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A Study to Determine the Effectiveness of Automated Electronic Classrooms in the United States Navy

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A STUDY TO DETERMINE THE EFFECTIVENESS OF AUTOMATED ELECTRONIC CLASSROOMS IN THE UNITED STATES NAVY

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APPROVAL PAGE

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CHAPTER I

INTRODUCTION

The United States Navy boasts about having the latest technology and being the guardian of the world's seas, yet when it comes to educational training and methodology, the Navy primarily uses 1970s technology. The overall responsibility of training and infusion of technology into the classroom rests on the shoulders of the Chief of Naval Education and Training (CNET). CNET mandates a group-paced instructional methodology, which is taught to prospective Navy instructors at ten locations nationwide. Group paced instruction was designed to accommodate the wide range of training programs found in the Navy and incorporated rudimentary technological devices, i.e., an overhead transparency machine, into the curriculum. Unfortunately, group-paced instruction is based on teaching and evaluating knowledge and comprehension, which represent the lowest order thinking skills according to Bloom's cognitive taxonomy (Bloom, 1956). CNET has realized that group paced instruction is not appropriate for all Naval training and is incorporating technology into the classroom.

The Operations Specialist (OS) "A" School, which is offered by the Fleet Combat Training Center (FCTCL), is one example of a course in which the group-paced instructional methodology is exceedingly inadequate. OS "A" school is unlike many of the Navy's schools in that the student's knowledge and comprehension level has to be at the forefront of their mind. Instantaneous responses and actions have to become second nature. In order to properly train new OS "A" students with the required skills, instructors must go beyond the group paced mentality. Research indicates that active

teaching methodologies focus on higher order thinking skills like analysis, synthesis and evaluation. These skills serve as the cornerstone of the operations specialist profession.

CNET recognized that a shift in instructional strategies would be necessary to teach higher order thinking skills. In order to modernize the training environment to facilitate the most efficient training methods, CNET developed the Automated Electronic Classroom (AEC). The AEC supports formal instructor-led training sessions. It also provides an interactive environment supporting independent preparation, study, and self-paced learning to maximize the use of electronic training materials available at-sea and ashore. The AEC incorporates computer workstations, large screen display, student response keypads, printers, remote control devices, and a CD jukebox. In February of 1999, the first of six AECs was installed in Operations Specialist "A" school at Dam Neck, Virginia. The AEC installation symbolized CNET's shift from group-paced instruction to an instructional strategy that supports higher order thinking skills.

Statement of the Problem

The problem of this study was to determine if Operation Specialist (OS) "A" school students who were taught in an Automated Electronic Classroom (AEC), as established by the Chief of Naval Education and Training (CNET), had a higher rate of academic success compared to OS "A" school students who were taught in a traditional classroom.

Research Goals

Based on the problem statement, the research hypotheses for this study was as follows:

H_0: There was no difference in academic achievement for Operation Specialist's taught in an Automated Electronic Classroom (AEC) as compared to Operation Specialist's taught in a traditional classroom.

Background and Significance

Since the beginning of formalized education students have been taught by a subject matter expert in a room filled with little more than tables and chairs. This traditional classroom structure privileged the instructor as the authority figure in the classroom and therefore centered the class on him or her. We have all experienced this type of classroom at one time or another, the platform style classroom where an instructor stood behind a lectern presenting his/her knowledge to students who sat uncomfortably in their chairs while either gazing out the window, doodling on their paper or making incomprehensible notes.

There must be a reason instructors fall into the trap of lecturing. Primarily, the reason seems to be tradition and the ease of information transference. Instructors seem to think classrooms should be quite, peaceful settings where the instructor imparts his or her knowledge to the eagerly awaiting vessel, the student. Teachers tend to shun activity in the classroom, because activity is likely to be disruptive. They seem to believe there is no active learning going on in these classrooms. The instructors are treating the students as if they are an empty vessel ready to be filled with knowledge. Unfortunately learning

is not a passive activity. The majority of students leave these classrooms empty-handed. Since many students walk away with far less than they should receive from a classroom, the traditional model is flawed. It is time to break tradition and determine if the infusion of technology into the classroom possesses any benefits.

Between 1989 and 1996 the number of instructional computers in schools increased over 200% and by 1997, the number of schools with Internet access had reached 70% (Software Publishers, 1998). In today's education climate, use of current technology becomes increasingly critical in schools for several reasons. Schools that are able to demonstrate innovative educational strategies using technology are at a distinct advantage in attracting top students and in earning further funding through grants, endowments and programs. Of course, having technology does not ensure effective use of the tools and therefore may not translate into educational benefits.

Many institutions have incorporated technology into their classrooms. At East Tennessee State University (ETSU) students' academic achievement in an interactive television classroom outperformed their counter parts in a traditional classroom (Hodge-Hardin, 1997). The state-of-the-art electronic classroom at the University of Mississippi's School of Business incorporated a Group Decision Support System (GDSS) software which "reduces meeting time while increasing group satisfaction and meeting effectiveness and students using it in classes prefer it over traditional, verbal seminars" (Moore, 1998).

The United States Navy's answer to the infusion of technology into the classroom was the Automated Electronic Classroom (AEC). The concept of the AEC required cost reductions and improved fleet readiness, while delivering information more effectively

and efficiently than ever before (CNET, 1998). The AEC would incorporate multimedia presentations, student interaction and a Learning Resource Center (LRC). The ultimate beneficiary would be the learner since he or she would be situated in an active learning environment thereby invoking higher order thinking skills.

In 1998 Rear Admiral Tracey, Director of Training, endorsed the AEC concept. At Fleet Combat Training Center, Dam Neck, Virginia; the first of six Automated Electronic Classrooms was installed in Operations Specialist "A" school on February 11, 1999. The majority of the instructors approached the new breed of classroom enthusiastically and the student's reception was one of benevolence, but how effective has the AEC been? Until now, no study had been completed on the effectiveness of automated electronic classrooms at Operations Specialist "A" school. The purpose of this study is then to determine if this infusion of technology into Operations Specialist "A" School has improved student academic achievement.

Limitations

The following limitations applied to this study:

1. All aspects of the study were conducted at OS "A" school, Fleet Combat Training Center Atlantic (FCTCL), Dam Neck, Virginia.
2. The study has a sampling size of 10 classes in each of the teaching environments. Note: class size was not uniform.
3. Data collection did not interfere with student training.
4. Data analysis could only be performed on phase one, weeks one through five, of OS "A" school.

Assumptions

Assumptions for this study were as follows:

1. OS "A" school student's prior education, family environment, neighborhood setting and culture are varied and do not consist of a particular background or personality type.

2. OS "A" school is a nine-week curriculum and all students evaluated passed the course. Passing requires a cumulative raw score of 70 or better.

3. All perspective students have to have normal hearing and color perception, no speech impediment and a confidential security clearance (CANTRAC, 2000).

4. There are no age, ethnicity, or academic prerequisites for the students however the prospective students must meet all Armed Services Vocational Aptitude Battery (ASVAB) test scores established by the Navy Recruiting Manual (COMNAVRECCOM Instruction 1130.8F).

5. All testing devices, written and performance examinations, were uniform for all groups sampled.

6. All students were junior sailors, had less than six months in the Navy.

7. This study assumes that the students have not been exposed to Operations Specialist curricula prior to attending OS "A" School.

8. All of the students involved in this study have equal opportunities to do well, for the unit of study will be novel to all.

9. Technology will be used to improve efficiency and effectiveness of the education and training system.

Procedures

Research will be conducted using 7 classes of Operations Specialists enrolled in a traditional classroom environment, control group, and 7 classes of Operations Specialists enrolled in an Automated Electronic Classroom, experimental group, at FCTCL. The

experimental group was exposed to instruction in the AEC during weeks 1 through 5 as available. All classes were evaluated using weekly examinations and practical/performance tests throughout the course. Academic achievement was measured by the number of correct answers provided over the duration of the study and individual test scores were compared.

Definition of Terms

Acronyms, abbreviations, Navy specific terms, and terms associated with automated electronic classrooms and traditional classrooms include:

Armed Services Vocational Aptitude Battery (ASVAB) Test – is a multi-aptitude test battery that is designed to measure individual aptitudes, the readiness to become proficient in a type of activity, given the opportunity. It consists of ten short individual tests covering word knowledge, paragraph comprehension, arithmetic reasoning, mathematics knowledge, general science, auto and shop information, mechanical comprehension, electronics information, numerical operations and coding speed. Not only do you receive scores on each of these individual tests, but also several individual test results are combined to yield three academic composite scores: verbal, math and academic ability.

Automated Electronic Classroom (AEC) – classrooms equipped to deliver curriculum materials in an electronic format. Introductory AECs (I-AEC) consist of an electronic instructor podium, student response keypads, and 1 or 2 – instructor preparation/ curriculum development workstations. Advanced AECs (A-AEC) consist of an electronic instructor podium, networked personal computer stations for each student, 1 or 2 instructor preparation/curriculum development workstations, audiovisual equipment and other peripherals. Networking between classrooms will be accomplished where feasible.

Chief of Naval Education and Training (CNET) – is responsible to the Chief of Naval Operations (CNO) for the education and training of Navy and Marine Corps personnel, both officer and enlisted. CNET oversees a network of training and education programs throughout the United States and on ships at sea.

Distance Learning (DL) – An integrated combination of technologies designed to support interactive teaching and learning among persons not physically present in the same location.

Fleet Combat Training Center (FCTCL) – provides basic and specialized training to United States Navy, United States Marine Corps, Coast Guard, and foreign naval personnel in support of quality education and training to personnel in combat systems operation and maintenance. FCTCL also provides specialized skills training to individuals and training systems support to operational and systems commands.

Instructor Training School – trains selected Navy, Marine Corps and Department of Defense (DOD) civilian personnel, including students of allied nations, in the techniques and principles of instruction applicable to the formal school environment. Course content includes the Navy training program; objective, test item, and lesson development; theories and laws of learning; instructional methods and techniques; instructional media; instructor evaluation; factors affecting learning and student motivation and academic guidance and counseling techniques (CANTRAC, 1999).

Large Screen Display – provides navigation and control via one or all of the following: interactive touch screen, remote control device and/or keyboard and mouse. The large screen display must also support illustrations with a minimum of 4 colors and provide interactivity with Instructor and Student workstation computers for "at the board navigation and control of applications" (CNET Letter, 11 JAN 1999).

Learning – Webster's dictionary defines learning as knowledge and skill acquired by instruction and study (1984, p. 681). The term learning used throughout this study refers to the acquisition of knowledge and skills through both education and training.

Learning Resource Center (LRC) – a central location that contains print or electronic learning options allowing students to individually study training materials. LRCs consist of a file server, networked personal computer stations for students, 1-2 instructor preparation/curriculum development workstations and peripherals (CNET Notice, 1998).

