by assigning each potential subject a number from 1 to 50, then selecting slips of paper from a container until 25 numbers were drawn. Those students whose numbers were drawn became members of the treatment group. Students whose numbers were not drawn became members of the control group. This was done for each of the two classes (of approximately 45 students each) used in the sample.

**Data Collection**

The dependent variables were reported as follows. The number of interventions and the amount of time spent in one-on-one instruction with students was reported by course instructors on a weekly basis to ensure currency of information. The total number of interventions and the amount of time instructors spent in one-on-one instruction with students was divided by the number of blocks of instruction attempted by each student. This enabled the researcher to calculate an average amount of academic interventions and an average amount of time instructors spent in one-on-one instruction per block of
instruction for each student. This was done because poor performing students did not complete all blocks of training and it was important to accurately indicate the amount of time and additional interventions they required for attempted course-work. The course grades were reported via electronic spreadsheet after each block test. The overall course grade was averaged by adding the total test scores for each student and dividing this figure by the number of blocks attempted. Graduation rates were reported via electronic spreadsheet upon course completion. All data received from the School of Aerospace medicine was reviewed at course completion for accuracy by course instructors and the researcher to ensure accuracy.

Independent variable information regarding ASVAB test scores were reported via student records through the school registrar.

Data Analysis Procedure

All of the hypotheses were tested using regression analysis comparing results obtained from comparing the full model to the restricted model for each hypothesis.

The Full Model used was: \[ Y (\text{The dependent variable}) = X_1 (\text{Student ASVAB Score}) + X_2 \text{ (As indicated by a 0 for the control group or 1 as the treatment group to show group membership)} + \text{error}. \]

The Restricted Model used was: \[ Y (\text{The dependent variable}) = X_1 (\text{Student ASVAB Score}) + \text{error}. \] The difference between the Full and Restricted Models was represented in an F ratio which indicated significance or non significance. The final equation which determined the F ratio was represented in the following format;
$F = \frac{(r_F^2 - r_R^2 / K_F.K_R)}{(1 - r_F^2 / N - K_F - 1)}$

Where $F$ = the F Ratio

- $r_F^2 = r^2$ for the Full Model
- $r_R^2 = r^2$ for the Restricted Model
- $K_F.K_R =$ the number of predictor variables for the Full and Restricted Models respectively
- $N =$ the total of individual subjects in the experiment.

This procedure was used for each hypothesis tested in this study, (Hinkle, 1994).
CHAPTER 4

FINDINGS

This chapter represents the results of the statistical procedures used to test the four hypotheses in this study. Explanations will be given for each of the findings.

The population was approximately 250 Aeromedical Apprentice students who attended the School of Aerospace Medicine. From this population, a sample totaling 90 students, (45 in the control group and 45 in the treatment group), were randomly selected. The treatment group was given instruction on study skills techniques and the control group received no such training. The specific treatment (study skills course) is presented in Appendix E. The students were compared on the four null hypotheses stated in chapter three. All of the hypotheses were tested using regression analysis (Hinkle, 1994).

Descriptive Statistics

A major statistical foundation for this study was that the control and treatment groups did not differ in any significant way. The class and gender breakdown of the sample is shown in Table 1;

Table 1.
Sample Breakdown by Class and by Gender

<table>
<thead>
<tr>
<th></th>
<th>Class 1</th>
<th></th>
<th>Class 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>14</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>Male</td>
<td>12</td>
<td>8</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Total in Sample</td>
<td>21</td>
<td>22</td>
<td>24</td>
<td>23</td>
</tr>
</tbody>
</table>
The sample mix of 58% female to 42% male is consistent with the gender mix found in the overall population of Aeromedical Apprentice course students from 1995 through 1997 and allied health students throughout the Air Force from 1994 to 1996 (Sterling, 1996). Additionally, data were compared between the control and treatment groups to reinforce the idea the control and treatment groups were not significantly different. Using SPSS version 7.5 (1997), an independent samples t-test was conducted comparing Grade and ASVAB Test Scores between the control and treatment groups. The results are shown in Table 2;

Table 2.

Independent Samples Test Comparing Control and Treatment Group ASVAB General Scores

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error of Mean</th>
<th>t value</th>
<th>df</th>
<th>t sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
<td>Treatment</td>
<td>Control</td>
</tr>
<tr>
<td>ASVAB General</td>
<td>45</td>
<td>45</td>
<td>64.96</td>
<td>64.16</td>
<td>19.20</td>
<td>16.69</td>
<td>2.86</td>
</tr>
<tr>
<td>ASVAB Admin</td>
<td>45</td>
<td>45.00</td>
<td>66.20</td>
<td>66.91</td>
<td>21.76</td>
<td>16.75</td>
<td>3.24</td>
</tr>
<tr>
<td>ASVAB Electrical</td>
<td>45</td>
<td>45</td>
<td>61.91</td>
<td>61.93</td>
<td>19.25</td>
<td>18.73</td>
<td>2.87</td>
</tr>
<tr>
<td>ASVAB Mach</td>
<td>45</td>
<td>45</td>
<td>47.71</td>
<td>51.71</td>
<td>24.57</td>
<td>23.07</td>
<td>3.66</td>
</tr>
<tr>
<td>ASVAB AFOQT</td>
<td>45</td>
<td>45</td>
<td>68.13</td>
<td>64.62</td>
<td>14.68</td>
<td>15.61</td>
<td>2.19</td>
</tr>
<tr>
<td>Grade</td>
<td>45</td>
<td>45</td>
<td>32.07</td>
<td>32.58</td>
<td>1.21</td>
<td>1.62</td>
<td>0.18</td>
</tr>
</tbody>
</table>

