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MANPOWER AND PERSONNEL IMPLICATIONS OF INSTRUCTIONAL COMPUTER USE BY THE MILITARY SERVICES

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ABSTRACT OF DISSERTATION

An Examination of the Manpower and Personnel Implications Emerging from the Instructional Use of Computers by the Military Services

The military services have been developing ways of using the computer to assist in the training of their personnel since 1954. By the mid-1960s the feasibility of computer-supported instruction was accepted; yet considerable testing is still needed to establish its cost-effectiveness.

The increased use of computer-based instruction will have a significant effect on the human side of the Army—its manpower and personnel systems. Certainly, user attitudes toward computer systems will have a telling effect on the implementing of these systems.

The impact of computer-based instruction on military manpower and personnel management was examined, focusing on the cross-functional dimensions of information technology and personnel management. The primary data were collected by (1) gathering statistical data at 36 military training and education installations that use computers for instructional purposes, (2) conducting personal interviews with 92 selected staff officials using a structured interview guide, and (3) administering a questionnaire to 409 instructor personnel at 21 military installations.

The data from the statistical survey presented the most accurate assessment that has been made of the progress of the military services toward greater instructional computer use. Measurements of the extent of computer use revealed that the Army leads the other services in four of the five areas measured.

Data from the staff interviews and the instructor questionnaire were used in a complementary manner to produce the other findings. The responses to these two surveys indicated that some form of computer-based training is expected to be prevalent in the 1980s. The driving forces that might cause a significant shift toward increased use of computers are cost-effectiveness, better job performance, and even higher student achievement. In contrast, it was found that the barriers to computer-based instruction are thought to be the high conversion costs, the lack of a clear decision to implement such systems now, and a resistant organizational climate.

It was determined from the research that military students are favorably disposed toward computer-based training. It was found that instructional computer use reduces training time by about 33 per cent by virtue of its self-paced nature and the constriction of lesson material as conventional lesson plans are reoriented and converted to the computer.

Military instructors' attitudes toward computer-based instruction were found to be positive. The instructor for computer-supported courses will take on a new role and will teach in a different manner in the future. As the computer performs the more routine instructional tasks, the instructor is free to work with students as tutor, counselor, and motivator on a one-to-one basis. With the application of machines—computers—the instructional process is less labor intensive, and fewer instructors are needed.

On the basis of the research, it was determined that the introduction of computers into instructional programs necessitates changes in the organizational structure of the training systems. Faculty members will require less control because they will be responding to individual students' demands. This new breed of instructor will require special personnel management practices to insure optimum use of costly and scarce resources. For proper management of these instructors, they should be identified by a unique skill identifier. Further, it was established by the research data that present instructor performance standards and staffing criteria will no longer be applicable when the military services change to greater use of computer-based instructional systems.

The research data supports the conclusion that there is a trend toward more centralization of training management at all levels from the Army's training command to the Department of Defense. The centralization of activities within the Army framework is dominated by the zeal with which the Army's Training and Doctrine Command is moving to change Army training by the infusion of modern instructional technology. Concurrently, action is underway to transfer the instructional expertise of the Army schools to benefit the training of individuals at the post level. The Department of Defense has become actively involved in the military services' training programs, which has brought about the consolidation of many training activities. This increased cooperation between the military services has resulted in a saving of millions of dollars in the past few years.

NATIONAL DEFENSE UNIVERSITY
INDUSTRIAL COLLEGE OF THE ARMED FORCES
WASHINGTON, D.C. 20319

AN EXAMINATION OF THE MANPOWER AND PERSONNEL IMPLICATIONS EMERGING FROM THE INSTRUCTIONAL USE OF COMPUTERS BY THE MILITARY SERVICES IN THE 1980s

by

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The data for the report came from over 700 people in the field of computer supported instruction in military education and training. Without the selfless giving of their time and ideas, this research would not have been possible.

My thanks go to Mrs. Bessie Farber and Mrs. Valerie Barnes for the many drafts they typed. I am indebted to Mrs. Dorothy G. Couture for

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CHAPTER 1

INTRODUCTION

Background

Manpower has become the largest single item in the defense budget, accounting for 56 percent of all defense spending (see fig. 1).[1] The shift to an all-volunteer force, together with inflation, has doubled average military pay and benefits over the last eight years. At the same time, the size of the force itself has been reduced by more than one-third (see fig. 2). More than ever before, military managers are under pressure to use personnel effectively, especially at a time when aptitude levels of personnel available for many critical jobs are declining.[2] The all-volunteer force, by its nature, embraces a wide range of aptitudes, interests, and motivations. The zero-draft is making the American serviceman more "average" in the sense that more people coming into the military belong to the middle range of mental ability. This range of mental ability usually indicates an associated decline in the education level of military manpower. Consequently, the military services will need to bridge the education gap so that the enlistee can become an effective member

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[1] The percentage figure includes: basic, special, and retired military pay; civilian pay; family housing; and purchases. Elliot L. Richardson, Statement of the Secretary of Defense before the House Armed Services Committee on the FY 1974-78 Program, Washington, D.C., 10 April 1973, p. 93.

[2] Glenn L. Bryan, "Manpower and Personnel Systems Research Identifies Adverse Factors Affecting Performance," Defense Management Journal, January 1974, p. 39.

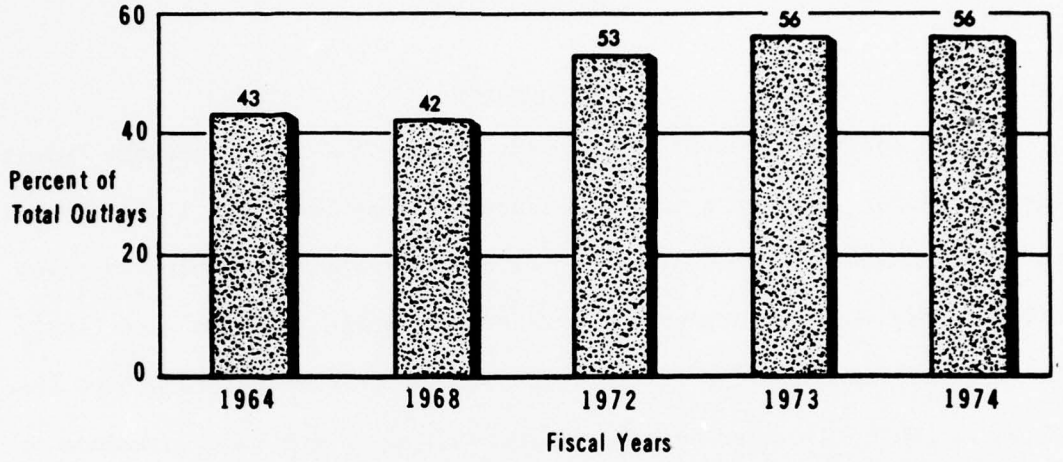


Fig. 1. Manpower costs as a percentage of total defense costs

SOURCE: Elliot L. Richardson, Statement of the Secretary of Defense before the House Armed Services Committee on the FY 1974 Budget and FY 1974-78 Program (Washington, D.C., 10 April 1973), p. 97.

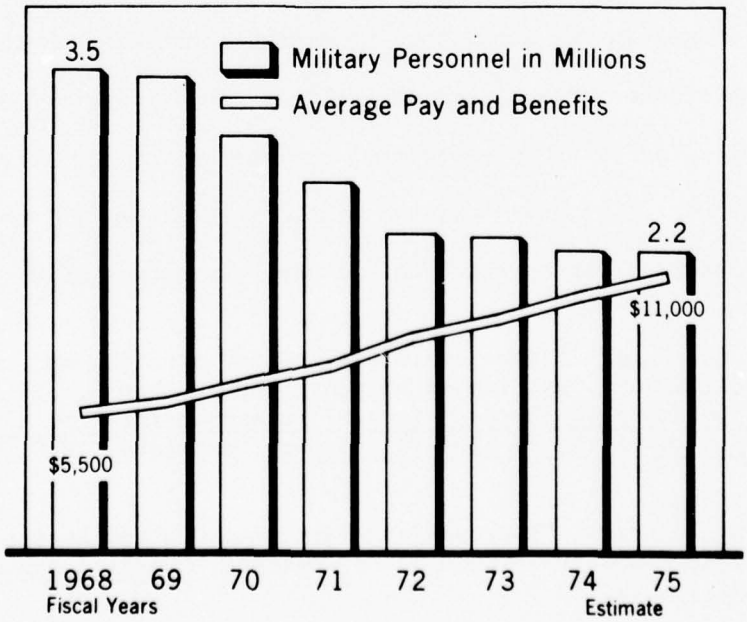


Fig. 2. Military personnel and average active-duty pay

SOURCE: "Nation's First $300 Billion Budget Is Almost Conciliatory," Washington Post, 5 February 1974, p. A10.

of the defense team. In 1970 the Blue Ribbon Defense Panel, pointing to the need for higher levels of education and skill to match advances in weapon technology, indicated that

> the Armed Forces must direct a major part of their efforts to training, education, and development of their personnel. This means training for the parade of short-term personnel flowing in and out of the services and continuous education and development for the career professionals.[1]

DoD Education and Training

Every year the Department of Defense (DoD) trains 1.8 million people at a cost of $6.6 billion.[2] At any given time, 20 percent of the department's total manpower is undergoing some kind of training.[3] While not as large as in recent years, these are still impressive figures, providing some notion of the magnitude of the task.

Instructional programs can teach a student how to do exactly what his job requires--avoiding both overtraining and undertraining. Such programs call for the creative use of modern audiovisual devices and self-paced,[4] individualized instruction. This use of instructional

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[1] Report to the President and the Secretary of Defense on the Department of Defense, a report by the Blue Ribbon Panel, Gilbert W. Fitzhugh, Chairman (Washington, D.C.: Government Printing Office, 1 July 1970), p. 135.

[2] Senator William Proxmire subsequently revealed that a General Accounting Office study showed that the FY 1974 training and education costs would be at least $11 billion because crew and unit training costs were not included. "Proxmire Wants Sharp Cut in DoD Training/Education Costs," Defense/Space Daily, 17 January 1974, p. 92.

[3] M. Richard Rose, "Cost Effective Learning in the Department of Defense," paper presented at the Second Symposium on Cost Effective Learning through the Application of Computer Technology, Washington, D.C., 21-22 February 1973. Dr. Rose held the position of Deputy Assistant Secretary of Defense for Education until April 1974.

[3] The term "self-paced" refers to that instructional strategy which allows the student to proceed through the learning situation at his own

technology will free the instructor from his role as a traditional lecturer and will place him in the position of a problem-solving manager of instruction.

The military services are implementing new training strategies which include individualized instruction, modular scheduling, and programmed audiovisual presentations.[1] They are integrating all aspects of computer managed instruction (CMI), computer assisted instruction (CAI), and other methods of computer based and off-line, individually tailored and administered instruction.[2] Dr. M. Richard Rose has stated that "as far as DoD is concerned, we are beyond the question of the feasibility of using computers in training. Our goal now is to find the best ways of implementing computerized instruction."[3] This assessment, that the military services

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rate. It is normally contrasted with lock-step instruction, in which the students proceed together at some predetermined rate or within a prescribed period of time. Individualized instruction is viewed as an array of patterns of instruction which meets, within limits, the goals, aspirations, abilities, and needs of each student.

[1]The military services are the U.S. Army, the U.S. Navy, the U.S. Air Force, the U.S. Marine Corps, and the U.S. Coast Guard. For the purposes of this report, the term "military services" refers to the first four of the services mentioned above. U.S., Department of Defense, Dictionary of Military and Associated Terms (Washington, D.C.: Government Printing Office, 3 September 1972), p. 212.

[2]As will be pointed out later (see below, pp. 13-14), CMI and CAI, though generally understood in the field, are frequently subject to narrow or very precise definition. Therefore, a general phrase, such as computer based training or instruction, will usually be used in this report. Practitioners have coined scores of CAI-type phrases, as enumerated in a 1971 report: Alan B. Salisbury, "Computers and Education: Toward Agreement on Terminology," Educational Technology, September 1971, pp. 35-40.

[3]Interview with Dr. M. Richard Rose, Deputy Assistant Secretary of Defense for Education, Department of Defense, Washington, D.C., 30 November 1973.

are now in the "how to do it" phase of computer based instruction, is a culmination of a tremendous amount of work and millions of dollars of effort contributed by the civilian, industrial, and military sectors of this nation. As far back as 1960, the University of Illinois began the development of its computer based teaching system.[1] The Air Force was using computers in its training long before then. In 1974, the Army began installing a multimillion-dollar prototype computerized training system for use in its branch schools. The plan is to test the system at one school and, if the results are favorable, expand computer use throughout the Army's school system.

The advent of instructional technology will have a significant effect on the human side of the Army--its manpower and personnel system. Certainly, the attitudes of people toward the use of computer systems will have a telling effect on the implementation of such systems. The two principal barriers to the widespread adoption of computerized learning have been identified as costliness and faculty resistance.[2] For example, in a Princeton study, it was found that faculty opposition to computer based teaching was placed as follows:

1. High cost
2. Fear of change
3. Ignorance of the computer's potential

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[1] D. Albert and Donald Bitzer, Advances in Computer-Based Education, Report X-10 (Urbana, Ill.: University of Illinois, July 1969), p. 1.

[2] Computer assisted training studies dating as far back as the mid-1960s have consistently found that the cost of installation has been a major obstacle to progress in the field. More recently, studies have revealed that the negative attitude of teachers and professors may be equally hampering.

4. The clash of values arising from the teacher's feeling that the computer will deprive him of highly personal relationships with students[1]

From these findings, it becomes apparent that the attitudes of people will be an important factor in the acceptance and growth of the use of computers in military education and training. The attitudes of three groups of people are involved--the military student, the faculty, and the staff. It is anticipated that, with the introduction of computer assisted instruction (CAI) into the Army school system, the climate and structure of the instructional facility will change in unsuspected ways.[2] At branch schools there are questions of acceptance and effectiveness when compared to conventional instruction.[3] For example, will the post-Vietnam enlistee of the modern volunteer Army readily adapt to receiving some of his training at a computer terminal, or will he demand it? Will the personnel assignment system be responsive and issue prompt reassignment instructions so as to capitalize on potential manpower savings resulting from computerized training systems? Traditionally, an assignment as an instructor at a

---

[1]Ernesto J. Anastasio and Judith S. Morgan, Factors Inhibiting the Use of Computers in Instruction (Princeton, N.J.: Interuniversity Communications Council, Inc., 1972), pp. 35-36.

[2]The Army school system is second in importance only to the troop units that represent the fighting strength of the United States Army. This school system provides individual military education for all Army personnel. Its mission is to prepare individuals of the Army components to perform duties required in war or peace, to support training research, to participate in the formulation of military doctrine, and to promote the highest standards of professional military competence. U.S., Department of the Army, Military Education and Training, AR 351-1 (Washington, D.C.: Government Printing Office, 7 January 1974), p. 2-1.

[3]A branch school is an Army school which conducts career and non-career courses designed to provide professional and technical skills required by individuals for duty in one of the branches of the Army. There are eighteen branch schools. Ibid., p. 1-2.

branch school has carried prestige. The opportunity for face-to-face contact with hundreds of students--both officers and enlisted personnel--as well as the opportunity for expanding one's knowledge through teaching may be jeopardized by widespread use of computers in the classroom. The staff and administrators will face a new kind of staffing problem. Instead of instructing, individuals assigned to branch schools may be required to serve as proctors and tutors for computer instructed classes. Consequently, the professional capabilities of the faculty may change from those of platform instructor to those of instructor-programmer. Another dimension which will generate a host of new manpower and personnel problems will be the need for computer operators, programmers, and technicians to keep the system operating--perhaps around the clock, seven days a week.

All of these changes are expected to have considerable impact on the Army personnel picture of the 1980s. The traditional subjects found in the study of military personnel management may take on new dimensions when modern instructional technology becomes established in the training systems of the military. Therefore, it is timely to examine the implications of computer technology for military personnel management functions and to analyze the significant issues that will emerge should computer technology be fully utilized in the future.

Subject Area

In this research report, the impact on military manpower and personnel management as a result of the use of computers in military training and education is examined. The report focuses on the cross-functional dimensions of information technology and personnel management.

In the field of information technology, the research is oriented toward that segment generally referred to as instructional technology. It implies a systems approach to instruction which uses a number of technologies to make learning more effective. In the field of personnel management, the research is oriented toward the training aspects affected by the use of instructional technology. Figure 3 illustrates the segmentation in these major areas of study as the focus of information is narrowed to the manpower and personnel implications of computer use in Army training. Preliminary to the impact assessment of computer use, an analysis is presented of training strategies available to the military, and an evaluation is made of the progress of the military services in developing computer based instruction. In addition, an examination is made of the outlook for the future use of computer technology in Army training.

Statement of the Research Question and Subsidiary Questions

The objective of the report is to respond to the following primary research question:

> What are the manpower and personnel implications that emerge in the military services upon changing to computer based training systems in the 1980s?

The primary research question suggests the following six subsidiary questions believed to be most crucial to the proposed research:

1. What are the alternative training strategies available to the military services for the 1980s?
2. What progress has been made by the military services toward the integration of computers in the instructional process?
3. What are the prospects for the adaptation of computer technology to the Army training system in the 1980s?

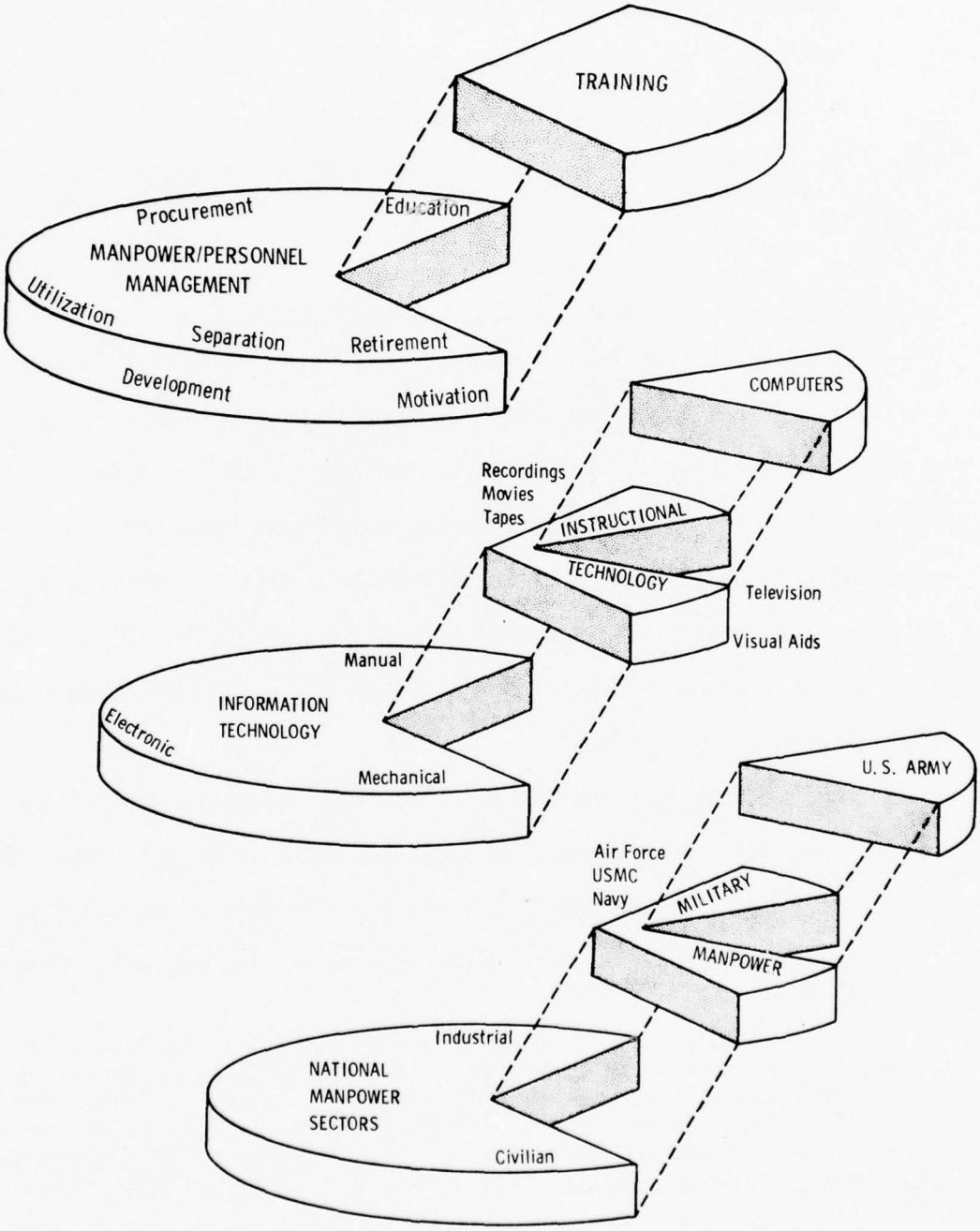


Fig. 3. Diagrams showing the narrowing of the research from three broad areas to the more specific aspects of training, computers, and Army manpower and personnel management

4. What impact will the instructional use of computers by the Army have on the administration of student personnel?

5. What manpower and personnel management considerations will arise in faculty staffing, should computers become a significant part of the Army's training process?