Lesson Plan – contains learning objectives that reflect knowledge and/or skills attained upon successful completion of the course; provides an outline of instructional materials to be taught in a logical and efficient manner; provides specific equipment and instructional media requirements and guidance for conducting the course (NAVEDTRA 135A, 1995).

Operation Specialist (OS) "A" School – is designed to provide E-1 through E-3 personnel with the basic technical knowledge and skills of the OS rating providing for effective performance as apprentice Operation Specialists. Students will be trained in security, internal communications, basic radar theory, detection equipment operations, basic maneuvering board plotting, combat information center publications, tactics, external communications, dead reckoning system, anti-submarine warfare plotting, coastal navigation, anti-air warfare and combat information center casualty procedures. Students will also be trained to apply knowledge and skills under supervision during

underway peacetime cruising conditions and ashore evolutions in combat information and direction centers. Graduates will require additional training before they can perform unsupervised watchstanding duties (CANTRAC, 1999).

Standard Training Activity Support System (STASS) – is a state-of-the-art computer application designed to capture Navy training information and to support Navy schoolhouse management. STASS is a distributed, client/server system designed to provide easy user access to data, shared telecommunications, and full integration with the Navy Integrated Resources Activity System (NITRAS) and the Navy Training Reservation System (NTRS). Each user performs authorized functions at a client PC located in their workplace. Each user has access to the STASS database and software through a communication network that links the user to their own local database as well as to corporate databases on an HP9000 server in Pensacola, Florida (CNETINST 1550.1G, 1998).

Traditional Classroom – an instructor led environment where students sit in desks or at a table. Only basic equipment is available to the instructor: chalkboard, overhead projector and lectern.

Overview of Chapters

In an attempt to keep pace with evolving technological advances related to education, the Navy has developed the Automated Electronic Classroom (AEC). The purpose of this study is to determine if this infusion of technology into Operations Specialist "A" School has improved student academic achievement. Research indicates that adding technology to the classroom improves academic performance and is more effective than teacher led instruction. This study covered a three-year time span, using twenty different classes, with an approximate sampling size of 350 students.

Chapter II is a review of literature focusing on the effectiveness of a learning environment in an AEC classroom compared to a traditional classroom. Chapter III outlines the methods and procedures used to conduct the study. Chapter IV lists the findings of the study and Chapter V summarizes the study and includes recommendations for further research.

CHAPTER II

REVIEW OF LITERATURE

During the Middle Ages formal instruction began and people were trained in a teacher led environment. Society, technology and instructional strategies have changed significantly since then, yet the majority of today's training is still teacher directed. Recently the Department of Defense (DOD) has been forced, as a result of severe budgetary cuts, to investigate innovative methods to train personnel. Both research (Aiken & Hawley, 1995; Cavanaugh, 1997; Van Horn, 1999) and the DOD favor accomplishing training in a multimedia, multi-sensory environment. The Navy's version of the multimedia classroom is the Automated Electronic Classroom (AEC). Within the confines of the AEC students are exposed to audio, video, computer mediated instructional presentations, print media, audiographics, instructor led and student led activities. To provide background on the development and implementation of an AEC, Chapter II will describe the evolution of a classroom, the emergence of technology into the classroom and how the Navy developed the AEC. Student academic achievement issues will also be discussed.

Evolution of the Classroom

There is no doubt that the leading form of education in Europe and America is pedagogy, or what some other people refer to as didactic, traditional or teacher-directed approaches (Hiemstra & Sisco, 1990). Pedagogy is derived from the Greek word "paid", meaning child and "agogos", denoting leading. Thus, pedagogy means the art or science

of leading or teaching children. In the pedagogical model the teacher makes the determination as to what will be learned, how it will be learned, when it will be learned and if the material has been learned. Pedagogy, or teacher led instruction, also places the student in a submissive and obedient role. The result is a teaching and learning situation that actively promotes dependency on the instructor.

The pedagogical model of instruction was originally developed in the monastic schools of Europe in the Middle Ages. Monks taught young boys with the understanding that all students must be obedient, faithful and efficient servants of the church (Knowles & Assoc., 1984). From this origin developed the tradition of pedagogy, which later spread to secular schools in Europe and America and became, and remains, the dominant form of instruction.

Today's pedagogical model is portrayed by attentive rows of students gazing dutifully at an endless flow of overhead transparencies and taking copious notes. In this environment the textbook is all too often the centerpiece of the curriculum. This is no respite on textbooks, rather evidence that the explosion of computers and a computerized society has not reached the majority of classrooms. In many cases technology is merely an add-on to the textbook-based curriculum. Often that means that technology at best is used as a reward or for remediation – valid uses, but peripheral to the main curriculum.

Up until recently, the pedagogical model has been applied equally to the teaching of children and adults, and in a sense, is a contradiction of terms. The reason is that as adults mature, they become more independent, think more abstractly and become more responsible for their actions. They are often motivated to learn from a sincere desire to solve problems themselves. Additionally, they have an increasing need to be self-

directing. In far too many ways, the pedagogical model does not account for such developmental changes on the part of adults, and thus produces tension, resentment and resistance in individuals (Knowles & Assoc., 1984).

Experienced educators know that students perform better when they are actively engaged in the learning experience. Traditional classrooms succeed because they are highly interactive. Students can ask and respond to questions and engage in dialogue with the teacher and each other. Teachers can also watch student's expressions, gauge comprehension and adjust their presentation of material. Why should educators even consider adding technology into the classroom? Some key trends that are scuttling the pedagogical model are: increasingly complex training requirements, a more heterogeneous employee population, geographically dispersed work groups, corporate downsizing and a contemporary workforce characterized by active and visual learning styles (Rand, 1996).

Infusion of Technology into the Classroom

For hundreds of years the classroom has been the solitary domain of the teaching facility. Once that door closed, contact with the outside world was terminated (Cartwright, Roskus & Shapiro, 1995). In today's society this version of education is archaic and ineffective on the vast majority of the students, yet it still seems to be the predominant method of instruction. During the late 1980s the integration of computer technology began surfacing in the classroom. Today computers coupled with computer

connectivity via Local Area Networks (LAN), Wide Area Networks (WAN) and the Internet opens the classroom to the entire world.

Many universities and public schools now have computerized classrooms. An instructor's podium may be equipped with a networked computer, an overhead camera, and projection capabilities, while the rest of the classroom maintains a traditional design with desks or tables for students. In this variation of the traditional classroom, the teacher uses a multimedia-enhanced lecture to enrich the curriculum. A different, richer environment may consist of an electronic teaching podium as previously described and networked computers at each of the students' desks. Less common but still more advanced designs promote collaborative learning by clustering networked desks in a group to encourage active discussion and participation (Cartwright et al., 1995). The integration of these various components has allowed for a much richer learning environment and affords the teacher the opportunity to use all modes of instructional patterns and the ability to nurture all learning styles.

Numerous studies compared multimedia classroom instruction to traditional lecture. Sammons (1995) stated that research and experience indicates that the use of multimedia leads to enhanced learning on criteria such as acquisition of content, development of skills, efficiency of learning and satisfaction with instruction. Brown University implemented multimedia into its "Drug Free America" course. All respondents overwhelmingly concurred that the incorporation of multimedia enhanced the instruction (Lewis, Shaindlin & Treves, 1998). Aiken and Hawley (1995) discovered, at the University of Mississippi's school of Business, that the integration of computer and multimedia technology resulted in tremendous success for all finance classes. Pearson

(1994) found that nine out of ten students enjoyed the class more due to multimedia presentations. This was assessed by his development of the Perception of Multimedia Classroom Environment Survey. He also found that there was no evidence to suggest that learning styles and multimedia presentations were in any way related, hence the benefits of multimedia classroom instruction are equally available to students of all learning styles. This study used the Kolb Learning Style Inventory.

None of the previously cited instances noted that the incorporation of multimedia in a classroom was detrimental to the learning environment. The only location that encountered a dilemma within the confines of a multimedia classroom was at the University of North Florida. They incorporated video conferencing into the multimedia classroom. Since this was the only classroom on campus that provided multimedia and video conferencing, the demand for the room was more than what could be offered. Van Horn (1999) came to the conclusion that the best place to locate a video conferencing system was *not* in a multimedia classroom.

Many of these articles recommend ideas for future research, including looking at the specific components of multimedia instruction and other factors that contribute to students' success rates with this modality. One specific type of multimedia that has been studied in the literature is computer simulations. Simulations involve experimental learning which is a goal directed active learning process conducted in a controlled setting (Flusser & Hanna, 1991). Simulations provide realistic experiences for students without the constraints and distractions usually found with the realistic situation. Adults favor this type of learning since they prefer problem solving to abstract theory (Knowles, 1980). Therefore, simulations will enhance the information seeking skills of adult

participants and will engage their attention and efforts at a higher level than passive teaching methods such as lecturing (Flusser & Hanna, 1991).

The Navy's Solution

In the mid-nineties the United States Navy realized that their current method of training personnel, pedagogy based, was outdated and required revamping. In January of 1997 the Chief of Naval Education and Training (CNET) initiated phase one of a three-phase program. The concept behind the three-phase program was to improve the human to computer interfaces for electronic classrooms (Kribs, 1998). Phase one contracted a six-month research project to establish all the necessary components for a technologically advanced classroom. Phase two, which began on September 17, 1997, incorporated the infusion of technology into the Automated Electronic Classroom (AEC). The goals of phase two were to aid in the dilemma of reduced budgets and make training more effective (Kribs, 1998). In order to accomplish this, ergonomics and instructional methods and strategies had to be examined. A set of integrated software tools and interactive software that supported the AEC environment had to be developed as well. Additionally, these components had to accommodate variability, allow for reinvention, make pedagogical sense, and design desktop simulations and problem solving instruction that reduced laboratory time (Kribs, 1998). These criteria were established by CNET in October of 1997 and are listed in Appendix A.

Vice Admiral Tracey, Chief of Naval Education and Training, held a technology re-engineering meeting in August of 1998. She wanted a group of individuals representing interests of all Navy components to determine how best to influence the way

Navy Training Technology is implemented, monitored, tracked and investment benefits accounted (Tracey, 1998). Tracey simplified this statement by breaking it into three objectives: reduce the infrastructure cost of training, increase time in homeport and improve readiness, and "train hard, train fast, train often and train first" (Tracey, 1998). In order to realize this vision she implemented four action teams: a charter action group, a leveraging action group, a consensus strategy group and an overcoming action group. Specifically, the charter action group was tasked to develop a charter enabling an integrated Navy to: operate collectively as a single Navy technology integrator, identify long range Navy training objectives, and outline how this group will effect consensus recommendations and affect decision making. The leveraging action group was tasked with addressing such issues as life cycle management, shared licensing, lease vs. buy concepts, sharing software, consolidating bulk buys of hardware and software, and interoperability/compatibility of hardware and software. The consensus strategy group was tasked to address the development of standard criteria for investments in technology, review the current practices for planned implementations, and to determine a return on investment process. Lastly, the overcoming barriers group was tasked to identify barriers encountered or anticipated, identify processes that do and do not work, and to develop a process for addressing the identified barriers. These four groups were extremely successful and established nearly one hundred goals that would bring to fruition Admiral Tracey's vision.