Using a p<0.05 level as a basis for comparison, none of the ASVAB battery of tests or military rank (grade) indices were significantly different between the control and treatment groups. These data along with the fact that the subjects were randomly
assigned into the control and treatment groups, suggest that the control and treatment groups were similar and that the sample was representative of the population as a whole.

**Hypotheses Testing**

\( H_0: \) There will be no significant difference in the number of academic interventions, individualized instruction or other counseling external to the course during the entire length of the course between students who are trained in study skills and students who do not receive training in study skills prior to the start and during the Aeromedical Apprentice course.

The hypothesis was tested by conducting a full model, (Table 3) versus a restricted regression model shown in Table 4. The difference in \( r^2 \) between the models was then computed to determine significance.

**Table 3.**

**Ho\(_1\) Model, ANOVA and Coefficient Summary: Full Model**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.441(^a)</td>
<td>.194</td>
<td>.176</td>
<td>.6333</td>
</tr>
</tbody>
</table>

\( a \) Predictors: (Constant), GENERAL, group

**ANOVA\(^b\)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Regression</td>
<td>8.417</td>
<td>2</td>
<td>4.208</td>
<td>10.494</td>
<td>.000(^a)</td>
</tr>
<tr>
<td>Residual</td>
<td>34.890</td>
<td>87</td>
<td>.401</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>43.307</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( a \) Predictors: (Constant), GENERAL, group

\( b \) Dependent Variable: Avg Times
The full model summary for H01 indicates an $r^2$ of .194 indicating that 19.4% of the variance in the dependent variable is attributable to the independent variables of study skills training (group) and General ASVAB score. The ANOVA summary indicates a significant F ratio at the .000 level of significance. Coefficient analysis yielded t ratios below the .05 level of significance for both independent variables in the model.
The restricted model summary for H₀ (independent variable of study skills training removed from the model) indicates an $r^2$ of .146 indicating that 14.6% of the variance in the dependent variable is attributable to the independent variable of the General ASVAB score. The ANOVA summary indicated a F ratio significant at the .000 level. The coefficient analysis shows a significant t ratio below the .05 level of significance for the General ASVAB score independent variable.

The $r^2$ values to be compared were .194 in the full model and .146 in the restricted model. The ANOVA tables indicated significant F values, for both the full and restricted models. The Coefficients tables indicated significant t values for all independent variables in both the full and restricted models. All variables contributed to the predictability of the dependent variable. The $r^2$ comparison of the full versus restricted model was computed to determine significance.

H₀ Regression Equation Full Vs Restricted Model.

$$F = \frac{(r^2_F - r^2_R / 2 - 1)}{(1 - r^2_F / 90 - 2 - 1)}.$$  

The Critical F Value was $1_{df}/87_{df} = 3.951$ at the .05 level of significance.

The computed F Value for H₀ was $F = 5.18$ which was significant at the .0253 level.
Ho$_1$ was rejected due to a statistically significant difference between the full and restricted models leading to the conclusion that a relationship exists between the independent variable of study skills training and the dependent variable of the number of times students require additional assistance outside of normal classroom instruction. Students who had received study skills training (treatment group) required additional assistance on fewer occasions than students who did not receive training in study skills, (control group).

Further analysis using a regression model with the group variable as the sole independent variable yielded an $r^2$ of .045, indicating that the study skills (group) variable accounted for 4.5% of the variance in the dependent variable.

A backward solution regression analysis was conducted and indicated no significant relationship between the independent variables of grade (military rank), prior military service experience, or any other ASVAB test (Administrative, Electrical, Mechanical, AFOQT) and the dependent variable at the p<0.05 level of significance.

Ho$_2$: There will be no significant difference in end-of-course scores between students who are trained in study skills and students who do not receive training in study skills prior to the start and during the Aeromedical Apprentice course.

The hypothesis was tested by conducting a full model, (Table 5) versus a restricted regression model shown in Table 6. The difference between the models were then computed to determine significance.
Table 5.  
Ho2 Model, ANOVA and Coefficient Summary: Full Model

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.588&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.346</td>
<td>.331</td>
<td>5.9277</td>
</tr>
</tbody>
</table>

<sup>a</sup> Predictors: (Constant), GENERAL, group

**ANOVA<sup>b</sup>**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>1617.516</td>
<td>2</td>
<td>808.758</td>
<td>23.017</td>
<td>.000&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Residual</td>
<td>3056.987</td>
<td>87</td>
<td>35.138</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4674.503</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Predictors: (Constant), GENERAL, group  
<sup>b</sup> Dependent Variable: AVG