6. What manpower and personnel issues will emerge at top management levels as computer technology is integrated into the training establishment?

Significance of the Research

Computers have been in use by the Army for more than a quarter of a century.[1] Since 1954, the military services have been developing ways of using the computer to assist in the training of their personnel.[2] By the mid-1960s, the feasibility of computer assisted instruction had been accepted; yet, considerable testing was still needed to establish cost-effectiveness. The military services began to publish reports describing their applications and covered such areas as costs, benefits, and student achievements and attitudes.

The initial research for this report revealed that the military services had made no cross-service comparisons. Further, they have concentrated their study of the computer based training process on only two of its four basic components--the computer system and the student. Almost

---

[1]The ENIAC computer was built at the University of Pennsylvania for the Ballistics Research Laboratory of the Army Ordnance Department. It was completed in 1945 and was used to solve differential equations in calculating trajectories of bombs and shells until 1956, when it was transferred to the Smithsonian Institution. Joseph F. Kelly, Computerized Management Information Systems (New York: Macmillan Publishing Co., 1970), p. 26.

[2]The SAGE system was the first computer driven training system. It trained operators in air defense intercept procedures using over a thousand realistic simulations. H. M. Parsons, Development and Installation of a System Training Program: The SAGE ECCM Model (Santa Monica, Calif.: Systems Development Corporation, 28 September 1960), p. 4.

totally ignored were the two important components that have the deciding influence over change in the instructional process--the faculty and the staff.

This report is the first step toward closing this gap in the research by presenting the faculty and staff views of these four components. The human components of these computer systems possess unique motivations and reflect attitudes which are crucial to the continued development of this field. The research for this report included all four of the components and solicited, for the first time, the ideas, sentiments, and attitudes of the service school faculty and staff personnel with regard to (1) the computer systems, (2) the students, (3) the faculty, and (4) the staff.

The primary data for this report was collected by (1) conducting personal interviews of staff personnel with the use of a structured interview guide, (2) administering a questionnaire to instructor personnel, and (3) gathering statistical data at every training and education installation in the military services using the computer for instructional purposes.

To sharpen the focus, the research was designed to examine the manpower and personnel implications of this new application of information technology in each of the four component areas. Thus, this report is intended to describe the effects of instructional computer use so that military managers, from the organizational levels of service schools to the Department of Defense, may gain greater insight and understanding of this dynamic field. Notwithstanding the focus on military applications

of computers, the scope of the report is sufficiently broad to make it of value to scholars and practitioners in the training and education environment.

Definition of Terms

The following terms are defined at the outset to facilitate precise communication, while other terms are defined as used.

Training and education. The term "training" generally refers to instruction in military subjects either at a basic level, as in recruit training, or in a military specialty, such as pilot training. The term "education" has a broader connotation and generally refers to the study of more advanced subjects or of military subjects that apply to an entire service or to the whole field of national security.[1] The term "training" is used in this report to refer collectively to individual training and military education as a whole.

Individual training. The term "individual training" includes all formal military and technical training, including professional education, conducted under centralized control, generally under the supervision of a service training command or similar organization.[2]

Crew and unit training. Crew and unit training consists of units which provide training to or evaluation of organized crews and units for the performance of a specific mission. This training is direct and operational in nature. It provides the necessary link between the

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[1] U.S., Department of Defense, Military Manpower Training Report for FY 1975 (Washington, D.C.: Government Printing Office, March 1974), p. I-3.

[2] Ibid., p. II-2.

specialized, centrally managed training activities that provide individuals with the basic skills to do a job and the operational units themselves.[1] This report is focused on individual training, but reference is made to the application of computers to unit training.

Computer assisted instruction. The acronym CAI is frequently used for computer assisted instruction, but it lacks a commonly accepted definition. The following definition most accurately conveys the meaning of this acronym as used in this report: Computer assisted instruction (CAI) is a man-machine interaction in which a multimedia teaching function is accomplished by a computer system. The student is provided lesson material, and the computer serves as the instructor using instructional material and the teaching logic which is stored in the computer memory.[2]

Two other acronyms have meanings similar to CAI. One is CMI, and the other CTS. The following definitions demonstrate their more precise meanings.

Computer managed instruction. Computer managed instruction (CMI) is the use of the computer as the classroom management tool. In this mode, the computer is used to grade tests, prescribe lessons to be studied, designate media to be used, schedule equipment and media, and monitor student progress.[3]

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[1] U.S., Department of Defense, Manpower Requirements Report for FY 1975 (Washington, D.C.: Government Printing Office, February 1974), p. VII-9.

[2] The immaturity of the computer based instructional field is evident from the lack of discipline in precisely defining terms. No standard or approved definition of CAI or CMI exists today. Therefore, it was necessary to develop for purposes of this report a generalized definition for both terms.

[3] Ibid.

Computerized training system.

> A computerized training system (CTS) integrates the computer into a totally self-paced training system. In a CTS, the computer serves as a teaching medium, a surrogate instructor, a classroom management tool, as well as performing many school administrative functions associated with training.[1]

Computer based training. The use of the terms CAI and CMI tend to cause an immediate communication problem; therefore, the more generalized terms "computer based training" and "computer supported instruction" are used throughout this report.

Research Methodology

As might be expected of a field that is scarcely out of its infancy, published materials on instructional computer use are few in number and not readily accessible. Literature surveys conducted early in the development of the research proposal seemed to indicate that it would be necessary to draw on all available civilian and military materials to establish the literature framework for the report. Thus, it was felt that the research design should include some form of staff and faculty survey to contribute some data to the military body of knowledge in instructional computer use. Gradually, the research was expanded by the following:

1. Visits to the military staffs in the Pentagon and nearby installations to probe for service policy, commitments to technology in training, training philosophies, and points of contact throughout their service who were personally involved in the instructional use of computers [2]

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[1] D. A. Kimberlin, A Preliminary Instructional Model for a Computerized Training System, an interim report, CTS-TR-73-2 (Fort Monmouth, N.J.: U.S. Army Signal Center and School, July 1973), p. 22.

[2] Not counting the actual survey of staff personnel, to be described subsequently, more than 260 personal interviews were conducted to develop material for this report.

2. Telephonic interviews with the leading researchers and practitioners in the field as a further means of discovering material and developing a keener insight into plausible research options[1]

3. A literature search at the DoD Documentation Center for government-sponsored or conducted studies on the instructional use of computers. Another literature search was accomplished through the DoD Logistics Studies Information Exchange[2]

After ten months of research, sufficient progress had been made to establish the basic source of data for each of the subsidiary research questions. By this time, it was possible to establish that the study could be almost completely supported by military data, with minimal reference to civilian applications.

It is believed that all military studies and reports on computer supported training were uncovered by the literature search.[3] Gaps in the military research were identified. These gaps gave confirmation to the notion that much has been learned about the computer system and the student, but little has been recorded about the staff and faculty. The research revealed that at least twenty military activities and several hundred instructors were currently involved in computer based instruction.

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[1] During the period of the research, telephonic interviews were held with more than 290 civilian and military personnel. A selected number of these interviews are listed in the bibliography.

[2] The Documentation Center provided a computer listing of 121 related studies, papers, and reports. The Logistics Exchange listing included 89 references. Many of the entries on these lists were dated, classified, or irrelevant. However, a number of useful reports were later obtained in hard-copy form as secondary source material for the report.

[3] With few exceptions, copies of all applicable military studies on instructional computer use were obtained directly from the source or through the ICAF library. As a means of highlighting the scarcity of published material in this area, all of the documentation of the services' research into the instructional use of computers fits easily into one standard, four-drawer file cabinet.

It was reasoned, then, that there was a wealth of expert opinion in the field to help fill the gaps of knowledge. Thus, it was believed that this report would gain a true note of authority if it reflected the experience of staff and faculty personnel working on a day-to-day basis with instructional computers. Arrangements were made to visit as many service installations using instructional computers as possible.

Research in the field

A series of questions was then developed which, when answered, would fill the voids of the research design. Some of the questions required discussion; others were subject to objective response. In addition, some areas applied to or were confined to the scope of knowledge or experience of only one of the components of interest--either staff officer or instructor. The questions were thus separated and used as the basis for the development of two survey instruments for on-site research. Through preliminary discussions with some of the practitioners in the field, it was determined that staff data would be collected through interviews, using a structured interview guide (see appendix A), and that the target group should be limited to a few staff personnel who could be expected to give expert opinion in the areas of personnel, instruction, and computer use. The questions for the instructor survey were designed for a self-administered questionnaire which would remain anonymous (see appendix B). The staff interview guide and the instructor questionnaire were designed to encourage maximum response by providing space on half of each page for additional comments.[1]

[1]Structuring the right-hand half of the page for comments was probably responsible for much of the feedback from the survey. More than

The guide and questionnaire were initially tested at the Industrial College of the Armed Forces (ICAF) using two staff officers for the interviews and three instructors for response to the questionnaire. Refinements prompted by this test included a new set of forms which were then tested with four staff officials and nine instructors at the U.S. Army Signal School at Fort Monmouth, New Jersey. The second test provided further improvements in the utility of the format and gave evidence of less bias than was encountered in earlier editions. After minor modifications, both the guide and the questionnaire were ready for field use.

The research plan was to visit almost all installations that use computers in the instructional process and to survey all their instructors, thereby collecting data from nearly the total population. The population would be defined by staff and instructor category. At each installation, the following staff members would be interviewed: the director of instruction, the educational adviser, the manpower-personnel officer, and the computer operations (or development) officer. Faculty participation would be limited to instructors who actually become involved in the computer-student interface.

Field visits were made to seventeen military installations throughout the United States: seven Army installations, two Air Force, one Marine

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1,500 written comments were found on the completed instructor questionnaires. Specific guidance on questionnaire format, question writing, and survey administration techniques were provided by Sharon G. Hadary, Manager of Personnel Research, at IBM's Gaithersburg, Maryland, office, and Major Fred W. Trone, Chief of the Survey Branch, Personnel Management Development Directorate, U.S. Army Military Personnel Center, Washington, D.C., during interviews, 14 and 17 May 1974.

Corps, three Navy, and four Department of Defense. Through computer and education and training conferences in Washington, D.C., and New York City, personal contacts were made with staff personnel of four additional installations. Hearing of the research project, they asked to have their installations included in the survey by on-the-spot interviews for the staff portion and by mailing in questionnaires for the instructor portion. This extension of the research design allowed all twenty-one military installations having an active computer program to be represented in the survey.

The research plan became a reality, as almost 100 percent of the military training and education instructors who use computers in the instructional process became a part of the survey. This population was made possible by the interviews conducted during personal visits to the military installations and the support gained through correspondence with the remainder. In all, 409 instructors responded, representing, in all but three installations, 100 percent of the instructors who met the criteria.[1] The survey population included a large relative frequency of Army instructors (42 percent), followed by Navy (28 percent), Air Force (15 percent), and Marine Corps (12 percent).

In the field, the staff survey was not nearly as successful in implementation as the instructor survey. Nonetheless, staff personnel interviews averaged four for each location, producing a staff survey population of ninety-two.[2] Aside from some attitudinal student questions

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[1]The exceptions and other information are found in summary form in appendix C.

[2]A tabulation of the staff interviews which summarizes the respondents by position and location is located at appendix D.

posed by Army and Navy researchers in some early CAI feasibility studies, this survey of 409 instructors and 92 staff personnel represents the largest collection of military CAI-CMI-type data that have been assembled.

A preliminary review of responses to questions dealing with military progress toward instructional computer use revealed that the instructors responded with a strong service bias. Further, nothing was available in the literature to corroborate the instructors' responses concerning service progress toward computer use or to suggest a trend for the future. Several service schools were contacted to test the feasibility of gathering quantitative data from them which could be used to show progress in computer use over the past ten to twelve years. Their favorable response led to the development of a follow-on data collection form (see appendix E) and the administration of another survey. After a preliminary telephone call to obtain their cooperation, the data collection form, together with a covering letter, was mailed to each training and education organization in the military service known to use computers in its instructional process. As a result of the field visits, it was believed that a number of other installations were making some use of computers in training. These installations included some that had used computers for training in the past but were not currently doing so, some that were not currently using computers but were scheduled to do so soon, and some that were currently using computers adjunctively in training but were not considered active users for the purpose of the original survey.[1]

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[1]As an example of the misunderstanding or confusion over the term "CAI," nine Army schools, in addition to the ten used in the instructor survey, were contacted by telephone to see if they should be a part of the original research design. In each case, they indicated they were not CAI or CMI users. A year later, when probing for these statistical data, the

The analysis

The nearly 100 percent response rate achieved in the instructor survey, which included all military installations active in CAI-CMI development programs, allowed the conclusion that the universe of interest was surveyed. The completeness of the data from the instructor survey permits the analysis and presentation in a descriptive manner.

The staff survey was not intended to be a probability sample. It was designed to gain information--expert opinion--from experienced personnel in key staff positions. Nevertheless, an effort was made to achieve a balance in representation among both the military services and the four staff areas of interest (computers, instruction, personnel, and education). The descriptive approach was used to treat the staff data.

All responses to the instructor questionnaire and to the questions from the staff guide, which were subject to quantification, were analyzed through the use of counts, cross-tabulations, and histograms. (The biographical elements served as categories for comparing responses by military service, civilian or military status, location, staff position, and amount of computer experience.) Detailed analysis sheets appear at appendix F for the instructor survey, and the quantifiable staff survey data are at appendix G.[1] These summary data were used to facilitate the analysis of each question and to make intra- and inter-survey comparison of responses.

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same schools admitted that they used computers to carry out their training mission. In most cases, these were adjunctive or peripheral applications but, nonetheless, instructional computer use. For the sake of completeness, it was decided to include all forms of computer use in the follow-on survey. This added sixteen installations to the twenty-one originally surveyed.

[1]Staff questions 5, 8, 12, 17, and 20 were subjective. Therefore, the responses to these questions are not summarized in appendix G.

In addition, these data provided the information from which to build a series of figures that would graphically illustrate the percentage distribution of responses to each question. These figures, with the specific question noted and a percentage bar graph depicting the response pattern, appear throughout the report.

The comments from staff interviews and the written comments by the instructors proved to be important elements of the research.[1] As the survey results are discussed in the report, these descriptive responses are used to give balance, understanding, and often the subtle rationale for the quantitative responses.

Limitations of the Report

This research project has been subject to the normal constraints of time and resources, but, more significantly, it has been limited by the basic research design to narrow the scope of research to manageable proportions.

As mentioned earlier, there are four basic components of instructional use of the computer--the student, the faculty, the staff, and the computer system. This report focuses on the staff and faculty components by making them the object of primary research. Computer systems receive moderate emphasis. No empirical data were gathered from students.

By addressing instructional computer use, the report is concerned with uses of the computer at installations charged with training and

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[1] Many of the staff responses were short answer or multiple choice responses; however, elaborations on questions produced more than 1,230 comments. The instructors' contribution of 1,517 written comments, mentioned earlier, meant that they averaged 55 written comments on each of the 27 questions on the questionnaire.

education in the military services. This approach intentionally ignores all strictly administrative computer applications. Further, computers are used extensively in flight simulators in a cost-effective application. However, they are usually considered in a different category from computer assisted training. They have therefore been excluded from the scope of this report.

The research base for the report was designed broadly to include the Army, Navy, Marine Corps, and Air Force in order to take advantage of their research material and to allow interrelation of service experience through comparison and contrast of the primary data. Using this broad base gives an adequate source of primary and secondary source data to enable narrowing the application in a deductive manner to the Army.

The time perspective taken in this report is oriented to the present--the mid-1970s--and the future, at least to the 1980s. Current studies, capabilities, and limitations are used to the extent possible to point to the implications for the Army in the future. Some historical data were utilized but, in the main, only those studies and material prepared since 1968 are utilized in this report.

Organization of the Report

The research methodology was designed in such a manner as to ensure that each subsidiary question would be adequately supported by the highest quality of research material reasonably obtainable. The basic research chapters (chapters 2 through 7) can be viewed as a spectrum of primary and secondary research. The report begins with a comparison of training strategies (chapter 2) which is heavily based on secondary source research.

Chapter 3, in which service progress toward the use of computers in instruction is analyzed, is supported by first-hand information gathered during field visits. Even though some published material is incorporated to provide a more complete picture, progressively more of the survey information and other primary data are used to support chapters 3 through 7.

The purpose of this research is to investigate the manpower and personnel implications should the military services change to computer based training systems in the 1980s. To accomplish this purpose, the presentation of this report is organized into eight chapters.

The problem definition, area of research, and research methodology are presented in chapter 1.

In chapters 2, 3, and 4, the general instructional strategy of computer based learning is examined as a foundation to the research. In chapter 2, entitled "Alternative Training Strategies for the 1980s," the stage is set and several background areas are discussed to demonstrate the need for changing training strategies in the military services. An explanation of the services' institutional strategies for instruction provide insight into underlying training philosophies. Contrasting scenarios are used to develop a portion of this chapter, suggesting various alternative strategies that are available to the military. These alternatives are then analyzed on a comparative basis using empirical data developed in a number of contemporary studies. The complexity of selecting a training strategy is discussed in the closing section of the chapter.

In chapter 3, entitled "The Progress Toward the Instructional Use of the Computer in the Military Services," an evaluation is made of the progress of the military services as they plot their respective courses toward the use of instructional technology. Data are introduced which show graphically the time frames of growth of computers in military training and education. The development of computerized training from theory to present systems is examined in its historical context. Military applications of current training are traced to assess the scope of involvement and commitment of each service in the computerization of training. Survey data are used to draw attention to the progress made by the services in computer based training. Current and historical information is plotted to demonstrate the rate of growth in contact hours and percentage of training which is computer supported. Projections are then used to suggest the significance of computers in training for the 1980s.

In chapter 4, entitled "The Prospects for the Adaption of Computer Technology to Army Training in the 1980s," the linkage between such concepts as individualized instruction, productivity, technology, and the future style of military training is developed as a basis for assessing the likelihood of change. Data from two surveys are used to highlight the direction toward which the Army is moving in integrating computers into the training system. Staff and faculty of schools that now use computers in the instructional process provide interesting insights into the anticipated methods of training they predict for the future. Barriers and aids that may affect the future use of computers in military training are discussed; they suggest the prospect for adaption by the Army.

Chapters 5, 6, and 7 contain the manpower and personnel management considerations as they apply to the students, the faculty, and the staff.

In chapter 5, entitled "The Implications of Computer Based Training on the Administration of Student Personnel," attention is focused on the student component of the instructional model. Initially, a determination of the attribures of the "average" student recruited by the zero-draft environment is compared to the type of student a computerized training system is designed to handle. Of major import to this chapter is the development of the potential benefits for the military student associated with computer based training. These benefits include an analysis of student attitude, an indication of potential training time reductions, and consideration of the quality of the output.

In chapter 6, entitled "Faculty Staffing Considerations Arising from Computer Based Instruction," the role of the instructor in the CAI-CMI environment is examined, and the manpower implications for the faculty are developed. The attitudinal aspects of the change in the instructor's role inherent to the move toward more technology is reported in this chapter. The results of personal interviews with faculty and staff personnel at service training facilities visited in the course of the research are evaluated. These primary data, coupled with secondary data, are analyzed as a means of portraying the attitudes that may have an effect on the instructional mission should computer based training become the dominant mode of teaching in the future. This review leads to an examination of the faculty with respect to staffing, development, classification, and evaluation. From the management standpoint, an

assessment is made of specialty codes, grade requirements, staffing criteria, and total authorizations.

In chapter 7, entitled "Manpower and Personnel Issues at Top Management Levels in View of the Integration of Computer Technology into the Training Establishment," the staff component of the instructional process is examined, including the Army's training command and the military departments. The emphasis in this portion of the report is one of evaluating the impact of computer based training at the staff or headquarters level to determine what changes in manpower and personnel management are indicated. The area of exploration includes: centralization versus decentralization of control, changing personnel structures, and the linking of the schools with the personnel center to facilitate the flow of reassignment information on students who have completed their training. Primary data collected by staff level personal interviews and visits to service facilities provide unique insights into top management's motivation and interests in the utilization of computer technology in the military services. Of considerable importance is the interest the Department of Defense and the Congress might have in the integration of this new training technology.

Finally, chapters 2 through 7 are summarized in chapter 8, entitled "Summary, Conclusions, and Recommendations for Further Study." The conclusions emerging from each chapter of this research project are listed and discussed. Specific relevant issues identified in earlier chapters that are beyond the scope of this research report are discussed briefly and recommended for further study.

The appendixes contain material used in the development of data or represent a summary of pertinent data. The bibliography contains a list of publications and other sources which are relevant to the report.

CHAPTER 2

ALTERNATIVE TRAINING STRATEGIES FOR THE 1980s

Introduction

The material presented in this chapter addresses the subsidiary research question: What are the alternative training strategies available to the military services for the 1980s? The many optional strategies open to the military to carry out the training mission are described. The costs and benefits of each method offer the quantitative reasons for matching certain strategies to particular learning situations. By describing these alternatives, the significance of the computer in future training strategies becomes evident. The development of military members through formal training and education and practical experience follows a generally common pattern. Upon entering the military, the new member first receives orientation training designed to develop the basic attributes of all members of that service. In most cases, the graduate of this initial training is then provided the skill training required for a military job at the lowest skill level. By combining the job experience of the members with military training and education, a military force is developed which is capable of carrying out the national security mission in peace or war.