The first of six Automated Electronic Classrooms was installed at Operation Specialist (OS) "A" school at Fleet Combat Training Center Atlantic, Dam Neck, Virginia, in February of 1999. This particular installation was funded by CNET and the

classroom was only equipped with the large format display, Figure 1 of Appendix A and the instructor station, Figure 3 of Appendix A. Of the 18 personnel in the inaugural class, only one reference was made in the course critiques about the AEC. It simply stated the "new computer system is fine" (Document, 1999).

With all these new changes affecting the classroom, the role of the instructor would have to be expanded. Getting teachers to incorporate innovative techniques and the latest technology would be a challenge. To encourage the change, teachers must be involved in planning and must receive technical training in the use of hardware and software. Then they need to go beyond the technical aspects with a willingness to experiment in new and creative instructional techniques (Marsh, 1991). During this stage teachers develop new beliefs that lead to the effective incorporation of technology into their classrooms. The next logical progression is the expectation that students will learn more in the multimedia classroom. Before we examine academic achievement it is important to note that little to no instruction was provided to the AEC instructional staff. In fact, the contractors only provided the instructors with the rudimentary knowledge of how to turn on and off the equipment and demonstrated in one-hour the capabilities of the hardware and software. Instructional strategies and techniques were never addressed.

Academic Achievement

The literature abounds in studies that compares academic achievement in multimedia classroom instruction to traditional lecture. Hodge-Hardin (1997) compared the math achievement of students taught in a multimedia classroom to students receiving

instruction in a traditional classroom setting. She noted that there were no significant differences in student achievement. At Nova Southeastern University, where electronic telecommunications media is used, the authors noted that when effectiveness of learning is measured by achievement of learning, the outcome points overwhelmingly to its success (Hesser, Kontes & Mizell, 1992). At the University System of Georgia the academic achievement of multimedia learners was consistently comparable with pedagogical taught students (Ellis, Shuler and Thompson, 1998). Schmidt (1991) compared the effectiveness of computer managed instruction versus traditional classroom lecture on achievement outcomes. This study found the incorporation of high technology into teaching strategies to have a positive effect on achievement outcomes. Ball (1984) stated that studies seem to support the concepts of students' learning at least as effectively by computer assisted instruction as by traditional methods. These cited examples of groups studied included elementary, secondary, undergraduate and graduate students and working professionals. The subject areas represented included foreign languages, mathematics, teacher education, business, computer science and nursing. All of the studies found that there was no significant difference in the achievement of students in multimedia programs and the achievement of those in traditional face-to-face programs, based on standard performance measures.

In the American educational system technology is gradually being integrated into the classroom. Yet, technology is often positioned as another content area in which learning about technology takes precedence over learning with technology. Fortunately, this perspective is gradually migrating into the application of technology in the classroom. Multimedia creations allow tactile, visual and auditory learners to

communicate what they have learned and present information in a truly creative manner. The ability to present information in various formats is essential in order to meet every learning style in today's classroom (Williams & Crowell, 1993).

Summary

Instruction based upon a pedagogical methodology is old and is gradually migrating towards a more technologically proficient environment. The presence and use of computer technology in the classroom room has grown significantly in the past ten years. But having the latest technologies in a school does not necessarily mean that such technologies are being used well. A plethora of studies on the affects of multimedia in a classroom were examined and demonstrated the acceptance of multimedia but also showed no effect on academic achievement. CNET and the United States Navy is counting on its Automated Electronic Classroom (AEC) to meet, or surpass, the educational requirements necessary to support the operational readiness of the United States Naval Fleet as well as the budgetary cuts enacted by Congress. The following chapter, Chapter III, will discuss the methods and procedures used in conducting the study.

CHAPTER III

METHODS AND PROCEDURES

The purpose of this study was to determine if Operation Specialist "A" school students academic achievement would be improved if they were placed in an Automated Electronic Classroom (AEC). To research this problem a population was selected, an instrument was designed, data was collected and statistical analyses were performed. This chapter will discuss each of these areas, in addition to the research method used in this study.

Population

The population of this study was the students assigned to Operations Specialist (OS) "A" school at Fleet Combat Training Center Atlantic, Dam Neck, Virginia. In order to become an OS "A" school student an individual has to be eligible to enlist in the United States Navy, have a minimum score of 31 on the Armed Forces Qualification Test (AFQT), complete basic training and meet the following requirements on the Armed Services Vocational Aptitude Battery (ASVAB) test: Word Knowledge (WK) + Arithmetic Reasoning (AR) = 103; sum of word knowledge and paragraph comprehension (VE) + Math Knowledge (MK) + Coding Speed (CS) =153. Additionally all perspective students have to have normal hearing and color perception, no speech impediment and a confidential security clearance (CANTRAC, 2000). There are no age, ethnicity, or academic prerequisites for the students. Both the control and experimental

groups are representative of a typical United States Navy "A" school and were randomly selected homogenous groups.

The management structure of OS "A" school is as follows: there is an Officer In Charge (OIC) whose rank is Commander or O-5, an Executive Officer whose rank is Lieutenant (O-3) and five departments: Phase One, Phase Two, "C" school, Training Support Office (TSO) and Student Affairs. Each department is led by a senior enlisted person, varying in rank from Chief Petty Officer (E-7) to Master Chief Petty Officer (E-9). The remainder of the unit members are assigned to various departments from branch Chiefs down to Seamen. These ranks vary from Senior Chief Petty Officer (E-8) to Seamen (E-3).

Operations Specialist "A" school convenes 70 classes, with a maximum of 25 students per convening which translates to a potential annual throughput of 1750 students. Out of the population, a sample of 259 students from 14 classes were chosen of which 133 were in the control group/traditional classroom and 126 were in the experimental group/AEC. Since 70 classes convene annually, 14 classes equates to roughly 20% of the OS "A" school student throughput per year.

Research Variables

Research variables have been minimized wherever possible to increase the validity of this experiment. Two variables exist in this study, the instructor and the instructional delivery methods. Due to the high volume of student throughput and sea/shore rotations of the instructional staff, a variety of different instructors taught the students.

Instructional delivery methods differed due to the nature of the instructional environments, traditional classroom versus an Automated Electronic Classroom. Length of instruction, content, organization, and testing procedures were the same for both the control and experimental groups. Uncontrollable variables such as student motivation and attitude of the class have not been eliminated, but minimized by quality instruction. Uncontrolled variables controlled by the class have a negligible affect compared to the controlled variables listed above.

Instrument Design

No traditional instrument was used to conduct this experiment; rather a series of weekly examinations and one performance examination were administered to collect the data. The tests are not available due to classification, however the subjects covered included security, introduction to Combat Information Center (CIC), maneuvering boards, signal book, Naval Warfare Publication Library, log keeping, external communications, warfare commanders, introduction to radar, introduction to Naval Tactical Data System (NTDS), charts and Dead Reckoning Trace (DRT).

Classroom Procedures

The control group consisted of ten classes of OS "A" school students who were taught prior to the installation of the Automated Electronic Classrooms (AEC). The experimental group consisted of ten classes of OS "A" school students who were taught in an Automated Electronic Classroom (AEC). Both the control and experimental groups

were taught the exact same material and tested in the exact same manner; the only variables were the instructor and the instructional delivery methods.

Methods of Data Collection

The written tests and the performance examination were identical for both control and experimental groups. All tests were constructed and administered in accordance with NAVEDTRA 130A, Curriculum Development guide for task based curricula. All written examinations contained only multiple choice questions. Academic performance for each student was calculated as a raw score and the mean was derived for each group.

Statistical Analysis

Once the data collection and compilation were completed, statistical analyses were performed. The mean of each test was calculated for both the control and experimental groups from all fourteen classes. T-tests were conducted on the two sample means for both the control and experimental groups to determine student academic achievement. Class scores were analyzed separately to determine if the results were repeatable and also to increase sample size.

Summary

Even though this experiment did not employ a known instrument to collect data, the series of tests used were designed to eliminate controllable, extraneous variables. The

only controllable variable that was manipulated was the classroom environment. In order to measure how the classroom environment affected student academic achievement, an instrument was created consisting of a series of nine objective tests and one performance examination administered over the course of the ten week curriculum to both the control and experimental groups. Methods of data collection and statistical analysis were explained and the findings from the research will be presented and discussed in Chapter IV.

CHAPTER IV

FINDINGS

The purpose of this study was to analyze academic achievement in a traditional classroom and compare it to the academic achievement of Operation Specialist (OS) "A" school students taught in an Automated Electronic Classroom (AEC) at Fleet Combat Training Center Atlantic (FCTCLANT), Dam Neck, Virginia. OS "A" school is a nine-week curriculum which, is segmented into two phases. Phase one is the first five weeks and phase two is the remaining four weeks. The way the curriculum is structured, students can only be in an AEC for weeks one through five and seven due to equipment requirements. Therefore, for the purpose of this study, the primary comparative analysis of retention was focused on phase one or weeks one through five of OS "A" school. This chapter presents the findings of the research.

Presentation of Data

Data were collected from seven traditional and seven AEC classes. The seven traditional classes represented the control group and was comprised of 133 OS "A" school students. The experimental group consisted of 126 OS "A" school students. Areas of study included security, introduction to Combat Information Center (CIC), maneuvering boards, signal book, Naval Warfare Publication Library, log keeping, external communications, warfare commanders, introduction to radar, introduction to Naval Tactical Data System (NTDS), charts and Dead Reckoning Trace (DRT). The

material presented to both groups was taught using the same lesson plan and tested using the same examinations. Either a performance examination or a multiple choice/objective examination tested the student's mastery of subject knowledge. An objective test was given every Friday, which was preceded by a brief review. The performance tests were given on either Thursday or Friday. Retention was then measured by determining raw scores from all objective and performance tests.

In addition to determining raw scores for the objective tests and the performance tests, the means for Phase One (M1), Phase Two (M2), Cumulative (M3) and Armed Forces Qualification Test (AFQT) (M4) were calculated. These four means were calculated to ensure that the results could not be attributed to an unequal distribution of talent in either the control or experimental group. The mean for Phase One (M1) was 84.92 and 87.78 for the control and experimental groups respectively. The mean for Phase Two (M2) of training was 87.88 and 86.40 and the Cumulative mean (M3) was 86.40 and 86.98 for the control and experimental groups respectively. Lastly the average AFQT (M4) was 55.03 and 52.80 for the control and experimental groups respectively. These results are displayed graphically in Figure 1.