**Coefficients<sup>d</sup>**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>64.570</td>
<td>2.447</td>
<td></td>
<td>28.388</td>
</tr>
<tr>
<td>group</td>
<td>2.936</td>
<td>1.250</td>
<td>.204</td>
<td>2.349</td>
</tr>
<tr>
<td>GENERAL</td>
<td>.225</td>
<td>.035</td>
<td>.556</td>
<td>6.416</td>
</tr>
</tbody>
</table>

<sup>a</sup> Dependent Variable: AVG

The full model summary for Ho2 indicates an $r^2$ of .346 indicating that 34.6% of the variance in the dependent variable is attributable to the independent variables of study skills training (group) and General ASVAB score. The ANOVA summary indicated a significant F ratio at the .00 level of significance. Coefficient analysis yielded significant t ratios, (below .05 level of significance) for both independent variables in the model.
Table 6. 
Ho2 Model, ANOVA and Coefficient Summary: Restricted Model

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.552a</td>
<td>.305</td>
<td>.297</td>
<td>6.0779</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), GENERAL

**ANOVA**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Regression</td>
<td>1423.674</td>
<td>1</td>
<td>1423.674</td>
<td>38.539</td>
<td>.000a</td>
</tr>
<tr>
<td>Residual</td>
<td>3250.829</td>
<td>88</td>
<td>36.941</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4674.503</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), GENERAL

b. Dependent Variable: AVG

**Coefficients**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>66.158</td>
<td>2.411</td>
<td></td>
<td>27.436</td>
</tr>
<tr>
<td>GENERAL</td>
<td>.224</td>
<td>.036</td>
<td>.552</td>
<td>6.208</td>
</tr>
</tbody>
</table>

a. Dependent Variable: AVG

The restricted model summary for Ho2 (independent variable of study skills training removed from the model) indicates an \( r^2 \) of .305 meaning that 30.5% of the variance in the dependent variable is attributable to the independent variable of the General ASVAB score. The ANOVA summary indicates an F ratio that is significant at the .000 level.
The coefficient analysis shows a significant t ratio below the .05 level of significance for the General ASVAB score independent variable.

The \( r^2 \) values to be compared were .346 in the full model and .305 in the restricted model. The ANOVA tables indicated significant \( F \) values, for both the full and restricted models. The Coefficients tables indicated significant t values for both independent variables in the full and restricted models. All variables contributed to the predictability of the dependent variable. The \( r^2 \) comparison of the full versus restricted model is shown below.

\[
H_0^2 \text{ Regression Equation Full Vs Restricted Model.} \\
F = \frac{(r^2_F - r^2_R / 2 - 1)}{(1 - r^2_F / 90 - 2 - 1)}.
\]

The Critical \( F \) Value was \( 1_{df} / 87_{df} = 3.951 \) at the .05 level of significance.

The computed \( F \) Value for \( H_0^2 \) was \( F = 5.454 \) which was significant at the .0218 level.

\( H_0^2 \) was rejected due to a statistically significant difference between the full and restricted models leading to the conclusion that a positive correlation exists between the independent variable of study skills training and the dependent variable of end-of-course grade average. Students who were trained in study skills, (treatment group) had higher end of course averages than students who were not trained in study skills, (control group).

Further analysis using a regression model with the group variable as the sole independent variable yielded an \( r^2 \) of .037, indicating that the study skills (group) variable accounted for 3.7% of the variance in the dependent variable.

A backward solution regression analysis was conducted and indicated significant relationships between the independent variables ASVAB AFOQT and Mechanical tests.
as well as grade (military rank). Prior military service experience, Administrative and Electrical ASVAB scores did not have a significant relationship with the dependent variable at the p<0.05 level of significance.

H₀₃: There will be no significant difference in the amount of time spent in one-on-one instruction for student individual assistance during the entire length of the course between students who are trained in study skills and students who do not receive training in study skills prior to the start and during the Aeromedical Apprentice course.

The hypothesis was tested by conducting a full model, (Table 7) versus a restricted regression model shown in Table 8. The difference between the models was then computed to determine significance.

Table 7.
H₀₃ Model, ANOVA and Coefficient Summary: Full Model

<table>
<thead>
<tr>
<th>Model Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), group, GENERAL

ANOVAᵇ

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1   Regression</td>
<td>4218.193</td>
<td>2</td>
<td>2109.096</td>
<td>10.173</td>
<td>.000ᵃ</td>
</tr>
<tr>
<td>Residual</td>
<td>18036.459</td>
<td>87</td>
<td>207.316</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22254.652</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), group, GENERAL

b. Dependent Variable: Min Per Blk
Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Constant)</td>
<td>38.275</td>
<td>5.944</td>
<td>6.440</td>
<td>.000</td>
</tr>
<tr>
<td>GENERAL</td>
<td>- .338</td>
<td>.085</td>
<td>- .383</td>
<td>-3.964</td>
</tr>
<tr>
<td>group</td>
<td>- 6.807</td>
<td>3.036</td>
<td>- .216</td>
<td>-2.242</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Min Per Blk

The full model summary for H03 indicates an \( r^2 \) of .190 indicating that 19% of the variance in the dependent variable is attributable to the independent variables of study skills training (group) and General ASVAB score. The ANOVA summary indicates an \( F \) ratio below the .05 level of significance. Coefficient analysis yielded significant \( t \) ratios, (below the .05 level of significance) for both independent variables in the model.