How to Train

Recognizing that the military services have a training requirement, the basic question is not so much one of content, or "what" to

teach but, rather, one of the method of instruction or teaching strategy--the "how" to teach it. The "what" is accepted as a given in this report; therefore, the focus of the research is directed to the method of instruction--the "how."

The military services are changing their traditional view of training methods. An officer of the Department of the Navy confirmed this point in the following manner:

> To accomplish our training it is acknowledged that there are at least two identifiable approaches to providing instruction. One is the traditional method of conventional training which utilizes a class or lock-step method in which all students proceed at the same pace. The other approach--recognizing that rarely do any two students start with an identical information base or assimilate data in an identical manner--provides a course of instruction which is completely individual, if not unique, to allow that student to receive and understand the necessary information and obtain the necessary skills and no more.[1]

The fleet introduction team for the Navy's new anti-submarine warfare aircraft, the S-3A, is using an array of instructional techniques and media illustrations to accomplish its training mission. This example is timely in illustrating the blending of instructional strategies to achieve the training objectives. The fleet introduction team is characterized primarily by an all-out attempt to apply existing instructional science to both the development and the implementation of training courses. It is a systems approach to training. First, a task analysis is performed of the job for which the sailor is to be trained. Then, the job requirements are connected to a set of learning objectives with instructional

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[1] U.S., Department of the Navy, Chief of Naval Technical Training, "Computer Managed Instruction Automated Data System Documentation Update," letter to the Chief of Naval Education and Training, Naval Air Station, Memphis, Millington, Tennessee, 1 April 1974, p. 1.

methods of strategies specified. At the heart of the instructional process, the instructional design shifts to the consideration of what must be learned and how it should be taught. This evaluation leads to the selection of the method-media combination which uniquely fits the specific training requirement. An instructional method selection model has been developed by Richard A. Walker for use in determining what modes and media are most appropriate for each objective (see fig. 4).[1] An inherent feature of this system is the concept of hierarchical complexity of the subject matter and the related costs. The lesson objective is paired with the least costly and complex media consistent with learning effectiveness. Figure 5 illustrates the relationship of cost and complexity. The cost of various media increases as the devices become more sophisticated.[2] This hierarchical model causes the traditional technique of the large lectures familiar in military classrooms to be obsolete. The instructional strategies most frequently employed to realize training goals involving complex subject matter are self-paced instruction including programmed instruction, peer instruction, on-the-job training, and simulation. Each of these innovative instructional strategies may be used with a variety of media. Often, one or more strategies are used in conjunction with one or more types of

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[1]U.S., Department of the Navy, Anti-Submarine Warfare Wing, "S-3A Instructional Development," a briefing presented by Richard A. Walker, Naval Air Station, North Island, San Diego, California, 3 June 1974.

[2]Walker's hierarchical model had its genesis in Dale's "Cone of Experience," in which instructional media and resources were stacked in cone form to demonstrate that moving from one media to the next enhanced learning. From the tip to the top of the cone, the media listed are: verbal symbols; visual symbols; recordings, radio, and still pictures; motion pictures; television; exhibits; field trips; demonstrations; dramatized experiences; continued experiences; and direct, purposeful experience. Edgar Dale, Audio-Visual Methods in Teaching, rev. ed. (New York: Holt, Rinehart and Winston, 1954), p. 43.

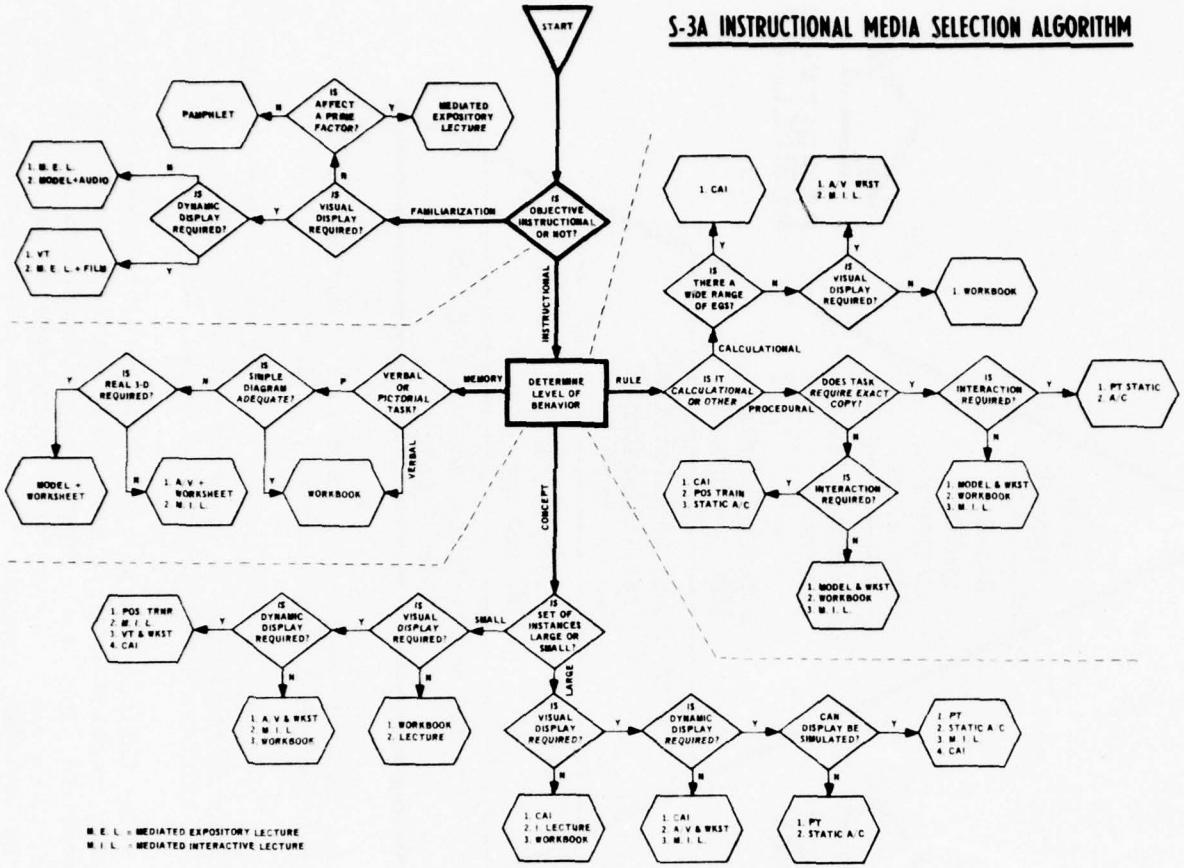


Fig. 4. An instructional method selection model for a new anti-submarine warfare aircraft crew

SOURCE: U.S., Department of the Navy, Anti-Submarine Warfare Wing. "S-3A Instructional Development," a briefing presented by Richard A. Walker, Naval Air Station, North Island, San Diego, California, 3 June 1974.

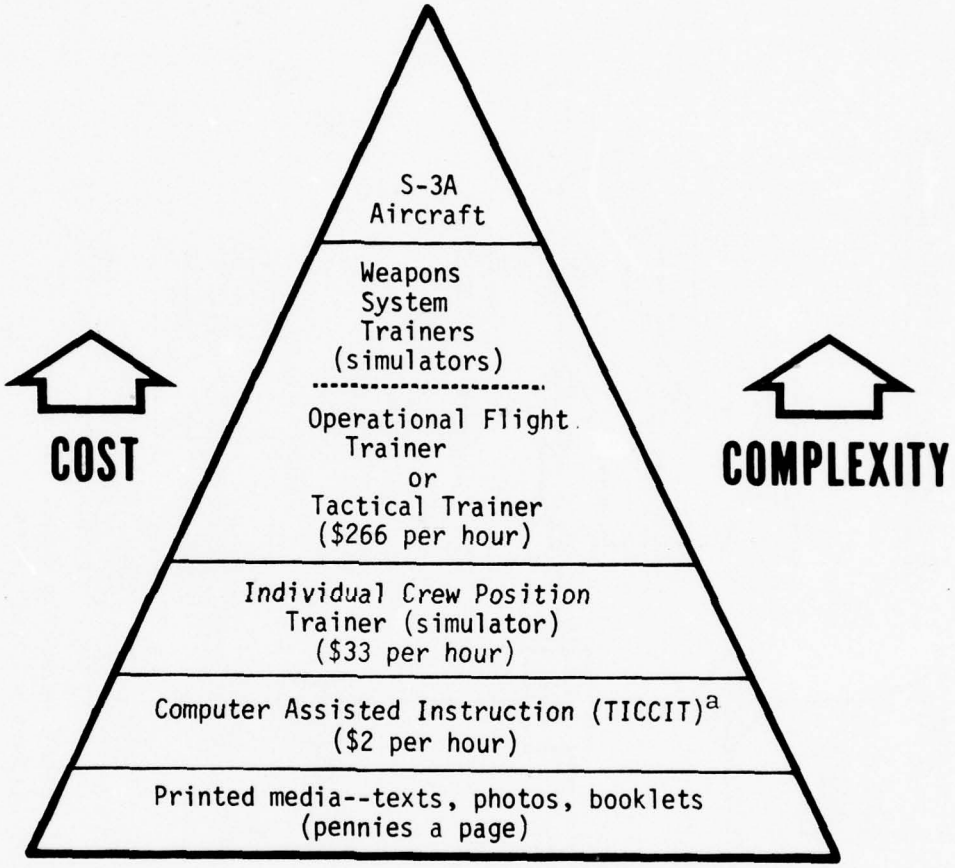


Fig. 5. Walker's hierarchical model relating cost of the instructional media to complexity of the subject matter

SOURCE: U.S., Department of the Navy, Anti-Submarine Warfare Wing, "S-3A Instructional Development," a briefing presented by Richard A. Walker, Naval Air Station, North Island, San Diego, California, 3 June 1974.

[a]TICCIT (Time-Shared, Interactive, Computer Controlled Information Television System) combines both computer and television technologies. Each student terminal employs an ordinary color television set, an off-the-shelf keyboard, and a video tape recorder, plus special receiver. The student, via the keyboard, communicates with the computer-stored lesson material. When frames are selected from the data base, they are converted into a composite video signal, transmitted in time-shared sections over coaxial cable and presented as "stills" on the individual student's television screen. The MITRE Corporation is attempting to catalyze the mass dissemination of an educationally sound form of CAI through a multi-year (1973-1976) program, sponsored by the National Science Foundation. The goal of this program is to demonstrate that CAI can provide today better instruction at less cost than traditional instruction in community colleges.

media or equipment. The most common combinations are usually (1) the lecture and the programmed textbook, (2) the lecture in combination with television, and (3) computer based instruction for self-paced instruction and simulation.[1]

Comparative Evaluation of Conventional and Computerized Instruction

As indicated earlier, the spectrum of training strategies available to the military is wide. A comparative evaluation is provided in this section to show the differences between conventional lock-step instruction and computerized instruction.

Conventional Lock-Step Instruction

Conventional lock-step instruction occurs in the standard classroom arrangement, with each group of students entering as a class and progressing in lock-step fashion through the course. Course presentation usually consists of lectures, practical exercises, supplementary programmed instruction, films, and educational television. Students attend classes for eight periods each day. They have one-hour lunch breaks and fixed short breaks following each period. Classes are conducted by instructors who work from standard lesson plans prepared in accordance with the guidance and content of current programs of instruction. Students who miss class time must make up the instruction during hours designated for academic assistance or on their own time. The students who perform unsatisfactorily are recycled through any portion of the course in which

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[1]Dean Brown, Survey of the Use of Educational Technology in the Armed Services, a final report, SRI Project ISU-1775 (Menlo Park, Calif.: Stanford Research Institute, November 1973), pp. 14-15.

they have encountered problems. A student who fails is required to repeat an entire block of instruction, including those areas of instruction in which he is already proficient. The student may be required to wait several days in order to enter a new class.

Computerized Instruction[1]

Students in a computer based training environment will undergo a somewhat different learning experience since the instruction is self-paced. All students taking a computer based course of instruction arrive at the school directly from their previous assignments in an evenly distributed flow throughout the year. Each student is scheduled to begin the course the day after arrival at the school.

The computer terminals are available for twelve hours a day unless the number of entering students is so large that the system must be operated longer. A student does not have a terminal reserved for him for a day or for a shift. Instead, he operates on several terminals during the course of the day depending upon the particular course schedule. This schedule may include an eight-hour day for each student, or the day may be broken up into various sections; for example, two hours at the terminal (on-line),[2] then a two-hour (off-line)[3] practical exercise

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[1]This is an idealized scenario. However, major segments of it were successfully tested at the U.S. Army Signal School in 1967. Since that time, many service tests have resulted in the development of numerous successful computer based instructional scenarios.

[2]"On-line" is a term meaning that the terminal is directly connected to and operating under the control of the computer.

[3]"Off-line" is a term meaning that the device is operating independently of the computer.

at the laboratory, followed by an hour for lunch. After lunch, the student may have one hour of free time until a terminal is available for use. He could then finish the school day with several consecutive hours at the terminal. This type of flexibility would make military training more like a college schedule, in which the student may have several hours between classes. In any event, the student is expected to spend no more than eight hours in class during the course of a training day.

Once the required course of instruction is completed, the student departs for his new assignment without delay. Groups of students are no longer handled as classes for purposes of graduation and assignment because each student finishes at his own pace and is immediately available for assignment utilizing his new skills.

The scheduling problem resulting from computer training is handled by the same computer that is used to support the student terminals. This is part of the computer management system developed as computer software.

Alternative Training Strategies

Instructional strategies may be viewed as combining a method of instruction with training aids. This is not to say that effective instruction cannot take place without training aids. For decades, the Army has recognized that "the only means by which human beings impart ideas to one another are the physical senses--seeing, hearing, smelling, tasting, and feeling."[1]

Traditionally, the Army, as well as the other services and the civilian teaching community, has used the following basic teaching

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[1]U.S., War Department, Military Training, FM 21-5 (Washington, D.C.: Government Printing Office, 1941), p. 25.

methods: (1) lectures, (2) conferences, (3) demonstrations, and (4) practical exercises.[1] The lecture is recognized as one of the poorest methods of imparting knowledge, because of the lack of student participation. Consequently, training aids have been integrated into the lecture and other methods of instruction to improve the level of effectiveness.[2] Conferences, demonstrations, and practical exercises continue to serve as valid strategies but, like the lecture, they consume manpower out of proportion to their effectiveness. New technologies have been introduced since the 1950s that make instruction more individualized and may make training less labor intensive.

Programmed Instruction

Since B. F. Skinner's work in 1954, programmed instruction (PI) has won wide acceptance in education.[3] Programmed instruction is a combination of the Socratic and Cartesian methods in the sense that the material is taught by question and answer and is broken down into a series of small, logical sequences arranged in hierarchical order.[4] At each sequence, the student proceeds, and learning takes place at his own pace.

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[1] U.S., Department of the Army, Techniques of Military Instruction, FM 21-6 (Washington, D.C.: Government Printing Office, 1967), p. 30.

[2] U.S., War Department, Military Training, p. 25.

[3] B. F. Skinner, "The Science of Learning and the Art of Teaching," Harvard Educational Review, Spring 1954, pp. 86-97.

[4] The Socratic philosophy includes the question method which stems from Socrates of Athens, who flourished in the last half of the fifth century, B.C. Cartesian rationalization comes from a set of philosophical traditions and scientific attitudes derived from the writings of René Descartes (1596-1650).

Television

Educational historians probably will note that the period from 1954 to 1965 represented a decade of intensive research on the development and use of television as an instructional method. Television allows a great number of students to share resources of highest quality that might not be readily available for ordinary classroom use. These materials include films, expensive or delicate equipment, and complex demonstrations.

Because television is similar to motion pictures in its effect, student interest is usually high, but educators persist in questioning its effectiveness. The use of video also raises the question of saving instructor manhours and manpower spaces. Yet, most instructors are quick to point out that television frees the instructor to give the student more individual attention.[1]

Computer Based Training

Types of uses of computers in training have become increasingly numerous, and so have the names used to describe them. Acronyms literally abound in this field, and commonly accepted definitions are lacking. For this reason, four forms of computer based training are described below as a means of covering the scope of this new instructional strategy. These forms are computer assisted instruction (CAI), computer supported instruction (CSI), computer managed instruction (CMI), and computerized training system (CTS).

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[1] Interview with Dr. Joseph H. Kanner, Educational Adviser, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia, 21 June 1974.

Computer assisted instruction (CAI)

As defined in chapter 1, CAI describes the man-machine interaction in which the teaching function is accomplished by the computer system.[1] Both the training material and the instructional logic are stored in the computer. Included in the concept of CAI are several modes of instruction. In drill and practice, the computer guides, controls, and monitors by repetition of a specific task or set of tasks. The purpose of this mode is to develop a predetermined level of proficiency in a skill.

The tutorial mode is more complex than drill and practice and requires the student to make increasingly sophisticated responses. Information is presented to the student in a form resembling a dialogue, and he responds to items designed to assess how much he has learned from each phase of the instruction. The sequence of presentation varies to fit the individual characteristics of the student.

The dialogue mode is less structured than the tutorial mode and approaches actual conversation between student and computer. Interaction involves either student inquiry or computer inquiry, depending upon student or computer initiative programming.

Simulation and gaming are modes in which a real situation is presented and the student is required to respond to it. Computer based games usually place the student in a less than realistic situation, but they provide specific payoffs in experience and practice and often introduce competition between students.

Problem solving or computation may also be considered a CAI mode. In this mode the student learns a language that permits him to

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[1] See above, p. 13.

enter data into the computer, and he then uses stored programs to work out solutions to problems.[1]

Computer supported instruction (CSI)

When the computer is applied in support of instruction, it takes on the title of computer supported instruction. The instructor uses it to assist in accomplishing the learning objectives as a classroom training aid. Included in this category are such applications as computer concept instruction, computer system analysis instruction, computer maintenance instruction, and computer operations instruction.[2]

Computer managed instruction (CMI)

Computer managed instruction is a system by which a computer is used to route a student through a series of instructional materials that are presented by various media best suited to the student's particular needs and abilities.[3] CMI includes the management of detailed student information, complete curriculum data, and information on available training resources.[4] These elements are combined to develop individualized programs of instruction, provide counseling data, and optimize resource utilization. Thus, CMI serves as the bridge between instructional and non-instructional uses of computers in training. An ideal CMI system

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[1]U.S., Department of the Army, U.S. Continental Army Command, Task Group Report on Computer Assisted Instruction (Fort Monmouth, N.J.: U.S. Army Signal School, April 1972), pp. B-1, 2.

[2]Salisbury, "Computers and Education," p. 39.

[3]U.S., Department of the Navy, Focus on the Trained Man (Orlando, Fla.: Naval Training Equipment Center, March 1974), p. 4.

[4]See above, p. 13.

will provide a diagnostic evaluation of a student on the basis of his background and training records, which results in individual learning prescriptions.

A schematic illustration of an operational Navy CMI system is presented as figure 6. Viewing CMI by the five functional categories in the figure makes it easier to see the broad range of combinations suggested by this strategy.

Computerized training system (CTS)

The Army has developed a computerized training system (CTS), which is an instructional model sufficiently comprehensive to accommodate every variable and contingency relevant to achieving its individual training objectives. It is defined as the integration of the computer into a totally self-paced training system. In CTS, the computer serves as a teaching medium, a surrogate instructor, and a classroom management tool, as well as performing many school administrative functions associated with training. In effect, it combines the best of CAI and CMI into a single system.[1]

A general view of the organization of CTS is provided in figure 7. The principal component of the system is the student. The computer and training components are comprised of three elements: hardware, software, and personnel. In CTS, the instructors are classroom managers whose associations with the students are generally on a person-to-person basis, in keeping with the self-paced nature of the training. The student's progress is constantly evaluated as he progresses through the course.

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[1]See above, p. 14.