The mean and t-test results were tabulated to determine if there was a significant difference in the academic performance of OS "A" school students taught in a traditional classroom compared to an AEC. The experimental groups mean for phase one was 87.7829 and the control group mean was 84.9229, a difference of 2.860 points. The control group then outpaced the experimental group by 1.480 points for phase two, 87.8814 to 86.4014, but the overall mean for the experimental group was 0.4857 points higher than the control group mean, 86.8886 vs. 86.4029. The t-test was calculated to

determine if there was a significant difference in the two groups. The calculated t-ratio for phase one was t=2.795, phase two was t=0.940 and the cumulative t-ratio was t=0.367. These values are listed in Table 1. The student's individual results used in the determination of the means and t-test are provided in Appendix B, Tables 1 through 14.

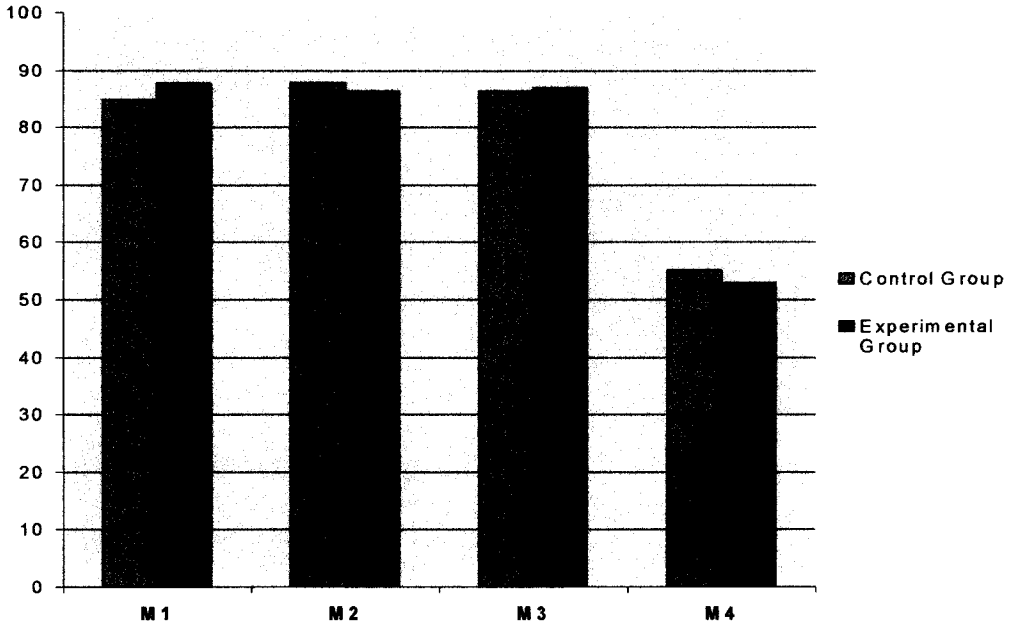

Figure 1

Course Means

	Mean		t-test
	Control	Experimental	
Phase One	84.9229	87.7829	2.795
Phase Two	87.8814	86.4014	0.940
Cumulative	86.4029	86.8886	0.367

Table 1

Data Display

Summary

This chapter has reported the results of the effects of learning in a traditional classroom as compared to learning in an Automated Electronic Classroom (AEC) in OS "A" school at FCTCLANT. The data collected from the test results were presented and were used to determine if there was a significant difference in the academic performance of students taught in a traditional classroom compared to students taught in an AEC. Chapter V will analyze these findings and provide conclusions and recommendations.

CHAPTER V

SUMMARY, CONCLUSIONS and RECOMMENDATIONS

Summary

No study had been completed on the effectiveness of Automated Electronic Classrooms (AEC) at Operations Specialist (OS) "A" school located at Fleet Combat Training Center Atlantic (FCTCLANT), Dam Neck, Virginia. With the infusion of technology into the Naval classroom it was imperative to determine if, in fact, the presence of and use of technology does enhance academic performance. The Navy seemed to think so since OS "A" school has six AECs and are currently under a Training Assessment (TA) study to determine whether or not an additional six AECs would be installed.

The overall purpose of this study was to determine if the infusion of technology into OS "A" School has improved student academic achievement. Specifically, the problem of this study was to determine if OS "A" school students who were taught in an AEC, as established by the Chief of Naval Education and Training (CNET), had a higher rate of academic success compared to OS "A" school students who were taught in a traditional classroom. The hypothesis provided by the researcher stated that there would be no difference in academic achievement for Operation Specialist's taught in an AEC as compared to Operation Specialist's taught in a traditional classroom. The population of this study was the students assigned to OS "A" school at FCTCLANT. From the approximately 70 classes that convene per year, 14 classes and 259 students were chosen. The classes were divided into control and experimental groups; the control group was seven traditionally taught classes and the experimental group was seven classes taught in

an AEC. Additionally, each class was treated as a separate experiment to determine if the results were repeatable. No traditional instrument was used, rather a series of written and performance examinations were used to measure retention. Written tests were given at the end of every week and a practical examination was given on either Thursday or Friday. Statistical analysis was performed to determine if there was a significant difference between the means of the control and experimental groups' scores.

A guiding principle for any study was to maximize the research without creating conflicts, constraints or any internal or external influences. The only limitations imposed upon this study were:

1. All aspects of the study were conducted at OS "A" school FCTCLANT.
2. The study has a sampling size of 7 classes in each of the teaching environments. Note: class size was not uniform.
3. Data collection did not interfere with student training.
4. Data analysis could only be performed on phase one, weeks one through five, of OS "A" school.

Conclusions

Pedagogy, or teacher led instruction, has been the preferred method of teaching since the Middle Ages when formal instruction began. The United States Navy believes that the infusion of technology into a classroom will reduce training time thereby saving taxpayers millions of training dollars. The researcher hypothesized that there would be no difference in academic achievement for Operation Specialist's taught in an AEC as compared to Operation Specialist's taught in a traditional classroom. T-tests were

calculated to determine if there was a significant difference between the seven traditionally taught classes, the control group, and seven classes taught in an AEC, the experimental group. The calculated t-ratio was 2.795. This value exceeds the ninety fifth percentile which means that the proposed hypothesis that "there would be no difference in academic achievement for Operation Specialist's taught in an AEC as compared to Operation Specialist's taught in a traditional classroom" can be accepted at the .05 level of significance.

Even though the level of academic achievement did not statistically change, the researcher noticed several differences in the classroom performance and composition. Students in the traditionally taught environment had a greater fluctuation of grades, as indicated by a larger standard deviation, 2.7007 vs. 1.1925. The traditionally taught students were younger than the AEC students; the average age for the non-AEC students was 19.504 and 20.29 for the AEC students and is graphically displayed in Figure 2. Therefore the level of maturity may have been a contributing factor in grade fluctuations. Additionally, education levels attained prior to joining the Navy varied a great deal. Of the 133 traditionally taught students, 131 had a high school diploma, 2 with a General Education Degree (GED), 20 with some college and 4 with a Bachelors Degree. The 126 AEC taught students were distributed as follows: 108 had a high school diploma, 14 with a General Education Degree (GED), 4 did not finish high school or earn a GED, 15 with some college, 6 with an Associates degree and 3 with a Bachelors Degree. These values are listed in Table 2. Additionally, the Armed Forces Qualification Test (AFQT) scores, also listed in Table 2, were 2.23 points higher for the traditionally taught students than the AEC students. Since the educational levels completed prior to entering the Navy and

the AFQT scores were so diverse, a comprehensive analysis of their affect on academic achievement is beyond the scope of this study.

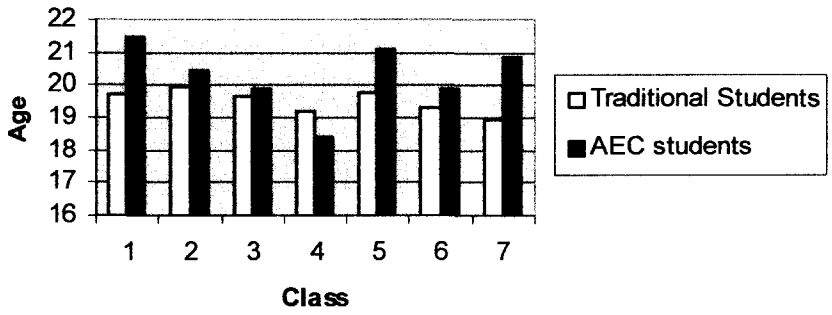

Figure 2

Age Comparison Between Traditional and AEC Students

	No H. S. Diploma	H.S. Diploma	GED	Some College	AA	BS	AFQT
Traditional Students	0	131	2	20	0	4	55.03
AEC Students	4	108	14	15	6	3	52.80

Table 2.

Prior Education Levels

Recommendations

Based on the findings and conclusions drawn, the following recommendations are offered:

1. Provide in-depth training to all instructors on the proper operation of an AEC. Many of the instructors interviewed did not know how to correctly operate all facets of the AEC.

2. Provide in-depth training to all instructors on proper instructional techniques and strategies associated with teaching in an AEC. The researcher believes that the lack of disparity between the raw means and statistical analysis was caused by an insufficient amount of training for the instructors on proper instructional techniques and instructional strategies that are required to create a learning environment that, not only enhances the learning process but fully utilizes every aspect of the Automated Electronic Classroom.
3. Have all nine weeks taught in an AEC. A more comprehensive and qualitative comparison would be accomplished if the entire course were taught in an AEC.
4. Increase the population size of study. An increased population will add to the validity of the study especially when a statistical analysis is performed.
5. Since the standard deviation for AEC students was approximately half of the standard deviation for traditional students, additional research could determine if students taught in AECs are better focused on the material as compared to students taught via traditional means.
6. The diverse degree of education attained prior to entering the Navy and its influence on academic achievement is such that another study should be conducted to determine if and how prior educational levels affect academic performance in an AEC.