Table 8.
H03 Model, ANOVA and Coefficient Summary: Restricted Model

Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.378 ( ^a )</td>
<td>.143</td>
<td>.133</td>
<td>14.7241</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), GENERAL

ANOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Regression</td>
<td>3176.262</td>
<td>1</td>
<td>3176.262</td>
<td>14.651</td>
<td>.000 ( ^a )</td>
</tr>
<tr>
<td>Residual</td>
<td>19076.399</td>
<td>88</td>
<td>216.800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22254.652</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), GENERAL
b. Dependent Variable: Min Per Blk
The restricted model summary for Ho3 (independent variable of study skills training removed from the model) indicates an $r^2$ of .143 indicating that 14.3% of the variance in the dependent variable is attributable to the independent variable of the General ASVAB score. The ANOVA summary indicated a F ratio that is significant at the 0.000 level.

The coefficient analysis shows a significant t ratio below the 0.05 level of significance for the General ASVAB score independent variable.

The $r^2$ values to be compared were .190 in the full model and .143 in the restricted model. The ANOVA tables indicated significant F values, for both the full and restricted models. The Coefficients tables indicated significant t values for both independent variables in the full and restricted models. Both variables contributed to the predictability of the dependent variable. The difference between the $r^2$ values of the full and restricted models was computed to determine significance.

**Ho3 Regression Equation Full Vs Restricted Model.**

\[
F = \frac{(r_F^2 - r_R^2 / 2 - 1) / (1 - r_F^2 / 90 - 2 - 1)}{1_{df} / 87_{df} = 3.951}.
\]

The computed F Value for Ho3 was $F = 5.048$ which was significant at the .0272 level.
Ho3 was rejected due to a statistically significant difference between the full and restricted models leading to the conclusion that a relationship exists between the independent variable of study skills training and the dependent variable of the amount of time spent in one-on-one instruction for student individual assistance outside of normal class time. Students who were trained in study skills, (treatment group) required less one-on-one instructor to student instruction outside of normal class time than students who did not receive training in study skills, (control group).

Further analysis using a regression model with the group variable as the sole independent variable yielded an $r^2$ of .043, indicating that the study skills (group) variable accounted for 4.3% of the variance in the dependent variable.

A backward solution regression analysis was conducted and indicated no significant relationship between the independent variables of grade (military rank), prior military service experience, or any other ASVAB test (Administrative, Electrical, Mechanical, AFOQT) and the dependent variable at the $p<0.05$ level of significance.

Ho4: There will be no significant difference in the graduation rate between students who are trained in study skills and students who do not receive training in study skills prior to the start and during the Aeromedical Apprentice course.

The hypothesis was tested by conducting a full model, (Table 9) versus a restricted regression model shown in Table 10. The difference between the models was then computed to determine significance.
Table 9.
Ho₄ Model, ANOVA and Coefficient Summary: Full Model

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.330a</td>
<td>.109</td>
<td>.088</td>
<td>.2880</td>
</tr>
</tbody>
</table>

- Predictors: (Constant), GENERAL, group

ANOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.882</td>
<td>2</td>
<td>.441</td>
<td>5.314</td>
<td>.007a</td>
</tr>
<tr>
<td>Residual</td>
<td>7.218</td>
<td>87</td>
<td>8.297E-02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8.100</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Predictors: (Constant), GENERAL, group
- Dependent Variable: GRAD

Coefficients

<table>
<thead>
<tr>
<th>Model</th>
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- Dependent Variable: GRAD

The full model summary for Ho₄ indicated an r² of .109 meaning that 10.9% of the variance in the dependent variable is attributable to the independent variables of study skills training (group) and General ASVAB score. The ANOVA summary did not indicate a significant F ratio below the .05 level of significance. Coefficient analysis yielded a significant t ratio, (below the .05 level of significance) for General ASVAB score, but not for study skills training, (group).
Table 10.  
Ho4 Model, ASVAB and Coefficient Summary: Restricted Model

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a. Predictors: (Constant), GENERAL

ANOVA*

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a. Predictors: (Constant), GENERAL  
b. Dependent Variable: GRAD

Coefficients*

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a. Dependent Variable: GRAD

The restricted model summary for Ho4 (independent variable of study skills training removed from the model) indicated an $r^2$ of .095 meaning that 9.5% of the variance in the dependent variable was attributable to the independent variable of the General ASVAB score. The ANOVA summary indicated an F ratio that was significant at the 0.003 level. The coefficient analysis showed a significant t ratio below the 0.05 level of significance for the General ASVAB score independent variable.
The \( r^2 \) values to be compared were .109 in the full model and .095 in the restricted model. The ANOVA table for the full model did not indicate a significant \( F \) value. The restricted model indicated a significant \( F \) value for General ASVAB score. The Coefficient tables indicated significant \( t \) values for General ASVAB scores in both the full and restricted models. The Coefficient tables did not show a significant \( t \) value for the study skills (group) independent variable. The \( r^2 \) comparison of the full versus restricted model is shown below.