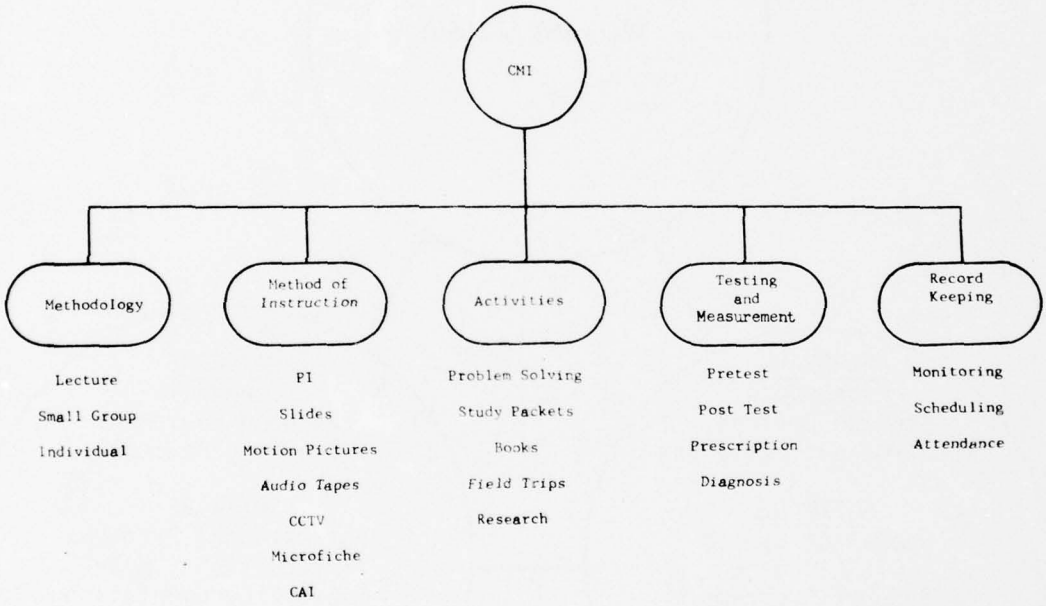


Fig. 6. An overview of computer managed instruction

SOURCE: U.S., Department of the Navy, Focus on the Trained Man (Orlando, Fla.: Naval Training Equipment Center, March 1974), p. 6.

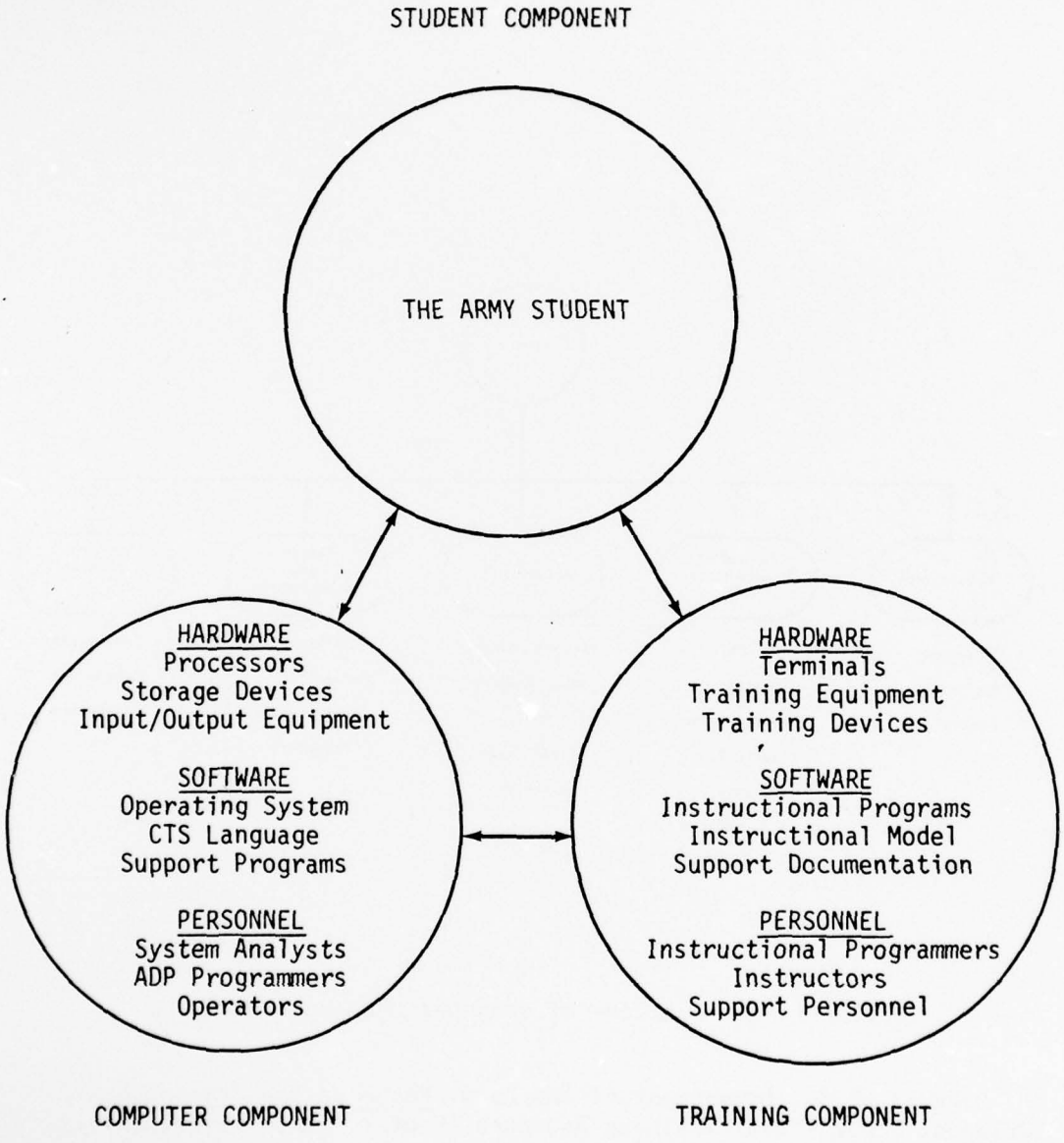


Fig. 7. A general view of the organization of the Army's Computerized Training System

SOURCE: U.S., Department of the Army, U.S. Continental Army Command, Concept Plan (Fort Monmouth, N.J.: U.S. Army Signal School, April 1973), p. 2.

Built into this evaluation is the capability of determining whether the student should be moved ahead, recycled within the course, or dropped because of poor academic performance. The first two decisions are automatically performed by the computer; the last is an instructor decision based in part on a computer generated student record printout. Also a part of the management system is a constantly updated prediction of the student's completion date and final grade.

An Analysis of Instructional Strategies

The very nature of instructional strategies presents complications for analysis. This difficulty stems from the fact that most strategies are individually designed to respond to a particular training situation. In recent years, the array of strategies has grown manyfold as the instructional technology discussed above offers the educator permutations and combinations of methods and media which defy comparative analysis. By a brief discussion of some alternatives early in this report, the benefits of computer based instruction can be estimated in relation to other strategies of training.

The benefits of using a particular strategy vary considerably. No common element identifies all potential benefits. The benefits that affect training requirements, however, can be divided into two categories: tangible benefits and intangible benefits. The tangible benefits can be translated directly into dollar savings, while the intangible benefits are more difficult to quantify but can be qualitatively assessed.

The research questions addressed in this report are oriented almost exclusively to the intangible aspects of computer based training.

It would be inconsistent with the purposes of this report to undertake a major cost analysis of the tangible benefits of instructional strategies. A comparison of some of the tangible benefits of these strategies, however, will give a somewhat balanced perspective of such benefits.[1]

Sufficiency and Comparability of Data

Comparable cost data on instructional strategies are almost non-existent. This seems to be an unlikely state of affairs, but the lack of a required discipline of measurement and recording has produced the situation. The lack of data severely impedes the instructional decision-making process. In the absence of comparable data, many decisions on strategies are made on a subjective basis as the trainer focuses on the apparent intangible benefits such as showing leadership in innovative training techniques over other schools and services, being responsive to anticipated student expectations of military training, creating an atmosphere of modern instructional technology to motivate the faculty to higher teaching efficiency, and providing basic research for computer use for the civilian educational community.

As a means of presenting the benefits of various strategies, four of the most recent and comprehensive studies of instructional alternatives will be briefly analyzed. Central to the discussion of each study is a table used to illustrate the salient aspects of their research. For each study these tables represent interpretations and condensations of the original findings.

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[1]The cost-effectiveness of these new systems are not yet determinable; however, research into this subject would make an excellent topic for further research and is so suggested. See below, p. 253.

Speagle's Cost Data

To present the multifaceted evidence about costs, Richard E. Speagle simplified a wealth of data from two studies and presented his concepts in summary form.[1] He felt that the most exciting possibilities of instructional technology centered around television and computers. Therefore, table 1 illustrates the cost structure of these media at several levels of application. Although estimates of this nature should be viewed with caution, the cost projections in this complex educational area depend on critical assumptions that must be identified and changed to fit practical training situations.

TABLE 1

SPEAGLE'S ESTIMATED COSTS OF MAJOR INSTRUCTIONAL TECHNOLOGIES

Instructional Mode and Quality	Cost per Student Hour
Conventional instruction	
Instructional materials	$ .02
Instructional television	
Utility model	.07
Medium quality	.21
Top quality	.40
Computer assisted instruction	
Drill and practice CAI	1.81
Tutorial CAI--IBM 1500 system	4.79

SOURCE: Interpretation and condensation of data compiled by Richard E. Speagle, "The Costs of Instructional Technology," in To Improve Learning, ed. Sidney G. Tickton (New York: R. R. Bowker Co., 1971), pp. 1061-74.

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[1] Richard E. Speagle, "The Costs of Instructional Technology," in To Improve Learning, ed. Sidney G. Tickton (New York: R. R. Bowker Co., 1971), pp. 1061-74.

Kiesling's Study

Herbert J. Kiesling, of Indiana University, explored methods of assessing the actual and potential efficiency of alternative instructional strategies and compared the problems of evaluating educational outcomes with those of evaluating governmental outputs in general.[1] His study introduces a discussion of twelve possible teaching strategies created by various combinations of conventional instruction and for other media--films, television, programmed instruction (PI), and CAI. Having constructed these alternative strategies, Kiesling computed cost estimated on a per-student basis. These estimates are summarized in table 2 showing a comparison of the relative cost of trading one media for another. From the table, it is apparent that CAI is expensive, but so is an instructor's time.[2]

Of all the media listed in table 2, television is the least expensive. It is even less costly than films. This is due to the copyright laws governing commercial films.

Up to this point, only the costs of alternative strategies have been considered. The effectiveness of the various strategies was developed by Kiesling from a synthesis of twenty-one independent studies. Table 3 is provided to illustrate a generalization of media effectiveness. The most appropriate conclusion that can be drawn from this composite of studies is that the use of instructional media does not hinder the learning process. Indeed, Kiesling makes the point that multimedia, PI, and CAI can improve

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[1]Herbert J. Kiesling, "On the Economic Analysis of Educational Technology," in To Improve Learning, ed. Sidney G. Tickton (New York: R. R. Bowker Co., 1971), p. 977.

[2]It should be noted that the source studies took place between 1966 and 1969, when CIA was in its infancy.

TABLE 2

INSTRUCTIONAL STRATEGIES USING VARIOUS MEDIA AND INSTRUCTOR COMBINATIONS

STRATEGY	MEDIA	COST PER STUDENT PER YEAR
1. Large TV, Films, and Conventional	66 percent TV 10 percent Films 24 percent Instructor	$202
2. Half TV and Half Conventional	50 percent TV 50 percent Instructor	$277
3. Conventional with TV and Films	60 percent Instructor 20 percent TV 20 percent Films	$307
4. Television, Films, Programmed Inst.& Conventional	33 percent TV 20 percent Films 20 percent PI 27 percent Instructor	$312
5. Conventional with Films	86 percent Instructor 14 percent Films	$322
6. Conventional with Large TV Groups	88 percent Instructor 12 percent TV + Monitor	$330
7. Conventional with CAI	91 percent Instructor 9 percent Computer	$343
8. Conventional Lecture	100 percent Instructor	$367
9. Conventional plus Television	84 percent Instructor 16 percent TV	$394
10. Conventional with CAI	67 percent Instructor 33 percent Computer	$400
11. Television, Films, and Conventional	66 percent TV 10 percent Films 24 percent Instructor	$410
12. Conventional with Programmed Inst.	84 percent Instructor 16 percent PI	$467

SOURCE: Interpretation and condensation of data compiled by Herbert J. Kiesling, "On the Economic Analysis of Educational Technology," in To Improve Learning, ed. Sidney G. Tickton (New York: R. R. Bowker Co., 1971), pp. 992-94.

TABLE 3

A SAMPLE OF EXPERIMENTAL FINDINGS IN AUDIOVISUAL TECHNIQUES

METHOD OF INSTRUCTION	EFFECTIVENESS (experimental vs control[a])
Television	
Half-hour classes by TV	No difference
All instruction by TV	Superior students--significantly poorer Average students--no difference Below average students--better
Half of instruction by TV	No difference
Closed circuit television	Statistically significant
All instruction by TV	No significant difference
Large & Small TV classes	White students--significantly better Negro students--no significant diff. Students in large classes did as well as those in small classes
Multimedia	
Film strips & motion	Most effective
Films and slides	Better on all tests
Film strips & sound film	Improved student performance Film strips most effective
Multimedia carrels	Faster learning Effectiveness--not statistically sig.
Programmed Instruction	
All programmed instruction	Above average students--significantly better Other students--no difference
30-minutes of PI	Significantly better except in low-ability students
40-minutes of PI	No significant difference except good students had time to do other things
Computer Assisted Instruction	
10-minutes per period of CAI drill & practice	Statistically significant better learning

[a]The control groups were face-to-face teaching (conventional instruction).

SOURCE: Interpretation and condensation of data compiled by Herbert J. Kiesling, "On the Economic Analysis of Educational Technology," in To Improve Learning, ed. Sidney G. Tickton (New York: R. R. Bowker Co., 1971), pp. 992-94.

learning. It should be noted that the ability level of the student is a factor in the effectiveness of the media. The reader is reminded that the data used in table 3 are from very early studies.

Miller's Approach

To give balance to the Kiesling data, the views of James G. Miller should be considered.[1] To determine the place of such technologies in the learning process, Miller advocates that educators must evaluate the technologies of the 1970s in terms of the comparative benefits, effectiveness, and costs. With these new resources, trainers should feel compelled to discard conventional methods of training unless the trade-off evaluations of the cost-effectiveness demonstrate such methods to be the more useful and desirable.[2] The summary of effectiveness shown in table 3 (page 48) reinforces the validity of individualized learning strategies. Further, it demonstrates to the instructors that they now have additional tools available to augment their human attributes, not to replace them. All too often these technologies have been viewed with fear and apprehension without prior examination. The very nature of our technologically-oriented society suggests that television, cathode ray tubes, and computers will be accepted by students in the future as the media for conveying information as readily as books have been in the past.

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[1] James G. Miller is one of the leaders in the general system theory field and has made comprehensive use of the "living systems" concept. He published eight articles between 1965 and 1971, with the phrase "living systems" as a part of the title. His book is entitled Living Systems (New York: John Wiley & Sons, 1972).

[2] James G. Miller, "The Nature of Living Systems," Behavioral Science, December 1971, pp. 36-37.

To assist the instructor in gaining an appreciation of several new instructional media, table 4 lists the major media of instructional technology now available for integration into the curriculum. This format avoids the pitfalls of cross-comparisons and focuses on nine elements of effectiveness in order that instructors can evaluate media characteristics in the trade-off analysis form necessary for valid cost-effectiveness decisions on teaching strategies.

A large body of research on learning, in general psychology, and educational psychology presents the framework of what constitutes an optional learning environment. Yet, this knowledge is not definitive. It differs from individual to individual. Miller suggests that aids to learning are most useful if the student can do the following: carry it around, use it individually at the school or at home, schedule its use, control the rate of information flow, interact with the media, receive individualized learning through branching,[1] employ several of his senses, and operate as part of a larger learning network. Upon examining the columns in table 4, it is apparent that none of the media are optimal in all of these ways. Some are better than others, and some are more appropriate than others for certain training situations. These differences among media make careful analysis of the trade-offs mandatory.

As a means of understanding the cost estimates provided in table 4, figure 8 is used to show the range of costs for each media. In addition, the likely direction of change in per-hour costs has been added to the

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[1]The term "branching" refers to a point in a computer program where the computer selects one of two or more subroutines, according to the conditions of the program.

TABLE 4

MILLER'S CHARACTERISTICS AND COSTS OF VARIOUS INSTRUCTIONAL MEDIA

Instructional medium	Can user carry it around?	Can user use it individually at school or college?	Can user use it individually at home?	Can user determine when it is to be used?	Can user control rate of information flow and repeat if not understood?	Can user interact actively with input?	Is individualized "branching" possible?	Senses used	Can signals be sent on electronic network?	Costs (dollar per hour of use)
1. Closed-circuit lecture on public address system	No	No	No	No	No	No	No	Audition	Yes	2¢-$2
2. Broadcast live instructional TV	No	Yes	Sometimes	No	No	No	No	Vision & Audition	Yes	2¢-$10
3. Closed-circuit tape recorded instructional TV	No	Yes	No	No	No	No	No	Vision & Audition	Yes	3¢-$2
4. Closed-circuit live instructional TV	No	Yes	No	No	No	No	No	Vision & Audition	Yes	3¢-$3
5. Other standard audiovisual aids	Usually	Yes	Often	Yes	Yes	Sometimes	Rarely	Vision & Audition	No	5¢-$8
6. Books and journals	Yes	Yes	Yes	Yes, unless another user has it	Yes	No	No	Vision	No	5¢-$10
7. Printed programmed instruction	Yes	Yes	Yes	Yes	Yes	No	Yes	Vision	No	5¢-$10
8. Class lecture	No	No	No	No	Rarely	No	No	Vision & Audition	No	15¢-$3
9. Dial-access instructional TV	No	Yes	No	Yes, unless number of terminals is limited	Sometimes	Rarely	No	Vision & Audition	Yes	50¢-$5
10. Small discussion group	No	No	No	No	Sometimes	Yes	Rarely	Vision & Audition	No	50¢-$15
11. Computerized programmed instruction	No	Yes	Rarely	Yes, unless number of terminals is limited	Yes	Yes	Yes	Vision & Audition	Yes	$2-$25
12. On-line computer aids to learning	No	Yes	Rarely	Yes, unless number of terminals is limited	Yes	Yes	Yes	Vision	Yes	$5-$100

SOURCE: Interpretation and condensation of data compiled by James G. Miller, "Deciding Whether and How to Use Educational Technology in the Light of Cost-Effectiveness Evaluation," in To Improve Learning, ed. Sidney G. Tickton (New York: R. R. Bowker Co., 1971), pp. 1012-13.

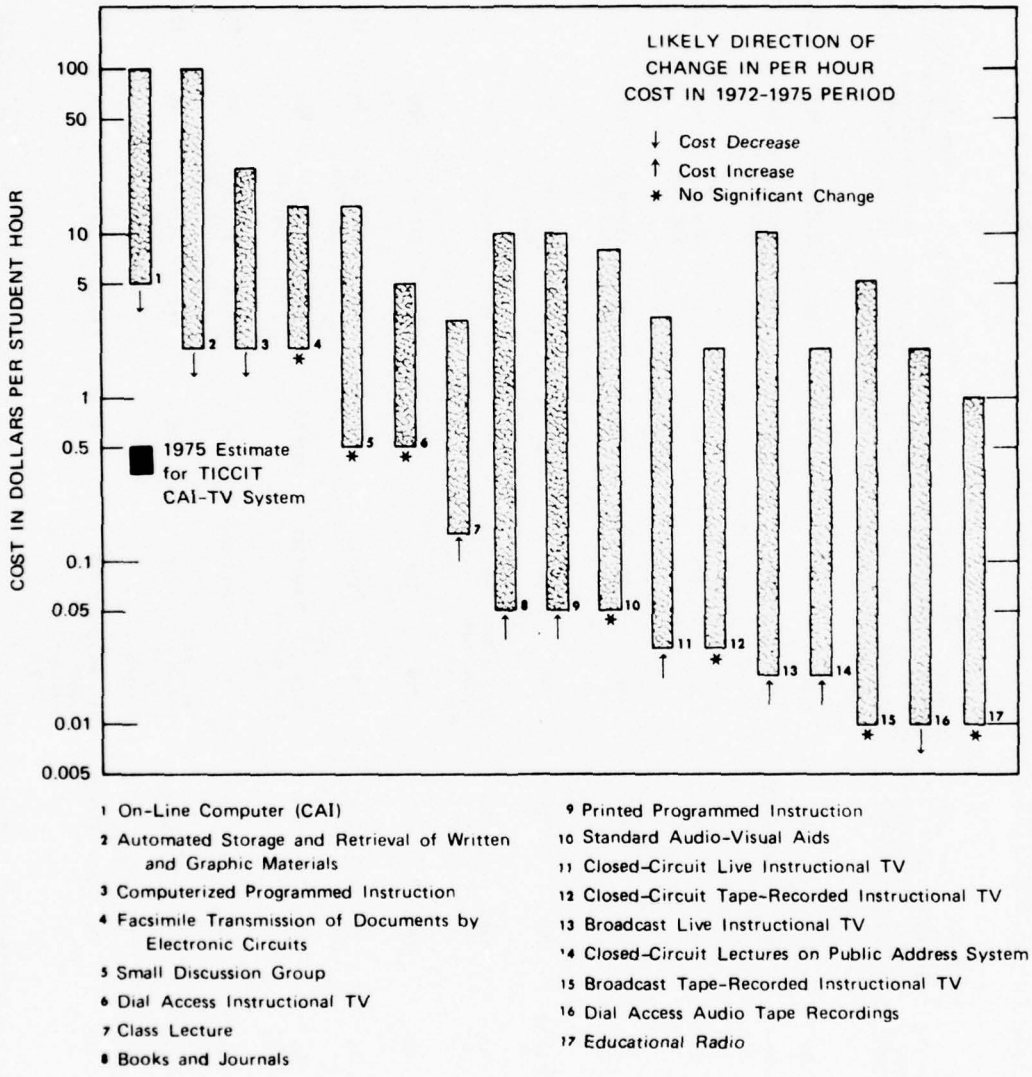


Fig. 8. Range of costs per student hour for instructional techniques (1970 data) compared with CAI estimated cost (1975)

SOURCE: Dean Brown et al., Survey of the Use of Educational Technology in the Armed Services (Menlo Park, Calif.: Stanford Research Institute, November 1973), p. 20.

cost-range bars.[1] A few general observations can be made from the chart. Large class lectures are less expensive than small group discussions. Even though more of the electronic media have all the advantages of direct human contact, some of them appear to be as cheap as traditional human teaching, or cheaper. Although printed media is regarded as cheap, its range of cost makes it sometimes more expensive than electronic technologies. To get electronic media that deliver to both the eyes and the ears of the student, the cost is normally more than for media involving audition alone.