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APPENDICES

APPENDIX A

Functional Requirement	**LARGE FORMAT DISPLAY**

Performance Characteristics:

a. Complaint with industry standards for safety and aesthetics
b. Unobstructed view form all Student Stations (raised platform if necessary)
c. Sufficient luminance to view displays without dimming normal ambient lighting
   - Minimum of 450 ANSI-lumens
d. Integrated stereo speaker system
e. Navigation and control via :
   - Interactive touch-screen
   - Remote control
   - Keyboard and mouse
f. Configurable resolution of 800 x 600 or 1024 x 768
g. Supports illustrations:
   - Free-hand "white board" drawings
   - Integrated "overlays"
   - Minimum of 4 colors and eraser

Interfaces:

a. Input capability from:
   - VCR tapes
   - Instructor and Student station displays
   - Industry-standard audio and video files
   - Laser Disc
   - Paper-based materials
b. Output capability of illustrations ("white board" and integrated overlays") to:
   - Printer
   - Storage media (hard drive, floppy, etc.)
   - Speakers

Figure 1

Functional Requirement	**STUDENT STATIONS**

Performance Characteristics:

a. General
- Complaint with industry standards for ergonomics, health and safety
- Comfortable and aesthetic
- Supportive of paper and electronic materials
- Configuarable quantity (up to 20)

b. Furniture:
- Chair
- Computer console
- Desktop and storage space
- Mobile, traditional podium
- Cable management system

c. Hardware:
- IT-21 complaint CPU and monitor
- Resource reserve capacity to provide for addition of at least twice the installed DRAM and hard disk storage
- Adjustable keyboard and mouse trays
- Audio headphones

c. Software and Displays:
- IT-21 complaint (32-bit Windows NT operating system)
- Easy to use, understandable, direct and informative graphical displays
- Monitor optimized at 15° angle
- Anti-virus protection
- Support multiple open windows
- Unobstructed view of Instructor and Large Screen Display

Interfaces:

a. LANs (internal and external to the school facility)
b. Printer

Figure 2

Functional Requirement	**INSTRUCTOR STATION**

Performance Characteristics:

d. General
- Complaint with industry standards for ergonomics, health and safety
- Comfortable and aesthetic
- Supportive of paper and electronic materials, seated operation and stand-up instruction

e. Furniture:
- Chair
- Computer console
- Desktop and storage space
- Mobile, traditional podium
- Cable management system

f. Hardware:
- IT-21 complaint CPU / fileserver
- Resource reserve capacity to provide for addition of at least twice the installed DRAM and hard disk storage
- Dual monitors (driven from single CPU)
- Adequate display area to view form ten feet away
- Remote control / keyboard / mouse
- Document camera

d. Software and Displays:
- IT-21 complaint (32-bit Windows NT operating system)
- Easy to use, understandable, direct and informative graphical displays
- Only essential information required for adequate job performance displayed
- Anti-virus protection
- Support multiple open windows

Interfaces:

a. LANs (internal and external to the school facility)
b. Printer

Figure 3

Functional Requirement	**INSTRUCTOR CONTROLS**
Performance Characteristics: a. Intuitive, simplified operation of multi-directional control of Large Format Display and Instructor/Student Stations via remote control with maximum of 7 buttons/functions. b. Send contents of any station to Large Format Display c. Send contents of any station to any other station d. Freeze all Student Station displays and input devices e. Provide synchronized navigation of Instructor and Student Station displays f. Send commands to Student Stations for instant access to specific training material element and turn over control for Student navigation g. Operate any Student Station using instructor input devices	
Interfaces: • None	
Notes: Use of excessive hardware, cabling, etc. should be minimized to simplify instruction and to reduce acquisition and maintenance costs. These functions have been proven (SPACE/TechSight) to be performed effectively with software. Hardware-based video switching system (AEC) provides one additional feature – the ability to view/scan actual Student Station displays from the Instructor Station. However, it has several drawbacks: (1) requires an additional PC, monitor and cabling devices, (@) does not allow for item (f) above.	

Figure 4

Functional Requirement	**CURRICULUM**

Performance Characteristics:

a. Use lesson Plans:
   - Easily viewable from ten feet away from Instructor Station
   - Remote control navigation
   - Controlled access and secured integrity of approved curriculum during formal training and independent study

b. Use Trainee Guides:
   - Access and navigation by students during formal training and independent study modes

c. Use Personalization:
   - Add, edit, delete, and save during formal training and independent modes
   - Configuration manage – maintain relationships to curriculum elements during updates and provide assisted review of impacted elements
   - Password protected by individual instructors
   - Display simultaneous with, but distinctive from, lesson plan data
   - Display and printing of all elements of lesson plan, with or without personalization, except: change record, letter of promulgation, and objective-assignment chart

d. Use Class Assignments:
   - Selection, broadcast, viewing, completion and receipt during formal training and independent study modes

e. Use Other Media:
   - Interpretation of any associated electronic references (links) stored in Authoring Instructional Media (AIM) version I or II when available
   - Automatic staging/display on instructor station of associated electronic references (links) upon discussion point/related instructor activity activation

f. Transportable from any workstation to instructor station (to allow personalization during independent study mode)

Source: Kribs, 1998.

Figure 5

Appendix B

Operation Specialist "A" School - Traditional Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	80	100	84	85	92	100	90.17	92	100	90	96	100	90.1	94.68	92.43	M	22	56	S	Y				
2	85	88	84	70	94	90	85.17	94	100	92.5	99	97.5	93.4	96.07	90.62	M	22	42	S	Y				
3	70	96	48	75	76	98	77.17	70	100	85.5	99	77.5	76.9	84.82	80.99	F	18	57	S	Y				
4	72.5	92	92	75	92	90	85.58	98	100	94.5	93	97.5	100	97.17	91.38	M	22	61	S	Y		Y(3)		
5	90	96	88	100	86	94	92.33	100	100	89.5	92	95	100	96.08	94.21	F	18	52	S	Y				
6	75	84	80	90	80	94	83.83	96	100	97	94	85	86.8	93.13	88.48	F	19	75	S	Y				
7	95	96	96	95	94	88	94.00	100	100	95	100	97.5	96.7	98.20	96.10	M	18	58	S	Y				
8	77.5	100	92	80	88	96	88.92	92	100	90.5	92	90	86.8	91.88	90.40	M	24	86	M	Y		Y(3)		
9	85	88	88	100	84	98	90.50	100	100	80.5	93	80	96.7	91.70	91.10	F	23	33	S	Y		Y(2)		
10	82.5	92	80	90	98	88	88.42	96	100	97.5	97	90	93.4	95.65	92.03	M	18	40	S	Y				
11	70	100	84	90	86	100	88.33	92	100	97	100	92.5	86.8	94.72	91.53	M	18	35	S	Y				
12	77.5	92	64	80	88	96	82.92	88	100	91.5	96	97.5	86.8	93.30	88.11	M	18	61	S	Y		Y(1)		
13	85	96	84	100	70	88	87.17	86	100	91.5	99	92.5	86.8	92.63	89.90	M	19	53	S	Y				
14	70	84	80	85	70	98	81.17	70	100	90.5	99	75	80.2	85.78	83.48	F	20	51	S	Y		Y(2)		
15	87.5	88	92	85	92	100	90.75	100	100	96	97	92.5	100	97.58	94.17	M	19	52	S	Y				
16	82.5	92	44	75	92	100	80.92	88	100	87	89	82.5	80.2	87.78	84.35	M	18	59	S	Y				
17	75	88	88	70	78	94	82.17	82	100	90	97	95	96.7	93.45	87.81	M	19	50	S	Y				
	80.00	92.47	80.47	85.00	85.88	94.82	86.44	90.82	100	91.53	96.00	90.44	90.49	93.21	89.83	AVE	19.71	54.18						

Table 1.

Class 97483

Operation Specialist "A" School - Traditional Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex					Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	82.5	76	72	100	80	98	84.75	82	100	93	82.5	84	83.5	87.50	86.13	F	19	41	S	Y				
2	85	84	96	90	76	88	86.50	92	100	88.5	77.5	88	80.2	87.70	87.10	M	19	35	S	Y				
3	85	76	72	90	80	100	83.83	80	100	96.5	100	100	93.4	94.98	89.41	F	18	56	S	Y				
4	95	96	72	90	90	94	89.50	90	100	96	95	100	90.1	95.18	92.34	M	17	81	S	Y				
5	90	80	84	75	90	92	85.17	88	100	84	85	80	86.8	87.30	86.23	F	20	53	M	Y				
6	77.5	76	72	100	94	82	83.58	94	100	85	87.5	96	83.5	91.00	87.29	M	18	51	S	Y				
7	87.5	92	100	100	80	98	92.92	72	100	93	92.5	100	90.1	91.27	92.09	M	22	96	S	Y				Y
8	87.5	84	76	90	76	98	85.25	76	100	96	87.5	91	93.4	90.65	87.95	M	18	63	S	Y				
9	85	92	88	100	84	98	91.17	84	100	91	90	91	80.2	89.37	90.27	M	20	61	M	Y				
10	87.5	80	56	90	78	94	80.92	84	100	90	82.5	95	90.1	90.27	85.59	M	21	35	S	Y				
11	92.5	80	84	75	92	100	87.25	90	100	95	92.5	99	90.1	94.43	90.84	F	20	44	S	Y				
12	92.5	96	84	100	96	100	94.75	76	100	98	92.5	92	86.8	90.88	92.82	M	22	56	S	Y				Y
13	85	68	96	90	82	74.5	82.58	86	100	86	75	94	70	85.17	83.88	M	18	52	S	Y				
14	95	100	96	95	86	99	95.17	96	100	97	100	96	73.6	93.77	94.47	M	20	68	M	Y				
15	95	96	100	95	92	98	96.00	96	100	95	100	92	93.4	96.07	96.03	M	20	58	S	Y				
16	87.5	84	80	100	90	98	89.92	90	100	91.5	85	95	90.1	91.93	90.93	M	18	59	M	Y				
17	80	64	80	85	94	98	83.50	72	100	81.5	85	84	76.9	83.23	83.37	M	20	46	S	Y				
18	95	84	76	95	88	99	89.50	86	100	90	82.5	96	86.8	90.22	89.86	M	20	35	S	Y				
19	95	88	80	95	86	98	90.33	96	100	97	95	96	93.4	96.23	93.28	M	22	52	S	Y		Y(2)		
20	90	72	60	95	72	80	78.17	78	100	81	77.5	82	73.6	82.02	80.09	M	22	47	M	Y				
21	90	88	96	95	84	99	92.00	88	100	87	85	80	83.5	87.25	89.63	F	21	40	S	Y				
	88.57	83.62	81.90	92.62	85.24	94.55	87.75	85.52	100	91.05	88.10	91.95	85.21	90.31	89.03	AVE	19.94	55.39						

Table 2.