Regression Equation Full Vs Restricted Model.

\[
F = \frac{r_{F}^2 - r_{R}^2 / 2 - 1}{1 - r_{F}^2 / 90 - 2 - 1}.
\]

The Critical \( F \) Value was \( F_{df/87,df} = 3.951 \) at the .05 level of significance.

The computed \( F \) Value for \( H_{04} \) was \( F = 1.367 \) which was significant at the .246 level.

\( H_{04} \) was retained. A statistically significant relationship does not exist between the independent variable of study skills training and the dependent variable of graduation rates. Although this result cannot be generalized, in this particular study, students trained in study skills, (treatment group) had a higher graduation rate than the students who were not trained in study skills, (control group).

A backward solution regression analysis was conducted and indicated no significant relationship between the independent variables of grade (military rank), prior military service experience, or Electrical, Mechanical, AFOQT ASVAB tests and the dependent variable. However the ASVAB Administrative test showed a correlation with the dependent variable. The regression model with only the Administrative ASVAB score as the independent variable was significant at the .001 level yielding an \( r^2 \) of .114 indicating
that 11.4% of the variance in the dependent variable was attributable to the ASVAB Administrative score.
CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study was conducted to analyze the effect of study skills training on academic interventions outside of normal class time, grades, time spent in one-on-one instruction outside of normal class time and graduation rates. The premise of the study was that students who are trained in study skills will be more academically successful than students who are not trained in study skills. The study was prompted by a perceived high rate of student disenrollments, washbacks and failure rates at the School of Aerospace Medicine. Obviously, students who fail in Air Force technical schools cost thousands of taxpayer dollars with no realized gain by the government or the students. Another goal of this study was to determine the relevance of a study skills course and recommend areas for further study.

An extensive review of literature was conducted and included civilian and military sources to fully investigate research on study skills intervention. Particularly noteworthy was McMurry’s work “How to Study and Teaching How To Study”, a 1909 effort which formed the foundation of many later works in the field. Walter and Siebert (1993) and Ellis (1997) provided excellent explanations of effective study skills methods. These works formed the foundation of the study skills model offered in Chapter 2. Prather
(1983) and Sterling (1996) conducted previous research in military training environments that proved very helpful to the development and execution of this project.

This study examined a random sample of 90 U.S. Air Force Aeromedical Apprentice students, (representing a population of approximately 250 students). The students in the sample included seven of the nine enlisted ranks from Airman Basic to Master Sergeant. The sample included Air Force and Air Reserve Component students who were new to the Air Force as well as senior non-commissioned officers with over 15 years of prior military experience. Subjects were randomly assigned into the control and treatment groups of 45 students each and observed for a three-month period.

A detailed analysis using independent samples t-tests was conducted to ensure the control and treatment groups were not different in any statistically significant way. Additionally, the fact that the groups were randomly selected into the control and treatment groups suggests that the control and treatment groups were similar at the beginning of the experiment.

The independent variables used in this study were the study skills course and the General ASVAB score, (used to place enlisted members into most medical career fields including the Aeromedical Apprentice career field). The dependent variables used were; number of academic interventions outside of normal class time, end of course grade averages, amount of time spent in one-on-one instruction outside of normal class time and graduation rates.
The study skills course was given to the treatment group on the first day of training, (90 minute orientation) followed by a 60 minute session one month later. The study skills course was not given to the control group.

Four null hypotheses were formulated to determine the effectiveness of the study skills course. Each hypothesis was tested by comparing full versus restricted regression models. The differences between the $r^2$ values of the full and restricted models were then computed to determine statistical significance at the p<0.05 level. A backward solution regression analysis was also conducted on each dependent variable to determine the presence of other significant correlations. Hypotheses 1, 2 and 3 were rejected, signifying a statistically significant correlation at the p<0.05 level between study skills training and dependent variables of; amount of times additional instruction was required, (negative correlation), end of course grade average, (positive correlation) and additional time required for one-on-one instruction for student tutoring beyond normal classroom instruction, (negative correlation). Hypothesis 4 was retained.

Conclusions

Based on the findings of the study, the following conclusions were reached.

1. A statistically significant negative correlation existed between the independent variable of study skills training and the dependent variable of the number of times students required additional assistance outside of normal classroom instruction.

   Students who were trained in study skills required additional assistance on fewer occasions than students who were not trained in study skills.
2. A statistically significant positive correlation existed between the independent variable of study skills training and the dependent variable of end-of-course grade average. Students who were trained in study skills had higher end of course grade averages than students who were not trained in study skills.

3. A statistically significant negative correlation existed between the independent variable of study skills training and the dependent variable of the amount of time spent in one-on-one instruction for student individual assistance outside of normal class time. Students who were trained in study skills required less time spent in one-on-one instruction for student individual assistance outside of normal class time than students who were not trained in study skills.

4. Although the student attrition-rate was 50% lower in the treatment group, (3) than the control group, (6), the difference was not statistically significant. Further analysis revealed the ASVAB Administrative test score correlated with the dependent variable of graduation rates and was significant at the p=0.01 level. Though a statistically significant difference did not exist between the independent variable of study skills training and the dependent variable of graduation rates, in this particular study, students who were trained in study skills were more likely to graduate than students who were not trained in study skills.