Westinghouse Learning Corporation

In 1970, an analytic study was directed toward the fundamental question of instructional technology cost-effectiveness. The purpose was to find ways of significantly reducing instructional cost while either maintaining or improving instructional effectiveness.[2] The operating supposition that prompted the Westinghouse Learning Corporation analysis was that significant economies can be achieved if the optimal combinations are found. For example, if various instructional means, particularly recent innovations requiring less direct manpower, are welded together into a comparatively large-scale system capable of handling at least several hundred students concurrently, significant cost saving could be generated. This 700-page study includes a lengthy review and assessment of seventeen selected media. With this comprehensive information

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[1]The chart (fig. 8) was prepared by Dean Brown, using the cost data from James G. Miller's study. Brown added his estimate for the direction of likely changes in cost and the TICCIT cost bar. For a brief description of TICCIT, see above, p. 32.

[2]William E. Rhode et al., Analysis and Approach to the Development of an Advanced Multimedia Instructional System (Bladensburg, Md.: Westinghouse Learning Corporation, May 1970).

tabulated for each medium, the analysis provides a detailed comparison of the respective merits for different purposes with emphasis on individualization of instruction and economy. From the many media studied, several have been summarized in table 5. This study included a significant amount of subjective effectiveness data. The characteristics tabulated by Miller in table 4 are applicable to all of these media studies.[1]

TABLE 5

A SUMMARY OF SELECTED MEDIA SYSTEM COSTS
FROM THE WESTINGHOUSE STUDY

	Selected Instructional Media	Cost Per Student Hour[a]
1.	Conventional Lecture/Text System	$ .25
2.	Audio Tape System	.69
3.	Learning (Listening) Laboratory	.80
4.	Programmed Instruction Text (Linear)	.84
5.	Portable Instructor Aids	.91
6.	Programmed Instruction Text with Branching	.97
7.	Portable Video Tape Recording System	1.40
8.	Programmed Instruction by Teaching Machine	1.75
9.	Closed Circuit TV	2.43
10.	Silent Still Visuals	2.56
11.	Live TV Instruction	3.49
12.	Video Tape System	3.58
13.	Sound Motion Pictures	6.78
14.	Audiovisual Carrel--Sound Film Cartridge	16.25

[a]This cost is the central figure from a series of matrices which represent the cost per student hour for 600 students taking a fifteen-week course, offered three times a year, or 810,000 student hours.

SOURCE: Interpretation and condensation of data compiled by William E. Rhode et al., Analysis and Approach to the Development of an Advanced Multimedia Instructional System (Bladensburg, Md.: Westinghouse Learning Corp., May 1970), pp. 57, 72, 81, 91, 159, 182, 190, 200, 227, 278, 316.

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[1]See above, p. 51.

The selection of one media over another is highly dependent on the nature of the instruction, once the cost parameters are established. On the basis of such comparisons, an optimum illustrative configuration was proposed to meet variegated training requirements in large volume. The suggested system was programmed instruction by text and teaching machine with individualized sound motion picture capability, video tape recording, simulation, and dial access computerized information retrieval. The programmed instruction text would carry the burden of instruction. A computerized management subsystem was proposed to handle the necessary control and coordination of such an advanced multimedia system.

The Difficulties of Selecting a Training Strategy

Some of the attempts to use modern teaching methods have failed because education or training goals have not been clearly stated or communicated to the instructor.[1] Without such direction, the opportunity for effective learning is foregone. On the other hand, if educational goals are identified and relevant policy decisions are made, the issues of an appropriate training strategy are more easily addressed. However, the active selection of the optimum strategy is a difficult task. In fact, there is seldom a single solution, but rather, a range of viable alternatives.

The Commission on Instructional Technology concluded in its study that "learning might be significantly improved if the revolution of information processing and communication could be harnessed to the tasks

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[1] Carnegie Commission on Higher Education, The Fourth Revolution (New York: McGraw-Hill Book Co., June 1972), p. 10.

of instruction.[1] The study supports the position that one-shot injections of a single technological medium are ineffective, and, at best, such injections offer only optional "enrichment." Technology can contribute its full potential only when educators perceive instructional technology as a system and integrate a range of human and material resources into the total teaching process.[2]

Whether mass lectures or individual tutorials are indicated, the mode of instruction cannot be decided until the effectiveness and cost of each alternative have been analyzed. However, as the discussion in this chapter has shown, the managerial information and methods do not yet exist in education except in small-scale or other experimental quantities. The conditions for success in the use of the "things of learning" are many, varied, imprecise, changeable, and changing.[3] Given this uncertainty,

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[1]The Secretary of Health, Education, and Welfare, in response to Title III of the Public Broadcasting Act, requested a select committee (chaired by Sterling M. McMurrin) to conduct a wide-ranging study to examine every aspect of instructional technology and every program which may arise in its development. In the light of their mandate, the Commission concerned itself with the whole gamut of instructional technology--old, new, and future; mechanical and electronic; automated and cybernated; from innovations in print technology to computers; from classrooms to multimedia centers. Six recommendations were proposed by the Commission on Instructional Technology that were considered essential to achieve the change needed in the American educational system. The changes required will probably be as thoroughgoing as those which industry underwent when it shifted from hand labor to mechanization. With a society that is hurtling into the age of the computer and the satellite, America can no longer be held back by an educational system that is limping along at the blackboard and textbook stage of communication. The study was directed by Sidney G. Tickton, executive vice-president of the Academy for Educational Development. The report was published as a two-volume book, edited by Tickton, entitled To Improve Learning (New York: R. R. Bowker Co., 1970).

[2]Ibid., p. 10.

[3]James W. Armsey and Norman C. Dahl, An Inquiry into the Uses of Instructional Technology (New York: Ford Foundation, 1973), p. 21.

the likelihood of achieving success in developing a training strategy can be improved by considering the following factors:

1. A recognized and generally agreed upon need for change must exist
2. A desire to meet the need and to do it through the use of instructional technology must pervade
3. A purpose must guide and must be articulated
4. A structure should exist which makes success possible
5. Leadership must be exerted at the right level of authority, responsibility, and control
6. Faculty must participate and support the project
7. Some substance (learning objectives) must require the use of "the things of learning"
8. A mechanism for measurement, for evaluation of the experience, must be included
9. Adequate resources must be provided at the beginning and for the duration of the project[1]

These nine factors demonstrate the difficulty in achieving successful training strategy. The "how" of training is the most illusive component of the instructional area. The factors listed above represent forward thinking synthesis of some of the steps which can make the educator's role more effective as the strategy of instruction is being selected. A number of these aspects will receive additional consideration in the chapters that follow.

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[1]Ibid., pp. 101-3.

CHAPTER 3

THE PROGRESS TOWARD THE INSTRUCTIONAL USE OF THE COMPUTER IN THE MILITARY SERVICES

Introduction

This chapter is designed to answer the subsidiary research question: What progress has been made by the military services toward the integration of computers in the instructional process? In responding to this question, three major areas are explored. First, it is necessary to determine the time frames of the development of the various computer applications to training and education. Then, the progress of each service is examined to establish the advancements with each. Finally, the quantitative data to illustrate progress of the services are presented. Because of the nascent nature of computer use in training, it is inappropriate to seize on any one of these areas as the measure of service progress. Rather, by evaluating the progress in the light of the subjective and the objective information in these three areas, a reliable perspective is obtained.

The Time Frames of Progress

In a study of this breadth, it is desirable to place some time parameters on the use of computers in military training. One of the early studies covered in this area was a 1972 Carnegie Commission report which posited several major themes of its inquiry on the "Fourth Revolution"

concerning instructional technology.[1] The first of these themes declared that new (electronic) technology has already transformed administrative methods and is entering into the instructional process. Figure 9 was used to depict the Commission's estimate of higher education progress made in the integration of electronic technology into the functional areas of research, administration, library, and instruction.

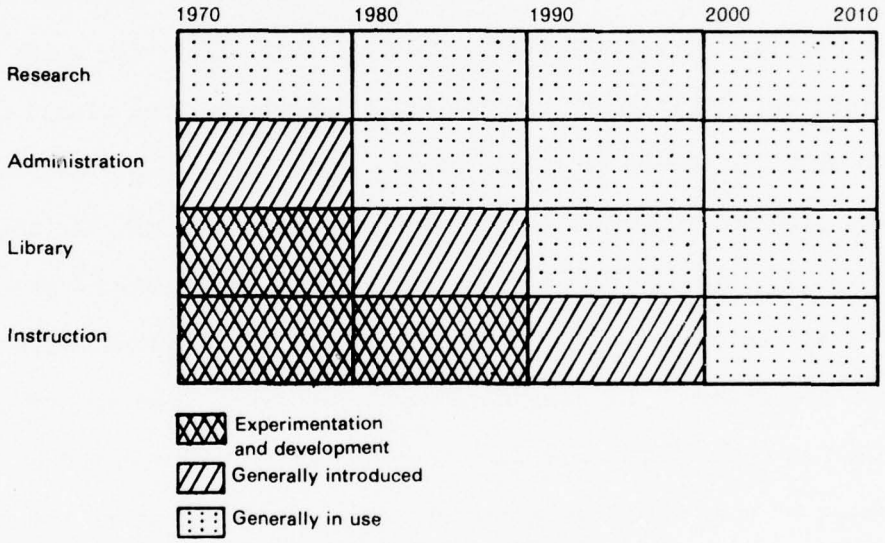


Fig. 9. Estimated use of electronic technology (computers, cable television, videocassettes) in higher education

SOURCE: Carnegie Commission on Higher Education, The Fourth Revolution (New York: McGraw Hill Book Co., 1972), p. 2.

By using this concept as a format, a similar figure was developed for the military services with an expansion of the functional areas to seven general categories of computer application: academic administration, calculation, simulation, service academy education, service college

[1]Carnegie Commission, Fourth Revolution, p. 1.

education, organizational training, and individual training.[1] New technologies usually become a part of an organization as a result of phased development programs. This notion of phased integration was depicted in the figure by contrasting bar codes to provide for (1) the development phase, (2) the general introduction phase, and (3) a generally in use phase. In developing the military version of this bar chart, time frame estimates were postulated as a result of researching the literature and conducting personal interviews during the period when the staff interview guide was being developed. The military version of the chart was then placed at the end of the staff interview guide and subjected to the same pretests and refinements accorded the other staff questions. This refined bar chart (fig. 10) was discussed at the close of each staff interview. A great majority of the respondents indicated satisfaction or agreement with the postulated time frames. The nagging thought persisted, however, that the large number of respondents accepting the charted time frames did so to be agreeable, or they were taking the easy way out by accepting the

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[1]The computer applications are defined as follows:

Academic administration--The computerization of administration that directly supports the instructional process to include such activities as test construction, grading, and analysis.

Calculation--Use of the computer to perform mathematical processes which may be student programmed, interactive, and on-line.

Simulation--A computerized model of a real-life situation represented by given sets of circumstances and parameters.

Service academy education--The use of computers to provide instructional support for courses conducted at the military academies to include CAI, simulation, and calculation.

Service college education--The use of computers to provide instructional support at the command staff college and senior service colleve level to include calculation, simulation, and CAI.

Organizational training--The use of the computer to provide training or evaluation of organized crews or units, normally conducted by a unit at a garrison or in the field.

Individual training--The use of the computer to train individuals, normally in a service school setting and directed toward skill acquisition.

estimates provided. Conversely, the fact that 79 percent agreed could mean that the time frames represented their best estimates also.

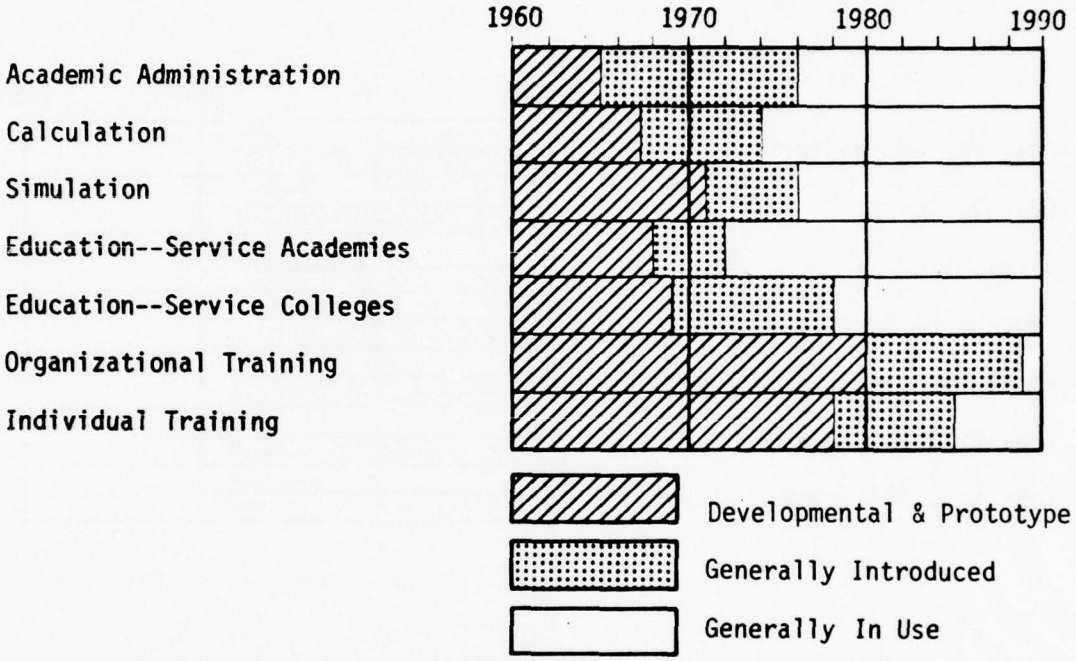


Fig. 10. The postulated time frames associated with various computer applications in military training which suggest the three phases normally associated with the introduction of new computer technology. Each staff survey respondent was asked to draw in lines to show his perception of the time spans applicable to each mode of computer use.

In such a case as this, it is entirely possible to conclude that the responses that varied from the postulated time frames are more significant than those that were in agreement. This thought led to the question of how best to aggregate the views of the ninety-two respondents and generate an "expert opinion" set of time frames. Stephen Isaac and William B. Michael suggest the use of the median as a measure of central

tendency for criteria similar to these.[1] Therefore, figure 11 was developed, on the basis of the median value of responses, for each phase of growth for all training and education applications.

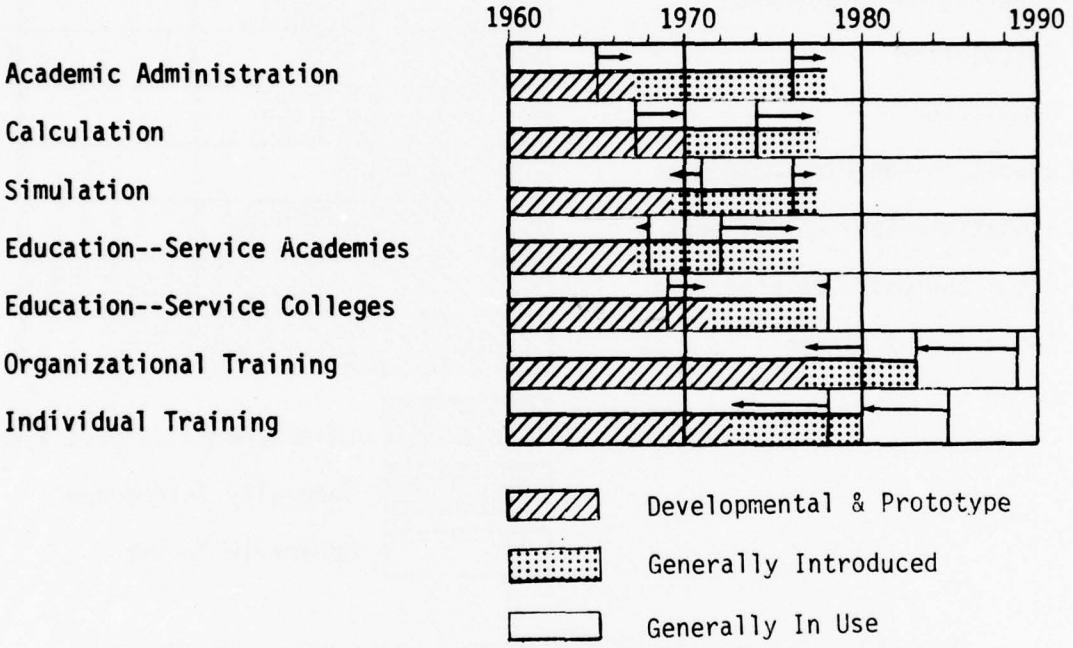


Fig. 11. Staff survey response produced new time frame estimates of when computer applications have or will take place in military training and education. From the median responses, each phase of the applications now has a new bar length which is contrasted with the postulated time frames by an arrow. The time shift is shown by the length and direction of the arrow.

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[1]The use of the median as a measure of central tendency is appropriate when the following applies:

1. "Distributions are markedly skewed"
2. "We are interested in whether cases fall within the upper or lower halves of the distribution and not particularly in how far from the central point"
3. "An incomplete distribution is given"

Stephen Isaac and William B. Michael, Handbook in Research and Evaluation (San Diego, Calif.: Robert R. Knapp, 1971), p. 117.

The arrows above each phase of the bars (fig. 11, page 62) show that the time frames needed to be extended a few years for academic administration and calculation. Conversely, the time frames needed to be shortened from three to six years in the two bars for organizational training and individual training. In the middle three categories (simulation, service academy education, and senior service college education) the responses reflected ambivalence. An interesting discovery is made by a holistic view of figure 11, observing the start and stop lines in each phase in relation to time. The survey suggests that all developmental and prototype work (diagonal lines) for computer technology in military training and education has already been completed except for organizational training, which continues to 1977. Table 6 recapitulates this information for ease of reference. The table reflects the estimate of the staff respondents that the main developmental work on computer based training will be completed in the decade of the 1970s.

TABLE 6

ESTIMATED COMPLETION YEARS FOR THE DEVELOPMENT AND PROTOTYPE PHASES OF COMPUTER APPLICATIONS IN MILITARY TRAINING AND EDUCATION

Application	Estimated Completion Year for Development-Prototype Phase
Academic administration	1967
Calculation	1970
Simulation	1969
Education--service academies	1967
Education--service colleges	1972
Organizational training	1977
Individual training	1973

These staff estimates should not lead one to believe that the military has completed the research and development of computerizing individual training. The phases, though drawn as start-stop bars in figure 11 (page 62), do not lend themselves to such clean breaks in reality. In fact, much developmental work will continue even though all of the services are "generally introducing" computer based training at this time. The information gained from personal visits to twenty service activities suggests, however, that the staff estimates are a bit heroic if one accepts the end of the diagonal lines as representing the end of development of computer based training.

Returning to the second set of phase lines of figure 11, it is equally important to realize that the staff respondents reached the consensus, again with the exception of organizational training, that all of the computer applications will be in "general use" prior to the 1980s. Thus, there is evidence in the field that the 1980s will be a decade of operational use of computers in military training and education. These data, from both staff and instructor respondents, lend support to the general premise of this research report that the military will find computer based training more prevalent in the 1980s.

An Overview of Computer Based Training Systems

The second step in determining military progress in computer technology was an examination of the ways the military services are presently using the computer in the instructional process. For the purpose of collecting relevant data for this report, personal visits were made to twenty military training or educational activities. In addition, data

were collected by telephone and by correspondence with sixteen other institutions. An overview of the highlights of progress of each service is presented in this chapter,[1] demonstrating how the scope and utility of computers for instructional purposes by each service have expanded to include computer based training.

The next twelve pages contain a brief description of the most significant instructional computer applications by the four military services and the Department of Defense institutions. Photographs are included in each section to illustrate the principal applications.

The Air Force and Computer Directed Training

The Air Force has been involved in computer aided training since the development of the SAGE (Semi-automatic Ground Environment) system of 1954.[2] This concept used operational computers in the training of operators on the job and subsequently was applied to the development of Computer Directed Training Systems (CDTS). CDTS programs are used at base level at over 100 installations, training operating personnel through the use of this tutorial, computer assisted instructional system.