Class 98011

Operation Specialist "A" School - Traditional Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	87.5	84	56	85	88	100	83.42	82	100	90	87.5	96	86.8	90.38	86.90	M	19	62	S	N	Y			
2	80	96	96	95	76	94	89.50	72	100	99	80	88	80.2	86.53	88.02	M	20	52	S	Y				
3	82.5	72	76	70	78	96	79.08	70	100	81.5	70	90	73.6	80.85	79.97	M	20	41	S	Y		Y(1)		
4	82.5	100	80	75	80	96	85.58	72	100	94	85	84	86.8	86.97	86.28	M	20	64	S	Y				
5	80	88	96	70	88	95	86.17	88	100	81	87.5	83	96.7	89.37	87.77	F	23	35	S	Y		Y(1)		
6	87.5	76	88	95	82	95	87.25	80	100	83	85	80	90.1	86.35	86.80	M	17	65	S	Y				
7	77.5	88	76	80	62	96	79.92	84	100	91	70	84	90.1	86.52	83.22	M	18	44	S	Y				
8	75	88	80	75	76	94	81.33	90	100	76	85	96	90.1	89.52	85.43	M	19	36	S	Y				
9	92.5	96	100	90	100	97	95.92	92	100	98	92.5	100	100	97.08	96.50	M	20	80	S	Y				
10	67.5	100	96	75	86	93	86.25	88	100	97	90	100	96.7	95.28	90.77	M	26	95	M/S	Y				Y
11	92.5	76	80	90	86	96	86.75	80	100	90.5	90	63	83.5	84.50	85.63	M	18	54	S	Y				
12	72.5	88	80	80	68	93	80.25	86	100	80	60	88	93.4	84.57	82.41	M	18	33	S	Y				
13	87.5	76	100	90	62	75	81.75	90	100	73	85	76	90.1	85.68	83.72	M	20	53	S	N	Y			
14	97.5	76	84	70	90	98	85.92	84	100	93.5	81.5	92	83.5	89.08	87.50	M	20	46	S	Y				
15	85	70	88	90	92	92	86.17	90	100	100	77.5	66	90.1	87.27	86.72	M	20	52	S	Y				
16	75	52	72	70	76	81	71.00	70	100	92	60	80	53	75.83	73.42	M	19	53	S	Y				
17	92.5	92	92	100	88	96	93.42	94	100	100	100	88	96.7	96.45	94.93	M	19	61	S	Y				
18	72.5	88	84	80	80	98	83.75	90	100	88	92.5	98	76.9	90.90	87.33	M	18	53	S	Y				
19	82.5	88	52	90	96	70	79.75	70	100	86.5	82.5	76	70.3	80.88	80.32	M	18	65	S	Y				
20	65	92	72	70	86	79	77.33	70	100	86	70	80	73.6	79.93	78.63	M	21	59	S	Y				
	81.75	84.30	82.40	82.00	82.00	91.70	84.03	82.10	100	89.00	81.58	85.40	85.11	87.20	85.61	AVE	19.67	54.94						

Table 3.

Class 98021

Operation Specialist "A" School - Traditional Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	80	92	100	70	90	100	88.67	70	100	96	77.5	90	81.8	85.88	87.28	M	18	62	S	Y				
2	82.5	92	88	70	58	97	81.25	87.5	70	70	80	84	83.5	79.17	80.21	M	18	43	S	Y				
3	77.5	92	28	90	72	99	76.42	90	100	86	77.5	84	70.3	84.63	80.53	M	19	56	S	Y				
4	75	48	20	45	74	94	59.33	70	100	72	70	65	70.3	74.55	66.94	M	19	43	S	Y				
5	72.5	100	92	70	86	100	86.75	76	100	97	85	80	79.6	86.27	86.51	M	18	42	S	Y				
6	90	56	100	70	84	100	83.33	84	100	95	85	76	78.1	86.35	84.84	M	18	52	S	Y				
7	67.5	76	56	75	92	97.5	77.33	78	100	89	77.5	70	76.3	81.80	79.57	M	18	57	S	Y				
8	92.5	100	92	90	90	100	94.08	94	100	100	95	83	85.4	92.90	93.49	M	19	56	S	Y				
9	82.5	56	80	45	76	98	72.92	88	100	89	70	73	71.09	81.85	77.38	M	22	44	S	Y		Y(2)		
10	87.5	88	84	85	88	100	88.75	82	100	97.5	77.5	84	83	87.33	88.04	M	19	97	S	Y				
11	70	96	76	60	90	99	81.83	72	100	96	72.5	77	68.4	80.98	81.41	M	20	32	S	Y				
12	90	100	88	90	84	100	92.00	88	100	100	90	100	86.33	94.06	93.03	M	18	84	S	Y				
13	82.5	56	92	70	82	92	79.08	70	100	78	75	97	62	80.33	79.71	F	19	53	S	Y		Y(1)		
14	70	52	88	60	78	100	74.67	70	100	85	80	78	75.18	81.36	78.02	M	20	35	S	Y				
15	72.5	70	80	70	78	84	75.75	88	100	85	70	70	64.7	79.62	77.68	M	17	62	S	Y				
16	82.5	76	96	70	86	20	71.75	70	100	83	80	96	70.35	83.23	77.49	F	25	53	S	Y		Y(1)		
	79.69	78.13	78.75	70.63	81.75	92.53	80.24	79.84	98.13	88.66	78.91	81.69	75.40	83.77	82.01	AVE	19.19	54.44						

Table 4.

Class 98031

Operation Specialist "A" School - Traditional Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	92.5	92	72	80	84	98	86.42	80	100	96	85	71	53.8	80.97	83.69	F	22	55	S	Y				
2	92.5	80	88	75	74	91	83.42	84	100	93	76	95	90.1	89.68	86.55	M	18	40	S	Y				
3	87.5	80	80	90	82	98	86.25	90	100	89	94	77	86.8	89.47	87.86	M	19	41	S	Y				
4	82.5	70	92	80	78	98	83.42	74	100	98	80	95	86.8	88.97	86.19	M	20	59	S	Y				
5	87.5	84	84	95	80	100	88.42	82	100	97	78	73	76.9	84.48	86.45	M	18	75	S	Y				
6	90	100	100	90	80	100	93.33	82	100	97	90	83	93.4	90.90	92.12	M	18	72	S	Y				
7	80	72	88	90	72	96	83.00	70	100	94	80	80	70.3	82.38	82.69	M	20	63	S	Y				
8	75	96	84	90	86	93	87.33	70	100	99	82	76	53.8	80.13	83.73	F	18	77	S	Y				
9	75	70	96	85	88	94	84.67	70	100	94	72.5	96	50.5	80.50	82.58	M	19	35	S	Y				
10	72.5	56	84	80	76	87	75.92	84	100	94	82	77	80.2	86.20	81.06	M	22	43	M	Y				
11	82.5	88	100	90	76	93	88.25	78	100	98	80	100	70.3	87.72	87.98	M	21	43	S	Y		Y(3)		
12	82.5	96	96	95	90	98	92.92	84	100	100	88	100	96.7	94.78	93.85	M	19	80	S	Y				
13	95	92	100	100	90	91	94.67	86	100	95	97.5	100	93.4	95.32	94.99	F	20	71	S	Y				
14	90	70	100	80	84	90	85.67	76	100	96.5	80	83	73.6	84.85	85.26	M	26	42	M	Y		Y(1)		
15	87.5	80	88	75	72	94	82.75	82	100	91	84	92	80.2	88.20	85.48	M	18	58	S	Y				
16	72.5	92	88	85	76	99	85.42	70	100	100	88	92	80.2	88.37	86.89	M	18	51	S	Y				
	84.06	82.38	90.00	86.25	80.50	95.00	86.36	78.88	100	95.72	83.56	86.88	77.31	87.06	86.71	AVE	19.75	56.56						

Table 5.

Class 98043

Operation Specialist "A" School - Traditional Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	95	70	96	85	92	90	88.00	96	100	94.5	90	92	80.2	92.12	90.06	M	20	68	S	Y				
2	70	48	72	90	84	94	76.33	84	100	70	82.5	83	80.2	83.28	79.81	F	19	53	S	Y				
3	75	80	60	70	80	90	75.83	54	100	92	70	84	86.8	81.13	78.48	F	18	56	S	Y				
4	85	88	64	95	84	85	83.50	96	100	89.5	75	87	80.2	87.95	85.73	M	18	65	S	Y				
5	77.5	96	92	100	90	89	90.75	96	100	78	87.5	80	83.5	87.50	89.13	M	21	59	S	Y		Y(1)		
6	92.5	92	80	100	88	89	90.25	92	100	81.5	70	91	93.4	87.98	89.12	M	22	66	S	Y				
7	75	100	88	90	60	95	84.67	72	100	80.5	80	70	80.2	80.45	82.56	M	20	42	S	Y				
8	72.5	70	80	100	90	90	83.75	84	100	70	75	80	73.6	80.43	82.09	F	20	44	S	Y				
9	75	84	60	90	82	82	78.83	78	100	89	75	87	86.8	85.97	82.40	M	19	61	S	Y		Y(1)		
10	70	72	80	70	88	83	77.17	78	100	79.5	72.5	70	73.6	78.93	78.05	M	19	45	S	Y				
11	70	80	72	45	74	99	73.33	72	100	75.5	70	76	72.8	77.72	75.53	F	22	51	S	Y		Y(3)		
12	75	92	96	75	78	100	86.00	64	100	70	52.5	74	71.3	71.97	78.98	F	18	56	S	Y				
13	85	96	88	70	78	98	85.83	74	100	83	80	70	83.5	81.75	83.79	M	20	53	S	Y		Y(2)		
14	70	92	60	70	82	70	74.00	72	100	70	85	70	86.8	80.63	77.32	F	21	42	S	Y		Y(3)		
15	85	92	72	70	86	100	84.17	68	100	96	77.5	77	76.9	82.57	83.37	M	18	63	S	Y				
16	80	36	40	55	92	87	65.00	82	100	86.5	65	74	80.2	81.28	73.14	F	19	53	S	Y				
17	92.5	100	88	85	94	96	92.58	88	100	91.5	80	81	100	90.08	91.33	M	19	45	S	Y		Y(1)		
18	87.5	92	52	70	82	98	80.25	78	100	81.5	80	81	73.6	82.35	81.30	M	19	56	S	Y				
19	75	92	60	70	72	98	77.83	86	100	77	65	80	83.5	81.92	79.88	M	19	45	S	Y				
20	92.5	100	96	95	88	100	95.25	96	100	98	90	96	93.4	95.57	95.41	M	20	88	S	Y				Y
21	82.5	88	84	90	78	97	86.58	80	100	91.5	90	70	86.8	86.38	86.48	M	19	57	S	Y				
22	75	100	64	85	80	96	83.33	78	100	80	85	89	86.8	86.47	84.90	M	21	52	M/S	Y				
23	95	92	96	90	86	96	92.50	84	100	96	90	100	90.1	93.35	92.93	F	19	79	S	Y				
24	87.5	80	76	80	80	100	83.92	82	100	85	85	70	73.6	82.60	83.26	M	17	82	S	Y				
25	87.5	76	72	70	76	91	78.75	72	100	75	72.5	71	70.3	76.80	77.78	M	19	32	S	Y				
	81.10	84.32	75.52	80.40	82.56	92.52	82.74	80.24	100.00	83.24	77.80	80.12	81.92	83.89	83.31	AVE	19.33	55.78						

Table 6.