5. The ASVAB General score was a statistically significant predictor of all of the dependent variables used in this study.

6. The Study Skills Model presented in Chapter 2 is an effective tool to use when developing and delivering a study skills course.
7. Findings of this study were consistent with earlier works of Zimmerman and Ponds, (1986); Kirschembaum and Perri (1982); Entwisle (1960) and Prather (1983). These works indicated that study skills training can yield positive results. This is especially true with study skills interventions that include multi-component instruction which involves such components as note taking, reading, test taking strategies, organization of study time, etc. and if the study skills instruction is reinforced over time.

8. The implementation of the study skills course used in this experiment appears to be a very effective use of time and resources. The amount of time and resources expended in providing additional instruction to poor performing students and/or the cost incurred when a student fails a course dictates the use of preventative methods such as the study skills course used in this experiment. The average cost of training Aeromedical Apprentice students for three months is over $12,500.

9. Air Force health care technical schools should encourage the teaching and use of effective study skills techniques to their students that reduce remedial instruction and increase end of course scores and graduation rates. Continued efforts in the area of study skills training will lead to a reduction in costs for the Air Force and savings for U.S. taxpayers.

10. The results of this study support the need for additional study skills intervention research in the areas of allied health care training.
Recommendations For Further Study

1. The results of this study suggest a possible relationship between study skills training and graduation rates. In this study, that relationship was not found to be statistically significant, however, a relationship may be possible in other academic settings that do not place such a large emphasis on graduation rates.

2. The results of this study suggest applicability of study skills intervention to other medical fields of technical training. The study skills intervention course in this experiment could provide a basis for further studies implementing study skills interventions in military and civilian medical training settings.

3. The results of this study suggest applicability of study skills intervention to non-medical fields of technical training. The study skills intervention course in this experiment could provide a basis for further studies implementing study skills interventions in non-medical military and civilian technical training settings.

4. Further studies regarding age and education level should be conducted prior to implementing a study skills intervention course in adult non-technical training environments.

5. Further research should be conducted in primary and secondary school settings to determine the feasibility of providing sustained cost effective study skills training to students early in their academic careers to enhance their learning capabilities.
6. Further studies should be conducted to identify the minimum number of study skills training sessions required with students for effective adaptation of study skills as evidenced by little or no remedial training and high graduation rates.

7. Further research should be conducted to determine the projected cost savings of implementing a study skills intervention course throughout U.S. Air Force medical and non medical technical training schools. This analysis could then be applied to the other three branches of the military if cost savings prove significant.
APPENDIX A

APPROVAL OF STUDY BY THE UNIVERSITY OF NORTH TEXAS

INSTITUTIONAL REVIEW BOARD
November 1, 1997

Mr. John Griffith
8230 Phoenix Ave.
Universal City, TX 78148

Re: Human Subjects Application No. 97-236

Dear Mr. Griffith:

As permitted by federal law and regulations governing the use of human subjects in research projects (45 CFR 46), I have conducted an expedited review of your proposed project titled "The Effect of Study Skills Training Intervention on United States Aeromedical Apprentices." The risks inherent in this research are minimal, and the potential benefits to the subjects outweigh those risks. The submitted protocol is hereby approved for the use of human subjects on this project.

The UNT IRB must re-review this project prior to any modifications you make in the approved project. Please contact me if you wish to make such changes or need additional information.

If you have questions, please contact me.

Sincerely,

Walter C. Zacharias, Jr., Ed.D
Chair, Institutional Review Board

cc: IRB Members
APPLICATION FOR APPROVAL OF INVESTIGATION INVOLVING THE USE OF HUMAN SUBJECTS

University of North Texas Institutional Review Board for the Protection of Human Subjects in Research (IRB)

1. Principal Investigator’s Name: John C. Griffith

2. Home Address: 8230 Phoenix Ave. Universal City TX 78148 (210) 659-8865

3. Faculty sponsor: Dr. Roger Ditzenberger Phone: (940) 565-2571

   This is in support of research for Ph.D. dissertation

4. Total Project Period: 27 Nov 97-1 June 98

5. External Support is not requested for this project

6. In making this application, I certify that I have read and understand the guidelines and procedures developed by the university for the protection of human subjects, and I fully intend to comply with the letter and spirit of the University’s Assurance and policy. I further acknowledge my responsibility to report any significant changes in the protocol, and to obtain written approval for these changes, in accordance with the procedures, prior to making these changes. I understand that I cannot initiate any contact with human subjects before I have received approval and / or complied with all contingencies made in connection with that approval.

Signature of Principle Investigator Date

Original signed and dated

7. Approval by Faculty Sponsor (Required for all students): I affirm the accuracy of this application and I accept the responsibility for the conduct of this research and supervision of human subjects as required by law.

Signature of Faculty Sponsor Date

Original signed and dated
8. I have included copies of all pertinent attachments including, but not limited to: 
Questionnaire/survey instruments, informed consent, letters of approval from 
cooperating institutions, copy of external support proposal if applicable.