The PLATO IV computer assisted instruction system, developed by the University of Illinois, is currently being tested for military

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[1]The general information and data gathered through personal visits together with a search of the literature and telephonic interviews were used to develop detailed descriptions of each service computer based training and education application. The descriptions represent a pioneer effort in documenting the status of institutional computer use in the military service and have been published separately at the request of DoD for use in a task force report and at a computer conference at the DoD Computer Institute. Col. Gene T. Sherron, Computers in Military Training (Washington, D.C.: Industrial College of the Armed Forces, June 1975).

[2]See above, p. 10, n. 2.

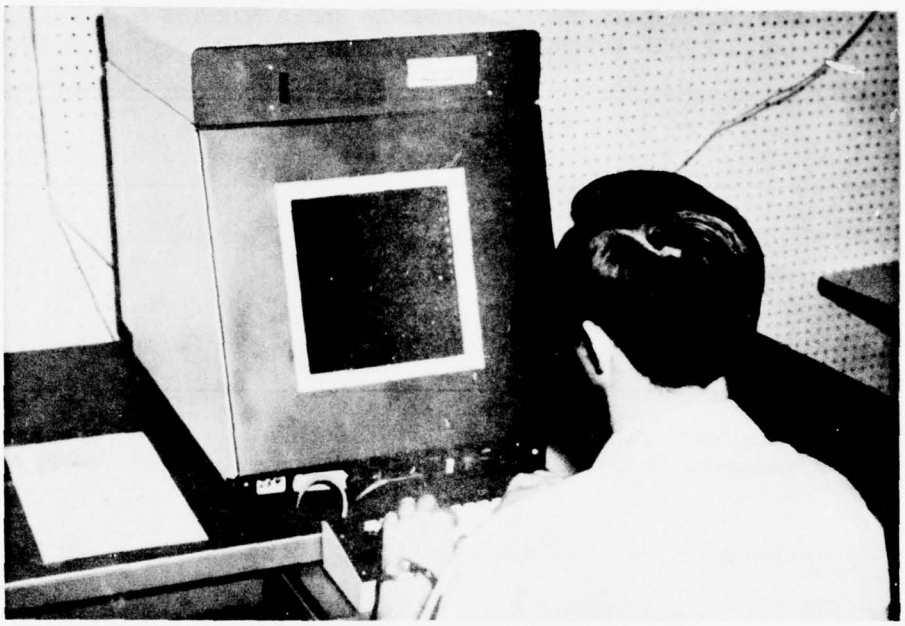
application at a number of Air Force schools.[1] PLATO IV programs include: vehicle maintenance training at Chanute Air Force Base, medical training at Sheppard Air Force Base, and logistical applications at Lowry Air Force Base.

The major CAI-CMI effort of the Air Force is the Advanced Instructional System (AIS) which is currently under development at Lowry Air Force Base. The project originated in 1969 and was extended over an eight-year period at a cost of more than $13 million. This individualized instructional system is referred to as the maxicomputer, multimedia approach to CAI. It features the CDC Cyber 73-14 computer and 115 PLATO IV student terminals. The system will include 600 carrels and 500 media devices (see fig. 12). Each of the three courses being developed for AIS will incorporate varying amounts of instructional media to teach about 7,000 students annually. The integration of technology in this multimedia system is a good example of the development of sophisticated future military training systems. Table 7 shows the courses and distribution of training strategies.

The allocation of training technology includes conventional military training strategies such as the lecture, conference, and demonstration, but

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[1]PLATO (Programmed Logic for Automatic Teaching Operations) is a computer based teaching system which provides a means for individualizing student instruction where the instructor, the computer, and the student are all members of an interactive team. The University of Illinois has been experimenting with PLATO since 1960. PLATO has since grown to a system of over 300 terminals in operation at more than fifty locations. The system features a maxicomputer (CDC 6000 series) and student terminals (the Magnavox PLATO IV student terminal with an Owens-Illinois Digivue Plasma display panel). Donald Bitzer and D. Skaperdas, The Design of an Economically Viable Large-Scale Computer Based Education System (Urbana, Ill.: Computer-Based Education Research Laboratory, University of Illinois, July 1973), p. 1.



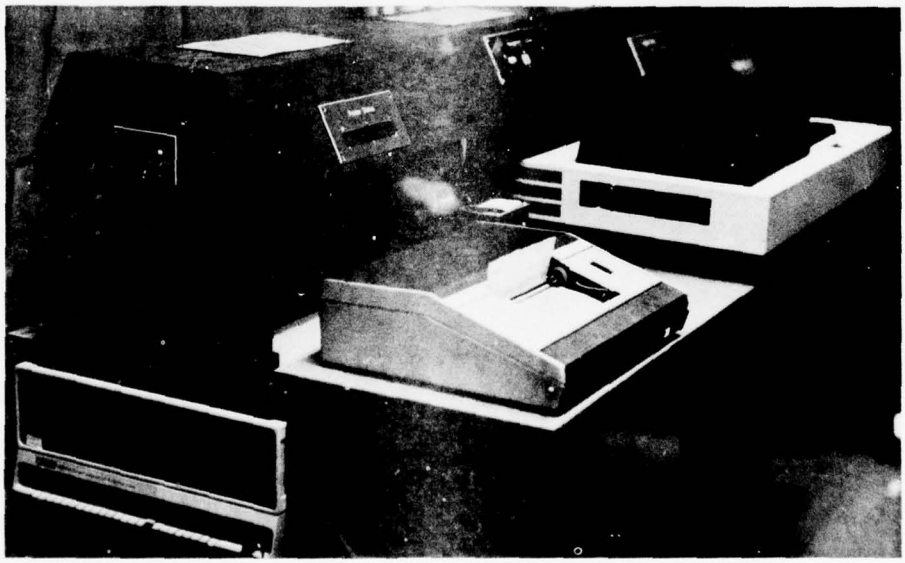


Fig. 12. Some of the components of the Advanced Instructional System. (a) Airman uses a modified (keyboard) PLATO IV student terminal by Magnavox which features a gas filled screen called a plasma panel. (b) A management terminal which includes a PDP 11/05 minicomputer (lower left), a Data Interface 240 line printer (center), and a Decision, Inc. 6500 optical form reader (top right).

SOURCE: Letter from Dr. Joseph Y. Yasutake, AIS Program Manager, AFHRL Technical Training Division, Lowry Air Force Base, Colorado, 21 March 1975.

TABLE 7

THE PERCENTAGE DISTRIBUTION OF MEDIA FOR THE AIR FORCE ADVANCED INSTRUCTIONAL SYSTEM

	Printed Media	Materials (Film, Tape, etc.)	CIA Terminal
Inventory management	65%	22%	13%
Precision measuring equipment	52	26	22
Weapons mechanic	54	36	10

SOURCE: Interview with Dr. Joseph Y. Yasutake, Advanced Instructional System Program Manager, Lowry Air Force Base, Colorado, 5 June 1974.

provides the opportunity for the student to be taught and directed by the computer system with a minimum of faculty involvement. This integration of technology does not mean that instructors are no longer required at the school. Development and continuing refinement of instructional materials remain the primary tasks of the instructor and consume a significant amount of his time. Of great importance is the one-to-one relationship between the instructor and the student. As the system moves the student through the learning process at his own pace, the faculty is ever present to motivate and help him with the difficult comprehension areas. The AIS contract includes a number of basic performance criteria which are of interest because they demonstrate the potential for computer based training. It is projected that the AIS will reduce the training time of each course by 25 percent and will not exceed the current wash-out rate.[1]

[1]U.S., Department of the Air Force, "General Specifications for Performance and Design Requirements for the Advanced Instructional System," an exhibit from the request for proposal (RFP) developed by the Air Force Human Resources Laboratory, Lowry Air Force Base, Colorado, 12 April 1972, p. 7. The term "washout" refers to academic failure in a course. It is synonymous with "attrition rate."

The long-range plan for this system suggests that several large systems such as AIS will be in use in 1980 at the major technical training bases to handle skill training for the Air Force.[1]

The Navy and Computer Managed Training

Since the mid-1960s, the Navy has been actively involved in developing computer based training applications on a broad front. For example, two large CAI projects were conducted at the Naval Academy from 1967 to 1972. One project featured the IBM 1500 system, which was used to experiment solely with tutorial and drill and practice techniques. The other project was an experiment with all CAI techniques using standard teletype terminals with a Honeywell 635 computer. On the basis of comparative cost effectiveness, the teletype system became the accepted system. The growth in number of users of this system has reached the point where virtually all midshipmen use the system as students, and the faculty members use it to develop more learning applications for their courses.[2]

The largest computer based training system in use by the Navy is computer managed instruction (CMI). Over the past seven years, CMI has been developed by the Naval Technical Training Command at Memphis,

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[1]Interview with Dr. Marty R. Rockway, Air Force Human Resource Laboratory, Lowry AFB, Colorado, 5 June 1974.

[2]In 1966, the Naval Academy began testing CAI systems for possible use as an instructional medium. By 1974, the Academy was using 180 terminals and a GE 635 computer to support over 200 of its courses. Of the 540 faculty members, about 66 percent are active users of the computer support. Sometime during their education the 4,100 midshipmen use the computer system. Interview with Capt. Philip A. Charest, Director of Computer Services, U.S. Naval Academy, Annapolis, Maryland, 13 June 1974.

Tennessee. This system uses a computer to monitor and direct aviation students on an individual basis, as shown in figure 13. The actual instruction takes place off-line, but the computer system manages approximately 500 students a week in several different courses. The success of this system has led to its adoption in the Basic Electricity and Electronics Schools at the Navy Training Centers at San Diego and Great Lakes.[1]

The Marine Corps and Computer Assisted Training

From a purist's point of view, the Marine Corps has the best operational example of CAI in the military. The Communications Electronics School in California has trained hundreds of Marines in basic electronics over the past two years. (See illustration in fig. 14.) The effectiveness of this system has accomplished the reduction of twenty-three instructor billets and quickened the pace of learning to the extent that the course lengths of the four courses were reduced by several weeks.[2]

The Marines are also leading the services in the use of computers for field exercises and command post exercises. Their Tactical Warfare Analysis and Evaluation System is designed for field exercises, and their Tactical Exercise Simulator and Evaluator is designed for command post and map exercises.

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[1]Interview with Cmdr. Richard Fletcher, Director of Instruction, U.S. Naval Air Technical Training Center, Memphis, Millington, Tennessee, 7 June 1974.

[2]Interview with Lt. Col. Robert B. Mason, Academic Director, Marine Corps Communications-Electronics School, Twentynine Palms, California, 4 June 1974.

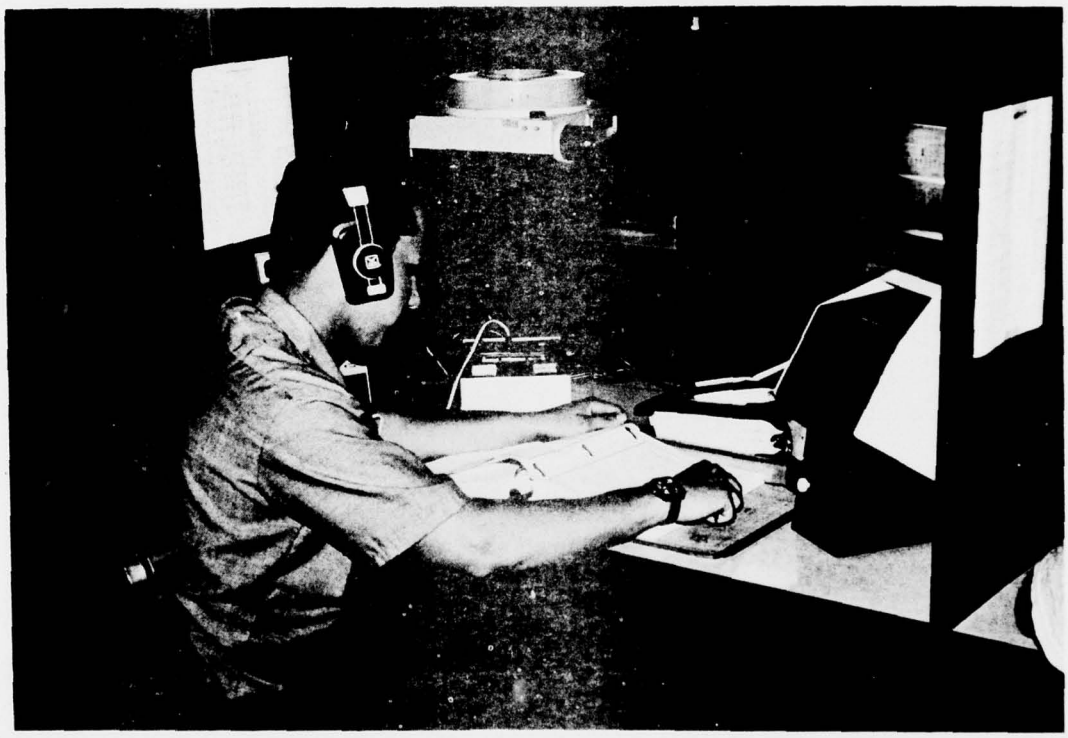


Fig. 13. Under CMI direction, a sailor receives audiovisual instruction (tape unit, lower left and 35 mm carousel slide unit projecting into a rear view screen, upper right) as he reads the programmed instruction text on basic electricity and electronics. This study carrel also has a capability for microfiche projection (lower right).

SOURCE: Henry Edsall, Educational Adviser, Naval Air Technical Training Center, Naval Air Station Memphis, Millington, Tennessee, 5 March 1975.



Fig. 14. A Woman Marine is tutored in supply manual use under control of computer assisted instruction via this terminal at the Communications-Electronics School at Twentynine Palms, Calif.

Department of Defense Computer Based Simulations

The Department of Defense has established a number of tri-service educational and training institutions over the years that use computers to aid in the learning process. For example, the Industrial College of the Armed Forces in Washington, D.C., has been using computer based simulations since 1961 to support its resident program. An illustration is shown in figure 15.

At Fort Belvoir, Virginia, the Defense Systems Management School uses a GSA time-sharing system to conduct a twenty-nine case simulation on the acquisition of a weapon system. Recently, the Armed Forces Staff College at Norfolk, Virginia, has installed a minicomputer to run three major exercises during its six-month course. Also, the DoD Computer Institute at the Washington Navy Yard in the District of Columbia provides hands-on experience for executive orientation courses on computers and information systems.

The Army and Computerized Training

The Army has been involved in the development of computerized training since the mid-1960s when CAI feasibility tests were conducted at the Signal School. One test led to another until the early 1970s, when Army officials decided to develop, test, and evaluate a large-scale prototype Computerized Training System (CTS). This system features a multi-minicomputer, which presents a variety of course materials to students in a real-time, hands-on, interactive mode similar to the CAI concept. The CTS is comprised of 128 cathode-ray tube (CRT) keyboard terminals divided into clusters of 32 terminals linked to six PDP 11/35



Fig. 15. Industrial College students engage in computer-assisted simulations via the TI Model 700 portable terminal (center front), the Hazeltine 2000 CRT terminal, the Western Union ASR Model 33, and Model 300. Data are transmitted to time-sharing computer systems using the General Electric Model 105 (background) as a front-end processor.

SOURCE: Charles M. Crawford, Visual Aids Section, Support Services Branch, Industrial College of the Armed Forces, Washington, D.C., 12 December 1974.

minicomputers as illustrated in figure 16. Each student sets his own learning pace and responds to problems via the keyboard as lesson material, containing both text and graphics, appears on the screen. The instructional model, designed by the CTS office, with its associated teaching strategies allows the student's progress to be monitored continuously by an instructor. An instructional path, which is based on the student's immediate past performance, is tailored for optimal learning. Most aspects of instruction are accomplished by the computer through pre- and post-testing, remediation, reinforcement, recycling, and branching. The classroom instructor provides individual assistance and counseling. By using the keyboard, the instructor can send messages to individual students, request data on a student, and duplicate a student's display on his terminal. An added feature of CTS permits on-line entry of course material by instructional programmers and entry specialists. Once the entire lesson is available on-line, the instructional programmer is able to debug and revise material on-line and finalize it for student validation.[1]

The CTS project is the prototype test for CAI-CMI in the Army. If successful, it will lead the way for the proliferation of CTS to other Army service schools. This minicomputer approach provides the Department of Defense with a system that contrasts with the Air Force's maxicomputer design, described above as the Advanced Instructional System.[2]

During the same period that the CTS project was instituted at the Signal School, the Army fostered the development of computer based

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[1] Computerized Training System [CTS], Information Bulletin (Needham Heights, Mass.: GTE Sylvania, August 1974), p. 1.

[2] See above, pp. 65-69.

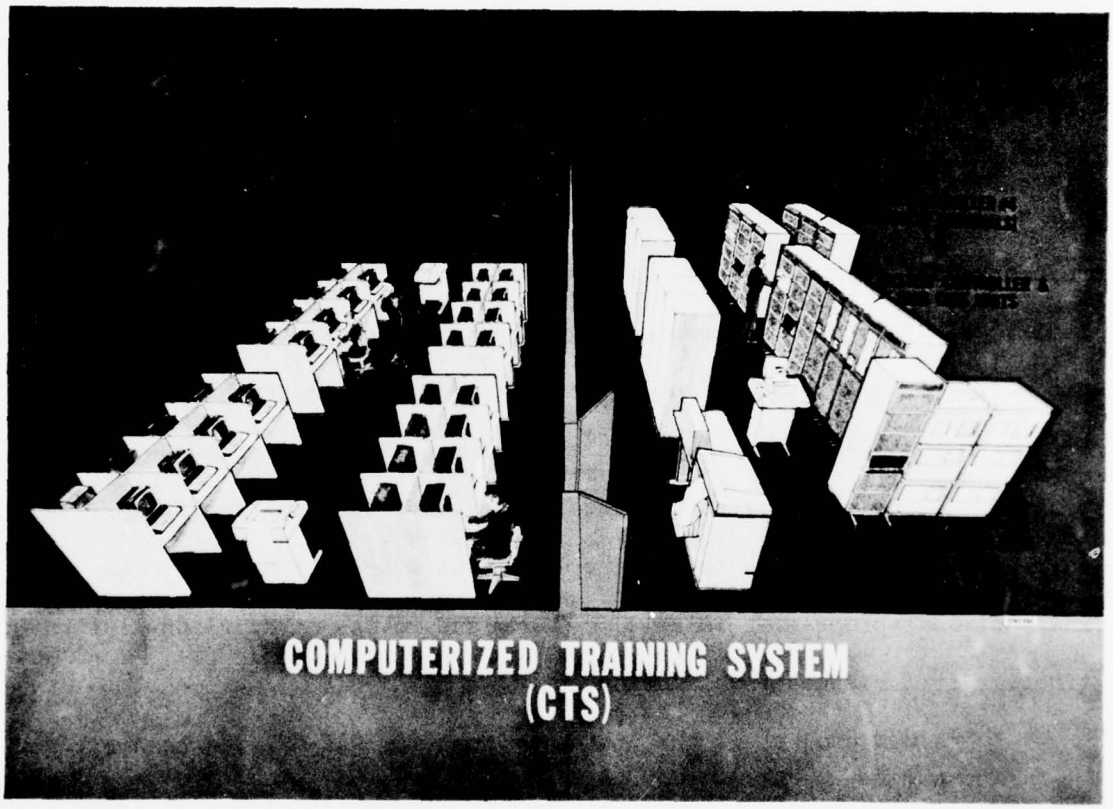


Fig. 16. A drawing of the Computerized Training System configuration which shows a 32-terminal classroom on the left and the associated computer support on the right. Such a system is currently being installed at the Army Signal School at Fort Gordon, Georgia.

SOURCE: Personal letter from Robert G. Foster, CTS Field Office, Fort Gordon, Georgia, 13 March 1975.

instruction at other schools and educational institutions. Fifteen of the Army's eighteen branch schools are using the computer in the various supporting strategies. The degree of computer support or involvement varies by mode from computer assisted instruction to computational use to simulation. This support or involvement also varies in the amount of use from a few hours per course to 75 percent of the course hours. For example, Morse Code training is taught almost completely by a tailor-made Sylvania Morse Code Trainer. It is one of the Army's best examples of operational CAI and features audio and visual presentation as well as automatic analysis of each student's progress so that the instructor can rapidly identify problem areas for remediation.

The Ordnance School at Aberdeen Proving Ground, Maryland, is making the most of a PLATO IV test situation by integrating this CAI system into three courses.[1] In 1974, three dedicated faculty members installed the PLATO IV student terminals and designed the instructional material for the system. By the end of the year, students were taking courses by CAI, and this system will continue to be tested with ordnance students through 1975. This testing, like that mentioned earlier for the Air Force,[2] is sponsored by the Department of Defense Advanced Research Projects Agency (ARPA) in support of the development of the University of Illinois' PLATO IV system.[3]

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[1]During an interview with the Army official who has become the focal point for all computer based training programs in the Army, he said: "It would be most descriptive to say that almost all of the branch schools are 'dabbling' in ways to use computers in training." Interview with Col. G. B. Howard, CTS Product Manager, Fort Monmouth, New Jersey, 28 May 1974.

[2]See above, pp. 65-66.