Class 98061

Operation Specialist "A" School - Traditional Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	95	76	96	95	90	98	91.67	100	100	86	92.5	93	73.6	90.85	91.26	M	18	67	S	Y				
2	82.5	92	44	90	76	94	79.75	82	100	91	92.5	84	70.3	86.63	83.19	M	20	52	S	Y				
3	92.5	100	84	90	92	94	92.08	92.08	92	100	100	100	92	96.01	94.05	M	20	47	S	Y				
4	85	80	84	80	82	100	85.17	85.17	92	100	86.5	82.5	94	90.03	87.60	M	18	44	S	Y				
5	70	80	72	70	70	100	77.00	77.00	78	100	89	87.5	85	86.08	81.54	M	19	32	S	Y				
6	55	76	76	70	90	92	76.50	76.50	88	100	79	79.5	85	84.67	80.58	M	18	42	S	Y				
7	95	92	96	95	92	100	95.00	95.00	96	100	100	100	93	97.33	96.17	M	18	75	S	Y				
8	82.5	100	80	80	82	100	87.42	87.42	86	100	98	82.5	89	90.49	88.95	M	18	44	S	Y				
9	82.5	88	80	75	88	86	83.25	83.25	76	100	96.5	87.5	87	88.38	85.81	M	20	58	S	Y				
10	72.5	88	72	60	72	100	77.42	77.42	72	100	92.5	79.5	76	82.90	80.16	M	18	47	S	Y				
11	90	100	92	95	94	100	95.17	95.17	92	100	98.5	98	96	96.61	95.89	M	20	71	S	Y				
12	90	92	92	90	90	100	92.33	92.33	96	100	96	87.5	100	95.31	93.82	M	20	63	S	Y		Y(1)		
13	95	100	84	85	84	98	91.00	91.00	82	100	86	92.5	93	90.75	90.88	M	18	46	S	Y				
14	95	76	92	90	90	96	89.83	89.83	70	100	87	87.8	95	88.27	89.05	M	19	55	S	Y				
15	80	70	12	70	82	96	68.33	68.33	82	100	76	92.5	74	82.14	75.24	M	22	70	S	Y				
16	80	92	88	85	92	94	88.50	88.50	70	100	91	92.5	78	86.67	87.58	M	18	36	S	Y				
17	100	96	92	95	92	98	95.50	95.50	98	100	97	97.5	100	98.00	96.75	M	19	52	S	Y				
18	97.5	100	96	100	96	100	98.25	98.25	96	100	100	100	100	99.04	98.65	M	18	69	S	Y				
	85.56	88.78	79.56	84.17	86.33	97.00	86.90	86.90	87.49	87	98.72	92.11	90.24	90.41	87.83	AVE	18.94	54						

Table 7.

Class 98071

Operation Specialist "A" School - Automated Electronic Classroom Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	80	88	80	85	91	88	85.33	94	100	91.5	90	80	90.01	90.92	88.13	F	24	54	S	Y			Y	
2	87.5	100	84	80	89	90	88.42	86	100	81	77.5	80	83.35	84.64	86.53	M	18	32	S	Y				
3	82.5	88	100	95	89	94	91.42	84	100	77	82.5	94	70.03	84.59	88.00	F	22	35	S	Y				
4	77.5	88	92	75	91	88	85.25	84	100	83.5	77.5	89	73.36	84.56	84.91	M	19	38	S	Y				
5	90	88	80	95	100	92	90.83	94	100	95	100	99	86.68	95.78	93.31	M	23	62	M	Y				
6	85	76	70	90	86	78	80.83	80	100	70	77.5	76	90.01	82.25	81.54	F	20	31	S	Y				
7	90	84	88	85	90	94	88.50	86	100	91	90	66	90.01	87.17	87.83	F	21	56	S	Y				
8	75	100	92	95	85	86	88.83	90	100	80.5	77.5	79	73.36	83.39	86.11	M	25	53	S	Y			Y	
9	95	100	100	90	100	100	97.50	96	100	99.5	95	100	100	98.42	97.96	M	26	88	S	Y				Y
10	82.5	80	70	80	95	98	84.25	76	100	87	75	91	80.02	84.84	84.54	M	26	58	M		Y			
11	95	84	80	95	100	84	89.67	90	100	95	87.5	100	83.35	92.64	91.15	M	17	56	S		Y			
12	70	100	96	80	100	90	89.33	80	100	92	87.5	81	83.35	87.31	88.32	F	20	77	S	Y				
13	90	80	100	90	100	88	91.33	88	100	81	77.5	70	80.02	82.75	87.04	F	18	56	S	Y				
Ave	84.62	88.92	87.08	87.31	93.54	90.00	88.58	86.77	100	86.46	84.23	85.00	83.35	87.64	88.11	AVE	21.46	53.54						

Table 8.

Class 99160

Operation Specialist "A" School - Automated Electronic Classroom Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	72.5	92	80	90	94	100	88.08	82	100	70	87.5	92	93.33	87.47	87.78	M	19	46	S	Y				
2	80	92	96	100	72	90	88.33	72	100	91	82.5	77	83.35	84.31	86.32	F	18	50	S	Y				
3	87.5	88	96	95	70	74	85.08	76	100	79.5	72.5	84	73.33	80.89	82.99	M	20	41	S	Y				
4	72.5	84	92	95	72	94	84.92	70	100	83	62.5	58	73.33	74.47	79.69	M	20	45	S		Y			
5	80	88	100	95	78	88	88.17	76	100	86	72.5	83	66.67	80.70	84.43	M	19	72	S	10				
6	77.5	96	100	100	92	93	93.08	66	100	97.5	70	100	80	85.58	89.33	M	20	61	S	Y				
7	87.5	100	100	100	100	96	97.25	86	100	99	82.5	100	73.36	90.14	93.70	M	20	67	S	Y				
8	75	96	96	100	88	83	89.67	68	100	75	77.5	75	76.67	78.70	84.18	M	20	33	S	Y				
9	80	100	92	100	90	96	93.00	56	100	96	80	94	76.67	83.78	88.39	M	19	59	S	11				
10	70	88	92	80	90	83	83.83	70	100	70.5	70	92	70	78.75	81.29	F	20	47	S	Y				
11	70	80	72	95	86	93	82.67	64	100	79	92.5	100	73.33	84.81	83.74	F	23	67	S	Y		Y(1)		
12	77.5	84	96	90	82	93	87.08	66	100	86	80	93	76.69	83.62	85.35	M	19	61	M	Y				
13	82.5	96	96	100	90	100	94.08	90	100	91	80	85	80	87.67	90.88	M	22	55	S		Y			
14	72.5	96	80	95	76	90	84.92	84	100	86.5	77.5	97	90	89.17	87.04	F	18	49	S	Y				
15	87.5	96	100	95	100	97	95.92	92	100	98	100	93	96.67	96.61	96.26	M	20	85	S	Y			Y	
16	85	92	96	100	88	94	92.50	84	100	89	85	86	83.33	87.89	90.19	M	20	69	S	Y		Y(1)		
17	87.5	100	96	100	96	93	95.42	88	100	94	85	100	90	92.83	94.13	M	18	42	M	Y		Y(2)		
18	72.5	80	72	100	76	93	82.25	68	100	80	72.5	82	86.67	81.53	81.89	M	22	57	S		Y			
19	77.5	88	88	100	90	72	85.92	84	100	60	75	96	70	80.83	83.38	M	20	42	S	Y				
20	77.5	96	100	85	80	75	85.58	74	100	79.5	62.5	81	80	79.50	82.54	M	23	69	S	Y			Y	
21	90	100	96	100	90	96	95.33	92	100	96	90	96	93.33	94.56	94.94	M	22	50	S	Y			Y	
														Ave										
Ave	79.17	92.00	92.19	95.95	85.71	90.14	89.19	76.57	100	85.07	78.93	88.76	80.32	84.94	87.07	AVE	20.46	57.85						

Table 9.

Class 99210

Operation Specialist "A" School - Automated Electronic Classroom Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	65	84	80	75	82	97	80.50	52	100	70	65	95	63.37	74.23	77.36	M	23	43	S	Y		Y(1)		
2	80	80	100	100	96	98	92.33	60	100	53.38	70	70	95	74.73	83.53	M	20	53	S	11				
3	70	80	84	100	88	100	87.00	92	100	91	77.5	96	100	92.75	89.88	M	19	62	S	Y				
4	95	100	92	90	100	99	96.00	98	100	93	92.5	92	96.67	95.36	95.68	M	20	72	S	Y				
5	77.5	72	76	75	86	95	80.25	88	100	93.5	82.5	91	93.34	91.39	85.82	F	17	36	S	Y				
6	57.5	72	96	90	90	88	82.25	82	100	85	65	91	53.38	79.40	80.82	M	19	33	S	Y				
7	75	96	100	85	90	96	90.33	96	100	94	87.5	92	93.34	93.81	92.07	F	18	58	S	Y				
8	47.5	80	84	85	70	98	77.42	84	100	73	62.5	96	83.35	83.14	80.28	F	21	40	S	Y				
9	82.5	100	96	75	90	99	90.42	86	100	86	82.5	95	90.01	89.92	90.17	M	18	43	S	Y				
10	82.5	100	96	90	76	100	90.75	86	100	85.5	77.5	96	76.69	86.95	88.85	M	18	62	S	Y				
11	57.5	44	84	80	70	79	69.08	72	100	73	75	84	83.35	81.23	75.15	F	23	40	D	Y		Y(1)		
12	77.5	100	100	80	88	96	90.25	80	100	88	70	77	83.35	83.06	86.65	M	23	54	S	Y				
Ave	72.29	84.00	90.67	85.42	85.50	95.42	85.55	81.33	100	82.12	75.63	89.58	84.32	85.50	85.52	AVE	19.92	49.67						

Table 10.