Yes X No

9. Sources of subjects: Subjects are United States Air Force Aeromedical Technician 
Students that attend the School of Aerospace Medicine from 2 Dec 97 through 1 June 
1998. The study will include approximately 100 students with a relatively equal 
number of males and females from differing racial and ethnic backgrounds. All 
students will be enlisted in the United States Air Force and will be in good health. 
Most students will be in their late teens or early twenties.

10. Study Procedures: Students will be randomly assigned to one of two groups, a control 
group and a treatment group. The treatment group will receive training in study skills. 
The control group will not. The basic design of the experiment is a Post Test Only 
Control Group Design using Regression Analysis to test all four hypotheses listed 
below at the 0.05 level of significance. The Hypotheses to be tested are:

**Ha₁:** Students who receive study skills training, prior to the start of technical training, 
will require significantly fewer incidences of academic interventions during the entire 
length of the course, then students who do not receive training in study skills prior to the 
start of technical training.

**Ha₂:** Students who receive study skills training prior to the start of technical training 
will achieve significantly higher end of course scores then students who do not receive 
training in study skills prior to the start of technical training.

**Ha₃:** Students who receive study skills training prior to the start of technical training, will 
require significantly fewer hours spent in one-on-one instruction with their teachers then 
students who do not receive study skills training prior to the start of technical training.

**Ha₄:** Students who receive study skills training prior to the start of technical training, 
will graduate at a significantly higher rate then students who do not receive study skills 
training prior to the start of technical training.

11. I have gained approval from the Commander of the School of Aerospace Medicine. 
Written consent will not be requested of the individual students in the study to avoid 
any "demand effects" resulting from the process of gaining consent. It is my belief 
that the only possible impact of this study is that students in the treatment group will
benefit from improved study skills. Students requiring help with the course material will be assisted through the normal processes currently in place.

12. Confidentiality Safeguards: Students will not be individually identified in the final report nor will they know that the study is in progress. Students will not receive information on the performance of other students.

13. Benefits to Subjects: Short term benefits to the subjects in this study include enhanced awareness of successful study skills which will enhance their ability to succeed in the academic environment. Longer term benefits to future technical school students and the Air Force include the possible implementation of the treatment of this study (study skills course) throughout the Air Force enhancing the performance of approximately 35,000 air Force Technical School students per year and or adding to the body of knowledge regarding the teaching of study skills to adult students.

14. The potential risks associated with this study can be overcome with confidentiality of individual subject data in the final report. These issues were discussed in paragraph 12. Benefits were outlined in paragraph 13 and far outweigh the risks. It is my sincere belief that subjects can only be helped by this study.
APPENDIX B

APPROVAL OF THE STUDY BY THE COMMANDER, USAF SCHOOL OF
AEROSPACE MEDICINE
5 October, 1997

MEMORANDUM FOR: HQ AFMSA/SGSLC (CAPTAIN GRIFFITH)

FROM: USAF School of Aerospace Medicine/CC

SUBJECT: Approval for Research Project

Your research project titled "The Effect of Study Skills Training Intervention on United States Aeromedical Apprentices" is approved. I look forward to reviewing the results of this study.

TOMMIE G. CHURCH, Col, USAF, MC, CFS
Commander
APPENDIX C

AVERAGE ASVAB SCORES OF TREATMENT AND CONTROL GROUPS
Control Group N=45

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The Study Skills Course is shown in the following format:

COPY OF THE SLIDE

Teacher’s notes:
STUDY SKILLS

USAF Aeromedical Apprentice Student Orientation

Introduce yourself
Objective

Identify aspects of an effective study strategy for technical training

The purpose of this class is to expose students to effective study skills strategies that will help them succeed.
Study Skills Model

- Shows continuous process used in effective study
  - Model consists of four basic steps with a feedback loop used to evaluate the process of study skills and improve it if necessary
- First major step in the input process
  - Includes social environment, physical environment, student’s reading skills and listening skills
- 2nd major step is the Process step
  - What do we do with information when we first get it
    - We should categorize it to determine if it should be memorized, important information needs to be selected out from the data we are getting or if we must memorize a technique that we need to transfer to similar situations
  - Tools we use to help us study
    - Note taking
    - Remembering
    - Organize study time
    - Minimize stress
    - Test taking strategies
- Output and self monitoring - receive grades and make adjustments based on how performance meets expectations
Overview

- Note taking
- Remembering
- Organizing Study Time
- Minimizing stress
- Test taking strategies

These are the main areas we will talk about
Note Taking

(Listening)

• Be attentive (eye contact, questions)

• Look / listen for clues about importance of what you are reading / hearing

• Use an outline format

• Draw models if it helps to associate different ideas

• Keep list of definitions with page numbers

• Pay attention to topics that are repeated or reinforced
• Pay attention to pictures or charts, they usually contain important information
Note Taking

(Reading)

• Look over Table of Contents, Headings to get main ideas

• Determine what questions you want answered

• Read material, but keep focused on questions

• Review each section - Keeping main points in mind

• Recite Material - (written summary, reviewing with another student)