[3]Over the past several years, ARPA has encouraged the military services to test the capabilities of PLATO IV for possible military

With few exceptions, the pattern of computer development has been a bottom-up approach. Generally, a few instructors have the vision of teaching with the aid of a computer and have developed a small program using whatever talent and equipment can be obtained locally. Some programs, like the one at the Engineer School, have led to the next step of purchasing a small computer to expand CAI activities. Other programs, like the one at the Police School, have received a diminution of interest because of the transfer of a few key instructors, and the system was consequently canceled.

Military Progress toward Computer Technology in Training

This chapter began with a quantification of computer progress in the services by suggesting the time frames of development for various training and education applications. The time frames and descriptions are two manifestations of progress. This final portion of the chapter presents the third and most tangible indication of progress, the analysis of statistical data from the follow-on survey, which quantifies service progress through time-series analysis. It also presents staff and faculty perceptions of the service leaders in the field and then removes all doubts by illustrating the comparative involvement of each service.

The Service Leader--An Opinion

By the design of this research, the third step in tracing service progress is the determination of service expertise or leadership as

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applications. In fiscal year 1974, ARPA placed fifty-seven terminals at Army, Navy, and Air Force schools. This number is to increase to ninety-seven by the end of fiscal year 1975. Interview with Col. Austin W. Kibler, Director of Human Resources Research Office, ARPA, Washington, D.C., 9 May 1974.

perceived by the military staff and faculty involved in computer use. For example, if the Air Force is the acknowledged leader in computerized training, it would be logical to use its experience as a reference point for the other services. Therefore, in both the staff and the instructor surveys, the first question related to this thought. Figures 17 and 18 show the questions and their responses. The staff respondents are of the

STAFF QUESTION 1. Based on your experience, which U. S. military service has made the most progress toward incorporating computer technology into its instructional progress?

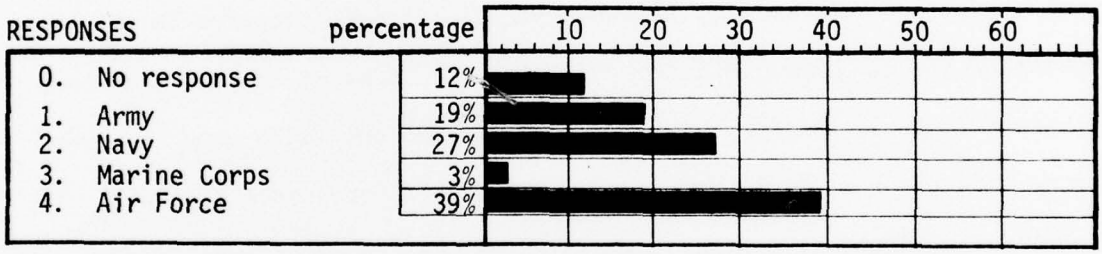


Fig. 17. Responses to staff question 1--service progress

INSTRUCTOR QUESTION 1. Based on your experience, which U. S. military service has made the most progress toward incorporating computer technology into its instructional process?

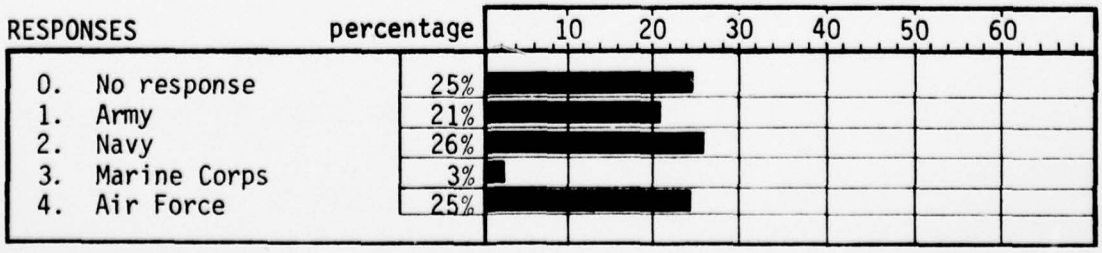


Fig. 18. Responses to instructor question 1--service progress

opinion that the Air Force is making the most progress, followed by the Navy and the Army in that order. The instructor response provides no clear picture of leadership, because the Navy is only a percentage point ahead of the Air Force and the Army is ranked only a few points lower.

In most cases, the respondents to these questions commented that they had little knowledge of the other services' computer activities. Thus, they made a guess on the basis of factors they thought might contribute to computerized training progress, such as: the Air Force and the Army have generally large budgets, and the Air Force and Navy are more technically oriented because of their involvement with high-technology weapons systems.

The problem underlying these two questions on progress is one of exceeding the respondents' information level.[1] Some of the staff members were sufficiently versed in instructional technology to be able to respond as service experts. Yet, it appears that the preponderance of the respondents possessed neither the expertise nor the experience to give validity to these questions.[2]

It was at this precise point in the research that it became apparent that the staff and faculty did not constitute the best source of data for determination of service progress in instructional computer use. As described in the methodology, a follow-on survey was undertaken to obtain quantitative evidence of service progress.[3]

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[1] Robert L. Kahn and Charles F. Carnell, The Dynamics of Interviewing (New York: John Wiley & Sons, 1957), p. 122.

[2] Ibid., p. 123.

[3] See above, p. 19.

The Evidence of Progress

The follow-on survey evolved in a serendipitous manner to become a significant contribution to the research. Every major training and education activity within the Department of Defense that uses computers in the instructional role is represented in this pioneer effort to establish the progress of computer use in military instruction. All data from this survey have been consolidated onto special analysis forms, by academic year. These forms (see appendix H) allow cross-service and inter-school analysis. Highlights of these data are used in the following pages to address the question of progress and in the next chapter to suggest the prospect of future use of computers in the military school systems.

Five separate areas have been quantified as a means of documenting the extent of computer use by each service on an annual basis since 1963. The analysis begins with a tabulation of the number of institutions using computers instructionally, followed by a discussion of courses supported by computers, students trained by computers, student contact hours, and the percentage of training that is computer supported.

Institutions using the computer in teaching

The first evidence of computer use by service is shown by listing the number of activities using computers for teaching. These data are not presented as a sample, but rather as a complete summary of all computerized training, by service and DoD institutions reported through academic year 1974. Table 8 provides a list of the number of installations, by service, that used computers in the instructional process from 1966 through 1974. Data from 1966 are shown in order to reveal the years of real progress

in computer use.[1] From the standpoint of separate computer operations, the table shows that the Army has a significantly greater number of training and education activities using computers than the other services. In fact, since 1970, the Army has more activities using computers in training than all the other services combined. Its progress was gradual until 1970, when the number of Army activities using computers almost doubled within one year.

TABLE 8

NUMBER OF TRAINING AND EDUCATION ACTIVITIES USING COMPUTERS IN SUPPORT OF THE INSTRUCTIONAL PROCESS, BY SERVICE

Year	Number of Service Activities			
	Army	Navy and Marine Corps	Air Force	DoD
1974	18	5	6	4
1973	18	4	6	4
1972	16	3	6	4
1971	15	3	5	3
1970	15	3	5	2
1969	8	2	4	2
1968	6	2	3	2
1967	5	1	3	1
1966	3	0	3	1

Courses supported by computers

Another measure of computer activity is the number of courses that incorporate computer support as part of the instructional process. Table 9 reflects these data. The growth in computer use for the three services and for DoD level institutions is shown for the last nine years.

[1]Data back to 1963 are shown in appendix H.

TABLE 9

NUMBER OF COURSES THAT USE COMPUTER SUPPORT IN THE INSTRUCTIONAL PROCESS, BY SERVICE

Year	Number of Courses			
	Army	Navy and Marine Corps	Air Force	DoD
1974	217	102	210	26
1973	193	101	166	25
1972	146	68	150	20
1971	127	42	121	16
1970	103	23	105	8
1969	68	13	53	4
1968	63	9	45	4
1967	46	3	35	1
1966	32	0	24	1

Once again, the activity of the Army in the use of computers in the instructional process clearly surpasses that of the other services and the DoD level institutions. Whereas the Navy and the Air Force were nearly matched in the number of schools (see table 8, page 82), the use of computers in the instructional process of the Air Force is much greater when the number of courses are used as a measure of progress.

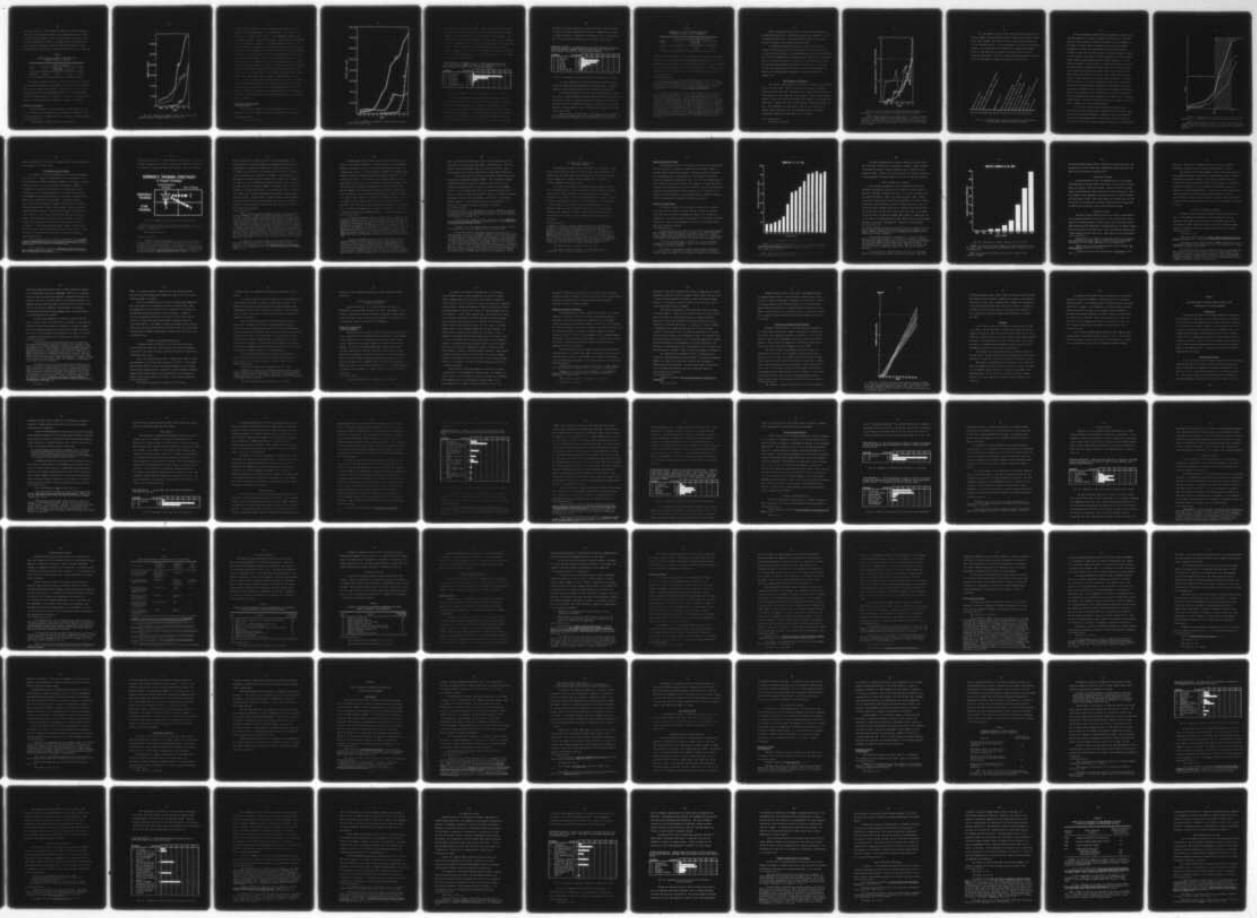
Students trained with computer support

Another way to measure service involvement in computer based training for this research project was to obtain the number of students exposed to computers in the instructional process. Table 10 shows the total number of students trained by computer supported instruction by each military service since 1963. The data on students were aggregated for this table to convey the degree to which the services have been using computers over a ten-year period. The data are disaggregated and shown on an annual basis for each

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service in figure 19. This information supports the trend of progress revealed by the two previous tables. The concerted move by the services to computer based training in 1970 is illustrated by this figure. With the Navy's installation of CMI at the Memphis Naval Air Training Center and the Marines' conversion to CAI for electronics training, student involvement more than doubled in 1970 and has continued to do so each year.

TABLE 10

NUMBER OF MILITARY STUDENTS INSTRUCTED WITH COMPUTER SUPPORT, BY SERVICE

Period	Number of Students			
	Army	Navy and Marine Corps	Air Force	DoD
1963-1974	169,370	34,322	93,106	16,195

The manpower strength buildup of the military during the Vietnam war may be the best explanation for the growth in computer activity when both facilities and courses are considered. However, since 1972, the size of military manpower has been diminishing rapidly; yet, continuously more students are being taught by the computer. This trend is evidence of the general acceptance and growth of computers in support of training.

Student contact hours

Another indication of military progress toward computer use was the determination of the number of hours of computer training received.[1] A better perspective of the magnitude of this training is obtained, however,

[1]These data are recorded in detail at appendix H.

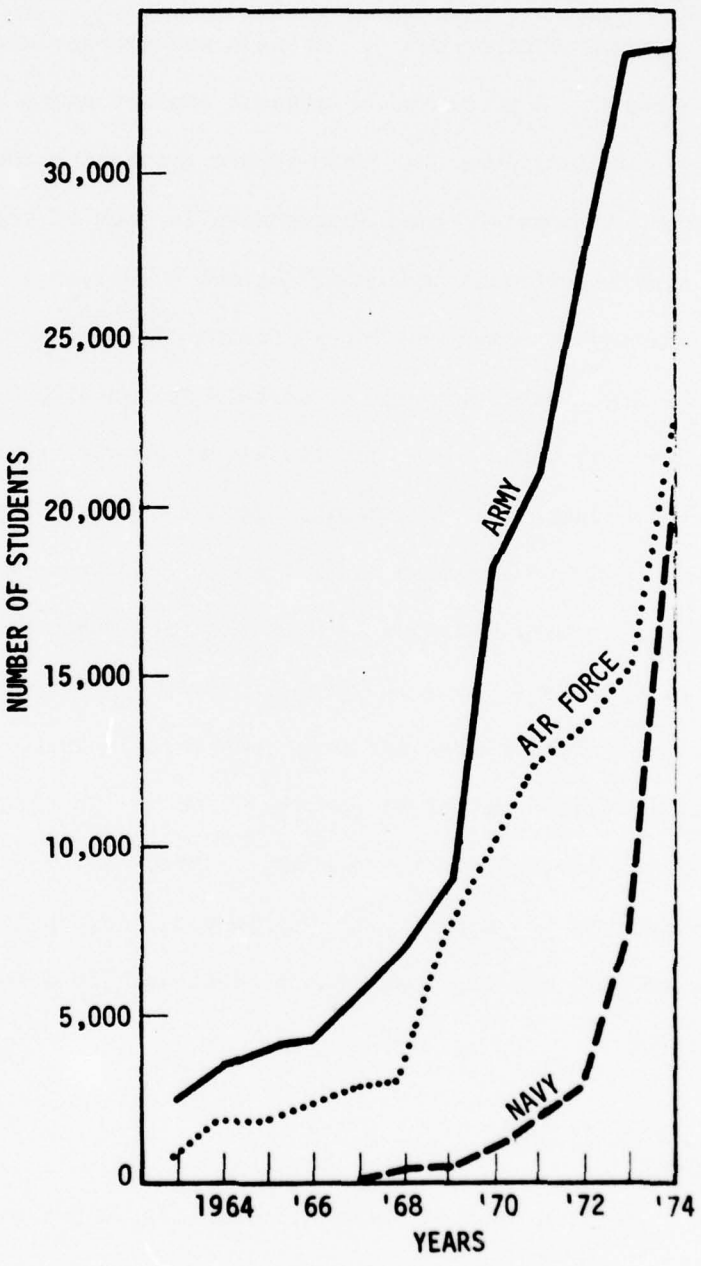


Fig. 19. Growth in the number of Army, Navy, and Air Force students trained by computer supported instruction

by multiplying the number of students trained by the number of hours he receives this training through the use of computers. This indicator is referred to as student contact hours. It is a measurement commonly used in pedagogic research. A portrayal of student contact hours by each military service is presented in figure 20. This figure provides evidence of the continuous growth in computer based instruction in each of the services and is one of the more significant indicators of the direction in which the Army is heading in the use of computers in the instructional process. Not only does it show the high number of contact hours compared with those of the other services, but it would seem that the steady growth indicates a stable and deliberate development of this media. It can be seen that Navy computer activity did not begin to increase until 1969 but has grown exponentially since that time. The Navy has more than doubled its computer based student contact hours almost every year. Compared to Army and Navy progress in number of student contact hours, Air Force progress is quite low. Recalling the "leadership position" gained by the Air Force in the opinion surveys,[1] the variance in the perception of the staff respondents, who saw the Air Force as the leader by 12 percent over the Navy and second in leadership to the Navy by 1 percent, and the quantitative data developed in the follow-on survey is apparent.

Percentage of training that is computer based

Another question used in the staff and instructors surveys to demonstrate the use of computers concerned the degree to which computers

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[1] See above, pp. 78-80.

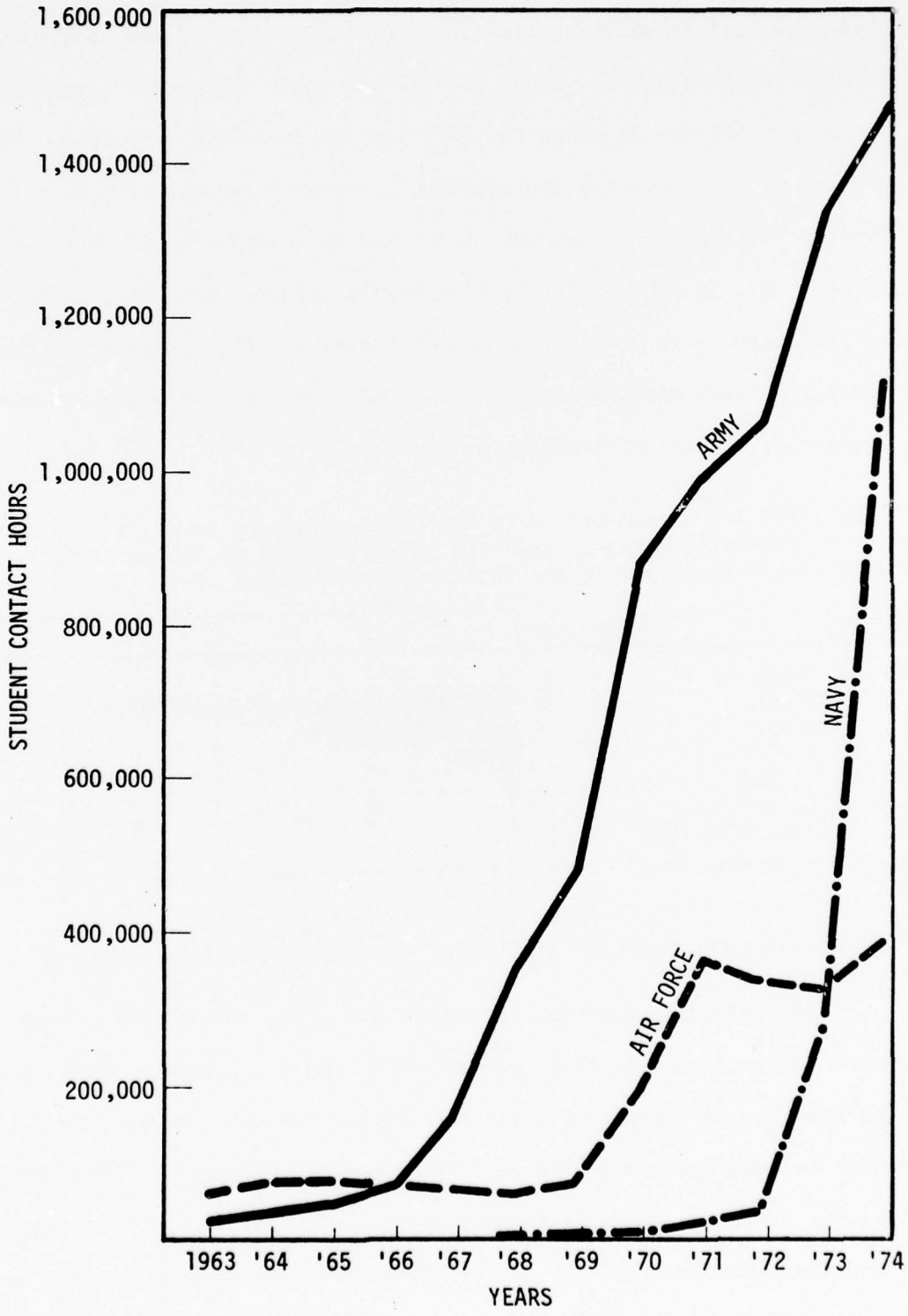


Fig. 20. Growth in the number of student contact hours by service from 1963 to 1974

had become a part of military training. Again, both staff and instructors were asked to quantify the amount of training their respective services had computerized. Figure 21 shows the question and the staff responses. With 55 percent of the responses indicating "less than 5 percent of the training," it could be assumed that what they meant was that progress, if any, had been very low. Yet, 29 percent of the respondents thought their service was using the computer in 6 to 10 percent of training. The remaining 13 percent of the staff respondents seemed to think their service was using the computer in 11 percent or more of training.