Class 99370

Operation Specialist "A" School - Automated Electronic Classroom Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	82.5	96	88	80	74	96	86.08	78	100	79	62.5	78	80.02	79.59	82.84	M	18	47	S	Y				
2	95	92	92	100	88	96	93.83	96	100	92.5	95	95	96.67	95.86	94.85	M	23	94	M	Y				Y
3	92.5	100	100	90	90	96	94.75	96	100	95	97.5	93	93.34	95.81	95.28	M	18	61	S	Y				
4	90	96	80	95	88	100	91.50	82	100	89	90	100	96.67	92.95	92.22	F	19	49	S	Y				
5	90	92	72	85	74	100	85.50	84	100	78	80	95	63.37	83.40	84.45	F	19	73	S	Y				
6	97.5	80	92	95	94	100	93.08	98	100	89	82.5	92	90.01	91.92	92.50	F	21	53	M	Y				
7	75	96	100	95	88	100	92.33	88	100	85	75	96	96.67	90.11	91.22	M	18	50	S	Y				
8	97.5	92	76	100	84	96	90.92	92	100	83	85	99	93.34	92.06	91.49	F	18	62	S	Y				
9	92.5	96	92	80	82	100	90.42	66	100	90	95	91	93.34	89.22	89.82	M	19	50	S	Y				
10	87.5	76	76	75	76	100	81.75	72	100	72	80	82	86.68	82.11	81.93	M	17	59	S	Y				
11	85	100	92	90	86	90	90.50	84	100	95	87.5	96	90.01	92.09	91.29	M	19	53	S	Y				
12	87.5	76	68	100	82	100	85.58	78	100	91	92.5	77	86.68	87.53	86.56	M	18	57	S	11				
13	80	92	92	85	88	100	89.50	90	100	89	62.5	96	76.69	85.70	87.60	M	18	48	S	Y				
14	80	80	60	85	78	94	79.50	94	100	74	80	78	96.67	87.11	83.31	M	17	47	S	Y				
15	90	76	88	100	84	96	89.00	86	100	87	70	92	93.34	88.06	88.53	F	18	54	S	Y				
16	80	100	92	90	78	96	89.33	82	100	71	77.5	96	86.68	85.53	87.43	M	19	41	S	Y				
17	87.5	88	76	75	82	96	84.08	84	100	81.5	90	95	90.01	90.09	87.08	M	20	84	S	Y		Y(2)		
18	80	60	76	80	78	100	79.00	84	100	82	80	85	73.36	84.06	81.53	M	18	67	S	Y				
19	80	96	92	90	86	100	90.67	80	100	70	85	88	93.34	86.06	88.36	M	18	35	S	Y				
20	87.5	88	72	90	92	96	87.58	90	100	83	95	89	100	92.83	90.21	M	19	65	S	Y				
21	90	68	96	100	88	96	89.67	88	100	89	82.5	100	83.35	90.48	90.07	M	20	71	S	Y		Y(2)		
22	60	64	60	65	86	100	72.50	80	100	70	90	96	90.01	87.67	80.08	M	18	52	S	Y				
Ave	87.02	87.62	84.38	89.52	83.81	97.52	88.31	85.33	100	84.05	83.10	91.10	88.58	88.69	88.50	AVE	18.38	56.38						

Table 11.

Class 99381

Operation Specialist "A" School - Automated Electronic Classroom Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex					Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	75	100	92	85	84	100	89.33	74	100	85	80	88	96.67	87.28	88.31	M	17	54	S	Y				
2	90	92	92	90	80	84	88.00	74	100	82	85	92	96.67	88.28	88.14	F	18	32	S	Y				
3	75	88	92	85	92	97	88.17	84	100	94	92.5	93	80.02	90.59	89.38	M	18	59	S	Y				
4	72.5	92	92	90	80	88	85.75	74	100	94	80	84	80.02	85.34	85.54	M	18	69	S	Y				
5	62.5	72	92	80	56	100	77.08	66	100	70	67.5	80	60.04	73.92	75.50	M	18	35	S	Y				
6	85	84	92	100	78	84	87.17	86	100	95	80	99	80.02	90.00	88.59	M	17	85	S		Y			
7	97.5	100	92	100	90	100	96.58	82	100	91	85	88	93.34	89.89	93.24	M	18	61	S	Y				
8	87.5	84	100	75	76	93	85.92	68	100	88	70	86	70.03	80.34	83.13	M	18	54	S	Y				
9	80	84	96	85	72	96	85.50	78	100	84	67.5	81	73.36	80.64	83.07	M	19	58	S	Y				
10	90	92	92	90	88	82	89.00	80	100	90	85	100	83.35	89.73	89.36	M	22	40	M	Y				
11	72.5	80	92	90	72	86	82.08	52	100	76.5	47.5	91	73.36	73.39	77.74	M	18	62	S		Y			
12	90	84	100	95	68	86	87.17	70	100	78	80	73	76.69	79.62	83.39	M	18	40	S	Y				
13	80	88	84	95	94	100	90.17	86	100	76.5	77.5	95	96.67	88.61	89.39	F	21	56	S	Y		Y(1)		
14	92.5	100	100	80	84	96	92.08	76	100	89	95	93	83.35	89.39	90.74	F	20	71	S	Y				
15	77.5	68	84	75	74	97	79.25	72	100	73.5	75	75	76.69	78.70	78.97	M	18	42	S	Y				
16	72.5	88	100	90	78	89	86.25	66	100	75	75	89	73.36	79.73	82.99	F	20	50	S	Y				
17	85	68	84	100	90	100	87.83	80	100	90	87.5	77	83.35	86.31	87.07	M	26	59	M	Y				
18	92.5	84	96	90	82	97	90.25	70	100	83	80	89	80.02	83.67	86.96	F	18	35	S	Y				
19	90	92	92	90	84	96	90.67	82	100	79	75	73	80.02	81.50	86.09	M	21	44	S		Y			
20	75	68	76	85	92	97	82.17	78	100	75	85	91	90.01	86.50	84.33	M	35	57	S	Y				
Ave	82.13	85.40	92.00	88.50	80.70	93.40	87.02	74.90	100	83.43	78.50	86.85	81.35	84.17	85.60	AVE	21.08	51.38						

Table 12.

Class 20023

Operation Specialist "A" School - Automated Electronic Classroom Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex					Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	95	100	100	100	98	99	98.67	94	100	96.67	87	90	100	94.61	96.64	M	20	63	S	Y		Y(1)		
2	100	96	96	100	98	100	98.33	94	100	96.67	92.5	77	93	92.20	95.26	F	21	71	S	Y		Y(1)		
3	85	32	68	95	84	99	77.17	86	100	90.01	70	77	75	83.00	80.08	F	19	75	S	Y				
4	87.5	84	96	100	92	98	92.92	96	100	86.68	92	80	91	90.95	91.93	F	19	42	S	Y				
5	85	96	92	95	84	100	92.00	84	100	96.67	82	77.5	96	89.36	90.68	M	20	47	S	Y				
6	80	92	80	100	78	99	88.17	82	100	90.01	82	82.5	83	86.59	87.38	M	18	43	S	Y				
7	85	100	92	100	84	99	93.33	84	100	93.34	75	76	92	86.72	90.03	M	25	74	S	Y		Y(2)		
8	95	96	76	85	86	95	88.83	94	100	83.35	87.5	87	92	90.64	89.74	F	26	33	M	Y				
9	87.5	88	100	95	92	94	92.75	90	100	100	87.5	82.5	96	92.67	92.71	F	24	31	S	Y		Y(3)		
10	75	72	88	70	80	100	80.83	78	100	76.69	76	72.5	80	80.53	80.68	M	18	39	S	Y				
11	75	100	96	100	92	100	93.83	94	100	100	86	70	99	91.50	92.67	M	20	49	S	Y				
12	85	72	88	70	80	93	81.33	80	100	80.02	70	77.5	90	82.92	82.13	F	19	44	S	Y				
13	85	52	80	70	84	80	75.17	76	100	90.01	80	75	85	84.34	79.75	M	19	32	S	Y				
14	85	84	76	90	82	98	85.83	94	100	76.69	89	77.5	92	88.20	87.02	M	18	35	S	Y				
15	90	100	88	100	90	100	94.67	82	100	96.67	87.5	80	92	89.70	92.18	M	18	64	S	Y				
16	85	64	88	85	80	99	83.50	84	100	93.34	81	72.5	84	85.81	84.65	M	22	44	S	Y		Y(3)		
17	87.5	64	88	75	78	100	82.08	86	100	66.7	95	85	89	86.95	84.52	M	18	70	S		Y			
18	75	96	60	70	82	89	78.67	76	100	63.37	70	85	80	79.06	78.86	M	18	48	S		Y			
19	85	92	96	90	98	100	93.50	100	100	96.67	78	87.5	82	90.70	92.10	M	21	81	S	Y				
20	82.5	72	84	90	76	100	84.08	84	100	86.68	65	73	92	83.45	83.77	F	18	39	S	Y				
Ave	85.50	82.60	86.60	89.00	85.90	97.10	87.78	86.90	100	88.01	81.65	79.25	89.15	87.49	87.64	AVE	19.92	46.85						

Table 13.

Class 20171

Operation Specialist "A" School - Automated Electronic Classroom Students

	Week 1	Week 2	Week 3	Week 4	Week 5		Phase 1	Week 6		Week 7	Week 8		Week 9	Phase 2	Final	Sex						Some		
Stu	Test	Test	Test	Test	Test	Prac	Ave	Test	Prac	Test	Test	Prac	Test	Ave	Ave	M/F	AGE	AFQT	M/S	H.S.	GED	College	AA	BS.
1	75	96	100	80	92	100	90.50	86	100	86.69	99	92.5	95	93.20	91.85	F	18	39	S	Y				
2	87.5	88	60	90	90	100	85.92	76	100	80.02	76	80	87	83.17	84.54	F	18	32	S	Y				
3	90	96	96	95	86	100	93.83	84	100	96.67	84	92	79	89.28	91.56	M	19	79	S		Y			
4	85	92	96	85	90	100	91.33	70	100	90.01	77.5	92	89.5	86.50	88.92	F	18	41	S	Y				
5	85	84	84	70	74	100	82.83	62	100	90.01	72.5	92	82	83.09	82.96	M	26	71	S		Y			
6	90	100	100	100	92	100	97.00	86	100	96.67	82.5	78	97	90.03	93.51	F	23	67	S	Y				Y
7	77.5	96	100	95	90	97	92.58	86	100	86.69	87.5	99	83	90.37	91.47	F	21	54	S	Y		Y(2)		
8	87.5	96	100	100	98	100	96.92	84	100	93.34	92.5	95	93	92.97	94.95	M	27	53	M	Y				
9	70	68	64	85	80	100	77.83	66	100	73.36	80	72	86	79.56	78.70	F	20	48	S	Y				
10	87.5	84	100	80	96	100	91.25	84	100	83.35	95	93	78	88.89	90.07	M	19	65	S	Y				
11	90	92	100	90	94	100	94.33	82	100	93.34	95	96	98	94.06	94.20	M	18	50	S		Y			
12	77.5	88	100	90	72	96	87.25	78	100	80.02	60	88	86.5	82.09	84.67	M	18	39	S	Y				
13	82.5	96	100	90	74	100	90.42	76	100	90.01	92	89	95.5	90.42	90.42	F	18	42	S	Y				
14	60	76	84	90	82	100	82.00	60	100	86.69	85	91	83	84.28	83.14	F	21	64	M		Y			
15	67.5	28	72	90	74	83	69.08	80	100	73.36	87.5	34	72	74.48	71.78	M	26	54	S	Y			Y	
16	75	80	92	70	78	93	81.33	68	100	60.04	87.5	85	81	80.26	80.80	M	18	67	S	Y				
17	72.5	84	88	90	90	100	87.42	64	100	93.34	73	80	82	82.06	84.74	F	23	44	S	Y		Y(1)		
18	85	100	88	95	90	100	93.00	80	100	90.01	92.5	89	89.5	90.17	91.58	M	19	54	S	Y				
Ave	80.28	85.78	90.22	88.06	85.67	98.28	88.05	76.22	100	85.76	84.39	85.42	86.50	86.38	87.21	AVE	20.85	53.92						

Table 14.

Class 20211