SQR³ Survey, Question, Read, Review, Recite

• Know what you want to learn before you begin to read!
• Reading from front to back of a book or chapter is not the most efficient way to learn new material.
  • Do not spend equal time on all parts of the section or chapter you are reading
  • Determine what is important based on the section or chapter objectives and focus on the main points
Note Taking

• Avoid word for word notes
• Use abbreviations
• Use a highlighter WITH CARE!
• Review notes ASAP after taking them

• Look for main ideas
• Note referenced page numbers in your notes
• If a person highlighted 20% of a 400 page book, they would need to re-read 80 pages of material! Be careful with the highlighter!
Remembering

• Be attentive

• Be selective - focus on objectives

• Use a system
  • Acronyms
  • Creative sentences
  • Rhymes and Songs

• Summarize newly learned concepts in writing

• Translate concepts in your own words
Remembering

- *Use Repetition*

- *Relate facts to each other*

- *Associate new facts with facts you already know*

- *Learn with as many senses as possible*
  - Visual
  - Auditory
  - Touch

- Use as many senses as you can when trying to learn something. Studying with a friend can reinforce learning
- Put learning concepts into your own words
Get Organized!!

• *Plan ahead / Be prepared!*

• Know when the next block test will be

• Identify deadlines early

• *Avoid cramming; it leads to:*
  
  • Anxiety
  
  • “Brain dump”
  
  • Sleep deprivation

• Insufficient time to clarify questions

• Make a long term schedule which shows test dates and assignment dates.
  
  • Show example
Get Organized!!

• Schedule your time every day

• Make a “to do” list - include everything that is important to you

• Plan study, exercise, and recreation time

• Plan to use small blocks of time

• Plan time to prepare before class

• Control your time
  • Plan time for fun
  • Stick to your schedule
  • Allow time for unplanned emergencies
- Try to pre-read materials before going to class
- Review materials as soon after class is possible to reinforce concepts discussed in class
Get Organized!!

- Use your time wisely - common time wasters include:
  - Avoidance
  - Studying things you know
  - “Hanging out”

- Not being organized can cause you to waste time and get behind in your studies. This may lead to panic during testing.
Minimize Stress

• Good health habits

  • Sleep
  • Diet
  • Exercise
  • Caffeine
  • Breaks

• Six to eight hours of sleep per night
• Exercise for at least 20 - 30 minutes two to three times per week
• Take little breaks while studying - even five minutes
Minimize Stress

- *Put situations into perspective*

- *Identify the actual WORST CASE SCENARIO* (versus the feared WCS)

- *Remember the Self-fulfilling Prophecy*
  
  - *Your predictions have much to do with what happens to you!*

- If you fail a test you will not die. You will simply retake the test!
Test Taking Strategies
(Before you go in)

- Know how much time you have and how many questions

- Allot a given amount of time for each section

- Leave some time at the end for review

- Take in needed supplies and have a back up

- Wear a watch

- Plan how you will manage your time during the test
- Spare pencils and calculators are always a good idea!
Test Taking Strategies
(During test)

- *Don’t rush - Know how many items you can miss*

- *Take questions at face value*

- *Answer easy questions first, come back to the hard ones*

- Know how many questions you can miss
  - This will put your mind at ease if you miss several questions in a row
- Do not read into questions
- Answer easy questions first - then go back to the hard ones!
  - If you spend more than a minute on a question and still do not have a clear idea what the answer should be - make a dot in the left margin and move on
  - Answer all the easy questions to accumulate the most points - then review the test answering all the questions you could not answer, (identified by the dots)
  - The dot method works well when your answers are on a separate sheet
Test Taking Strategies

- Try to answer questions without looking at the answers...
- Read the whole question...then read all the options
- Choose the best answer, regardless of patterns

- Look for absolute words in questions like “never” and “always” for clues when determining if an answer is correct
- Most teachers do not concern themselves with patterns of answers on multiple choice tests. Do not concern your self with perceived patterns on tests
Test Taking Strategies

• If you blank out, think of what you know

• Don’t panic if you don’t know several items in a row

• DON’T CHANGE ANSWERS! (unless you know why you are changing them)

• If you blank out, close your eyes for 15 seconds, think of what you know. If you are still confused by the question, move on and come back to that question after you have answered the easy questions
  • Sometimes questions later in a test will clarify the meanings of earlier questions

• Do not panic if you miss several questions in a row
  • Knowing how many questions you can miss and still pass should keep you calm

• Unless you marked an answer completely different than you meant to, do not change your answer, leave it alone! Most changed answers are from right to wrong!
Test Taking Strategies

(final thoughts)

- Do not be the first to finish, take all the time you can

- After answering all questions, review the test to make sure you answered all the questions

- Goal during test - To have the test reflect your knowledge of subject
Review

• Note taking
• Remembering
• Organizing Study Time
• Minimizing stress
• Test taking strategies

• Discuss the five main areas
Study Skills Model

- Review study skills model
- Ask for questions at this point
Follow-up

- We will get back together in about a month to review progress and answer questions

Good Luck!
REFERENCES


Clemmons, J. *Build The Study Skills Your Students Need Most.* *Instructor, July/August,* 87-90.