STAFF QUESTION 3. In comparison to all of the training in which your service is currently engaged, indicate to what extent you think it is using computers to assist in the instructional process?

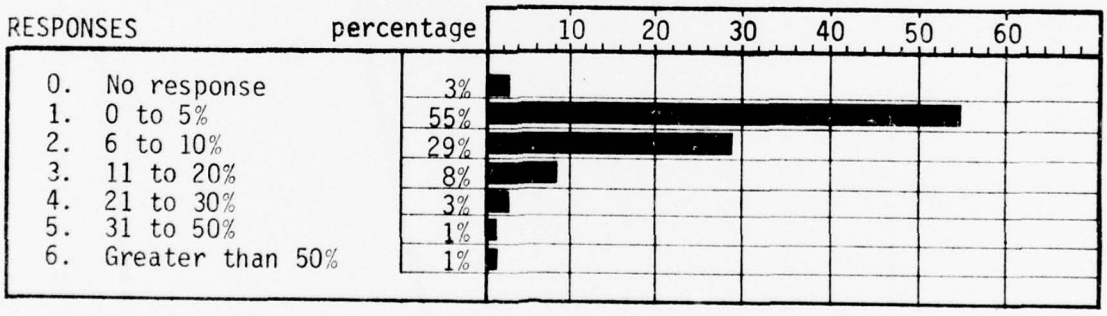


Fig. 21. Responses to staff question 3--percentage of training

When this same question was asked of the instructors, they were even more enthusiastic in their perception of service progress. Figure 22 illustrates the percentage of their responses. The instructors were inclined to perceive a wider range of progress than the staff. One way of explaining these responses is to consider the applications of the individual respondents. For example, the sailor instructors at Memphis probably see their service from their own perspective, which is almost 100 percent CMI.

Similarly, the soldier instructors at Fort Devens see a high percentage of computer use since the Morse Code training is completely CAI. However, the biggest drawback to a question of this nature is that the respondents have a low experiential base upon which to draw for their answers.

INSTRUCTOR QUESTION 3. In comparison to all of the training in which your service is currently engaged, indicate to what extent you think it is using computers to assist in the instructional process?

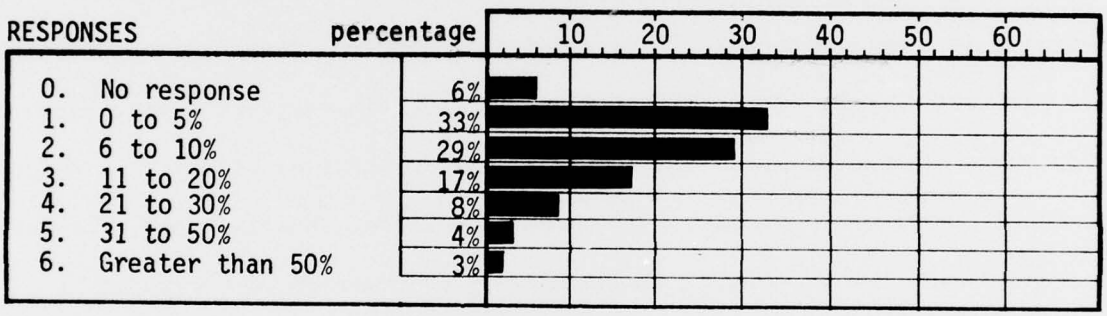


Fig. 22. Responses to instructor question 3--percentage of training

To offset this problem, the follow-on survey included two data elements for quantifying the percentage of instruction that is computer supported. Table 11 shows these data for 1974 by military service.[1]

The percentages shown in the table represent the amount of instruction which is computer supported compared with all instruction given at the institution. However, the survey included only those service activities that made some use of computers in instruction. Therefore, the 2 percent figure for the Army cannot be used to conclude that 2 percent of all Army

[1]With regard to the data found in the summary sheets in appendix H, the percentage of training data is quite unimpressive in tabular form. For this reason, only the most recent data (1974) are shown in table 11.

TABLE 11

PERCENTAGE OF MILITARY INSTRUCTION THAT WAS COMPUTER SUPPORTED IN 1974, BY SERVICE

Academic Year	Percentage of Computer Supported Training		
	Army	Navy and Marine Corps	Air Force
1974	2.1%	3.6%	2.1%

training is computer based. The obvious question is: What data are missing? For the Army, twenty institutions were surveyed--all computer users. The Army School System includes six other activities which do not use the computer in the instructional process.[1] If these schools had been included, the percentage figure for all Army training that is computer supported would be about 1.6 percent.[2]

[1]The list of Army training and educational activities that have no computer supported instruction includes: the Academy of Health Sciences, the Judge Advocate General School, the Chaplain School, the Intelligence School, the Institute for Military Assistance, and the Sergeants Major Academy. U.S., Department of the Army, Military Education and Training (1974), p. A-1.

[2]Computers are used for instructional purposes at 76 percent of the institutions in the Army School System. Using a Venn Diagram to develop a stochastic relationship, the 2.1 percent of computer based training at 76 percent of the Army's system suggests that about 1.6 percent of all Army training is computer supported. Applying this analogy to the other services shows the following: The Navy uses computers in 12 percent of its schools; therefore, it is estimated that 4 percent of all Navy training is computer based. The Air Force has computer supported training at 46 percent of its schools; thus, it is estimated that about 1 percent of all Air Force training is computer based. Telephonic interviews with James P. Couillard, Plans and Policy Division, Directorate of Naval Education and Training, Department of the Navy; and Col. W. M. Klesert, Training Programs Division, Directorate of Personnel Programs, DCSP, Department of the Air Force, Washington, D.C., 11 June 1975.

Figure 23 represents another way of visualizing Army progress in incorporating computers into the instructional process compared with that of the Navy and the Air Force. This growth pattern reinforces the steady increase in student contract hours shown by the Army.

No standard for measuring progress in the use of computers in training and education has yet been established. In collecting the data to quantify service progress, five measurements were taken in the belief that one or two would demonstrate the progress and the others could be discarded. However, the lack of discipline in this new field of computerized instruction has made each measurement significant within itself. Yet, each has at least one limitation, so that the mosiac of the five measurements is essential for demonstrating the progress of the military services in computer use.

The Progress in Perspective

The military services trace their interest in computer based training back to the early 1960s. Figure 24 illustrates the growth of computer applications since that time. Initially, the Air Force used the computer to train operators in CAI systems that were integral to large tactical weapons systems.[1] Since then, a natural marriage of the computer to the student has taken place to produce both effective and efficient individualized instruction. The development of various applications has been carried out in computer based instruction, and the only remaining areas that require developmental emphasis are individual and unit training.

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[1] See above, pp. 65-66.

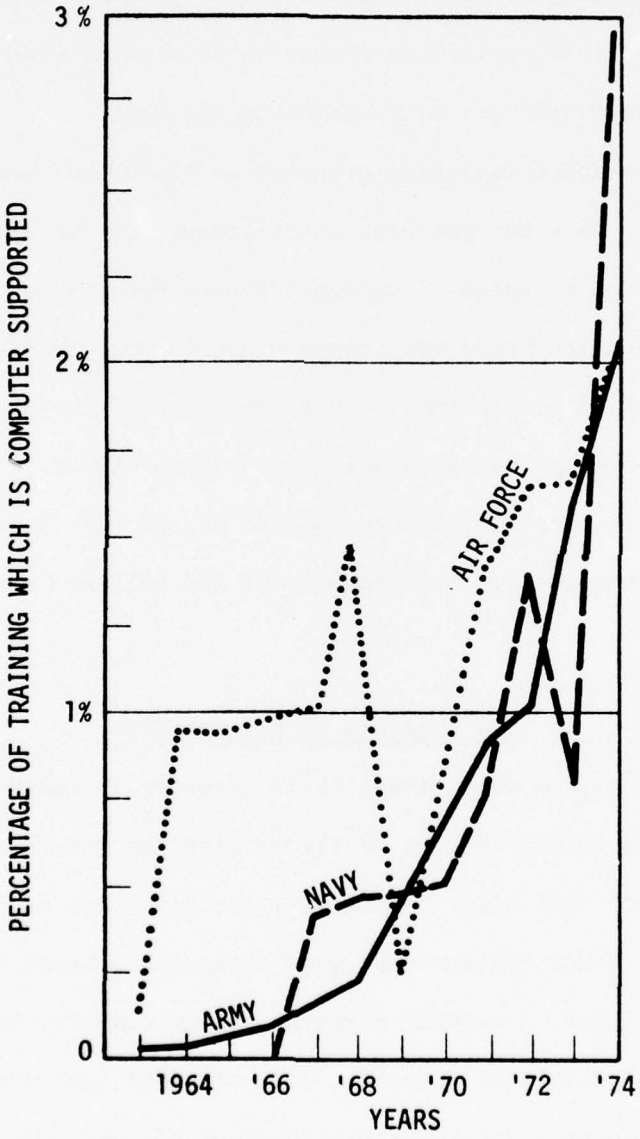


Fig. 23. Growth in computer supported instruction expressed as a percentage of total instruction in the Army, Navy, and Air Force

NOTE: Sheppard AFB began using computers in its training in 1969. Because of its large number of total academic hours, the Air Force trend line makes a precipitous drop in that year and takes three more years before its ratio between computer supported hours and total hours levels out to trend.

As of the present writing, in 1975, all three military services are actively engaged in developing new systems to address the challenge of individual skill training. The current Air Force system being developed will cost more than $10 million. It is about midpoint in a five-year installation program. More than $2 million is committed to a computerized prototype system for individual skill training for the Army, which will become operational during 1975. The Navy is making significant progress in CMI and should have thousands of students under CMI by the end of 1975.

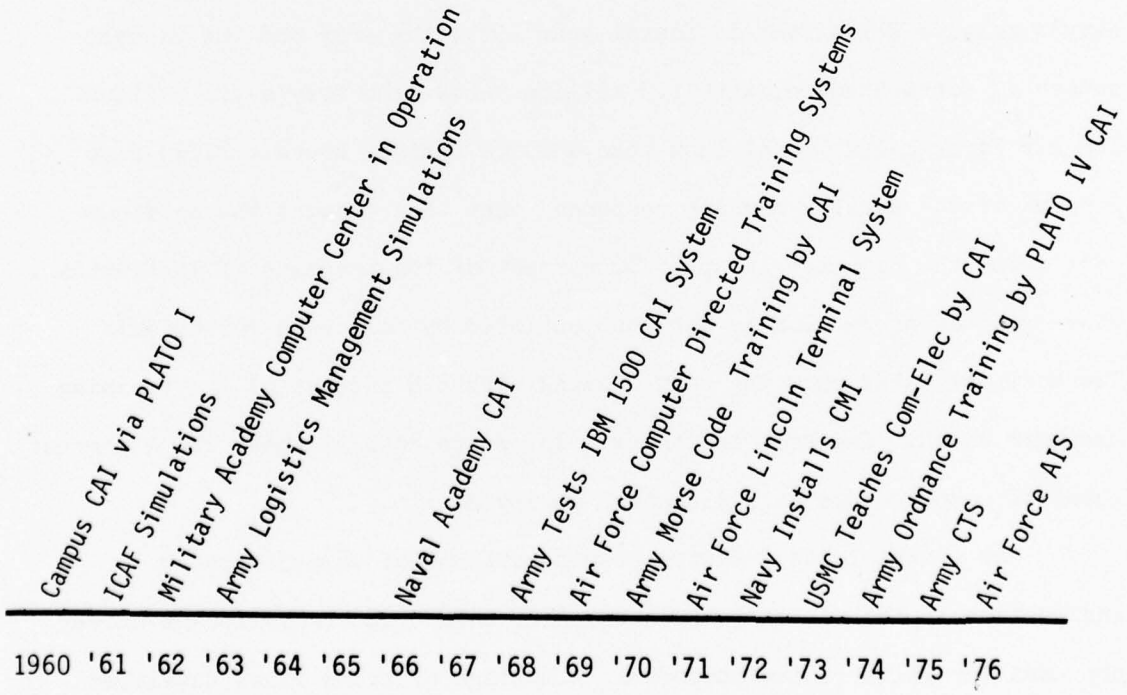


Fig. 24. A time spectrum of progress highlighting the development of computer based training and education systems

The five methods of assessing military progress in computer based training suggest that the Army is leading the other services. The Army leads the other services by a three-to-one margin from the standpoint of the number of schools using the computer for instructional purposes. Although the Air Force and the Army both have more than 200 courses converted to some form of computer support, the Army is ahead by a margin of seven courses. The number of military students instructed by computer support ranges from approximately 21,000 students annually in the Navy and 23,000 students in the Air Force, to over 33,000 students in the Army. The services have accumulated millions of hours of training in computer based instruction as measured by student contact hours. Even with the Navy's massive CMI effort in fiscal year 1974, the Army had the highest number of contact hours, with 1.5 million versus the Navy's 1.1 million. The Air Force had a low of less than 400,000 contact hours. Fifty-five percent of the faculty members responded that they thought the services were using the computer in up to 10 percent of the programs of instruction. However, this perception is not substantiated by follow-on survey data. The best estimates show the Navy leading with 3.6 percent of its training computer based. The Army and the Air Force are both at about the 2 percent level of computer use at the schools surveyed.

As a vehicle to describe growth patterns of computer based instruction in the military services, Army data from the follow-on survey are used for illustrative purposes. A montage of trend lines developed from previously discussed data but without value scales is presented in figure 25. A set of three lines overlayed in relation to time demonstrates

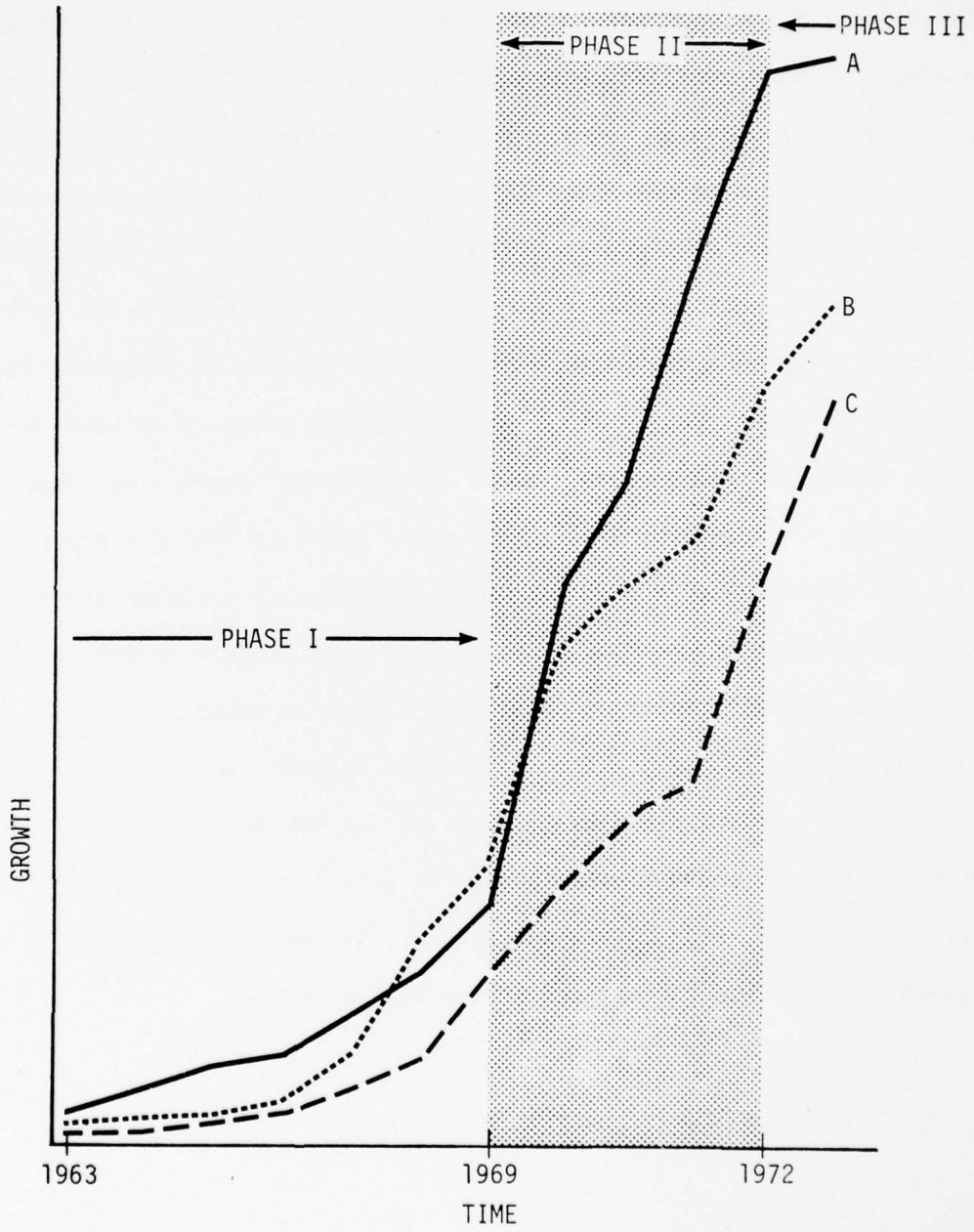


Fig. 25. A composite set of trend lines reflecting the phased progress of the computerization of Army training and education

NOTES: Line A reflects the number of Army students taught by computer supported instruction; Line B represents Army student contact hours; Line C is the percentage of Army training which is computer supported.

the nature of the progress in the computerization of Army training and education. When analyzed, these different sets of data suggest that the development of computer based training has evolved through three phases.

The first phase (Phase I) reflects the gradual and experimental growth of the use of computers in training. It covers the period from the early 1960s to about 1969. Phase II covers the period 1969-1972 and reflects acceptance of the idea of expanding the use of computers in the military services. Phase II was spurred by the military buildup in Vietnam, which meant that monies were readily available for developing various means of rapidly training manpower. It is quite possible that CAI benefited from this era of increased emphasis on new and efficient training strategies. Phase III covers the period 1973 and beyond and marks a period of maturity in the development process. Interest in computer based instruction is growing but not at the previous rate. The computer is becoming more acceptable in training and education, and its use is expanding to more courses and more schools even though the actual military population is decreasing. The trend in the direction of future growth appears to be upward. This trend is examined in the next chapter.

CHAPTER 4

THE PROSPECTS FOR THE ADAPTATION OF COMPUTER TECHNOLOGY TO ARMY TRAINING IN THE 1980s

Introduction

In this chapter, the following subsidiary research question is addressed: What are the prospects for adaptation of computer technology to the Army training system in the 1980s?

The methodology for determining the prospects for the Army's adaptation to computer technology in training in the 1980s is to examine the following four major, interdependent areas of activity:

1. The Army's progress in the use of computers in training
2. The training organizational climate for change
3. The attitude of staff and faculty at institutions where computers are currently being used in the training process
4. The future of computer based training

The first area, the progress of computer use in training, was covered in the preceding chapter. The remaining areas are examined in this chapter. The second area is an assessment of the training organizational climate for change to greater use of computer technology. This assessment will be limited to the organizational climate embodying the training command responsible for the Army's individual training mission. The third area focuses on staff and faculty attitudes relative to future methods of instruction. The fourth and final

area is concerned with the future of computer based training as suggested by an analysis of historical data.

The Organization of Training

In January 1973, the Army announced its most sweeping reorganization since 1962.[1] Among the changes made was the establishment of the U.S. Army Training and Doctrine Command (TRADOC) at Fort Monroe, Virginia, formerly the home of the U.S. Continental Army Command. TRADOC is responsible for training and educating the individual soldier and providing for more intensive management of this individual training.[2] Within TRADOC, the staff responsibility for training is assigned to the Deputy Chief of Staff for Training (DCST). The present incumbent, Major General Paul F. Gorman, has suggested that the Army is faced with a flawed paradigm when it comes to Army training. Figure 26 portrays Gorman's training construct. This theoretical construct shows that for years the Army, as the other military services have done, has placed primary training emphasis on the institutional training of the individual soldier provided by the Army School System, shown as block 1 in figure 26. This training strategy tends to ignore the other places and levels of individual training conducted by the unit (block 2), team training in the Army School System (block 3), and team training by

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[1]U.S., Congress, Senate, Committee on Appropriations, Department of Defense Appropriations for Fiscal Year 1974, Hearings before a Subcommittee of the Senate Committee on Appropriations, 93d Cong., 1st sess., 1973, p. 181.

[2]U.S., Department of the Army, Organization and Functions: U.S. Army Training and Doctrine Command, AR 10-41 (Washington, D.C.: Government Printing Office, 27 June 1973), p. 1.

the troop unit (block 4).[1] Gorman espouses the idea that far too much of the Army's resources go to formal training in the Army School System, to the detriment of subsequent training at the unit. When the individual

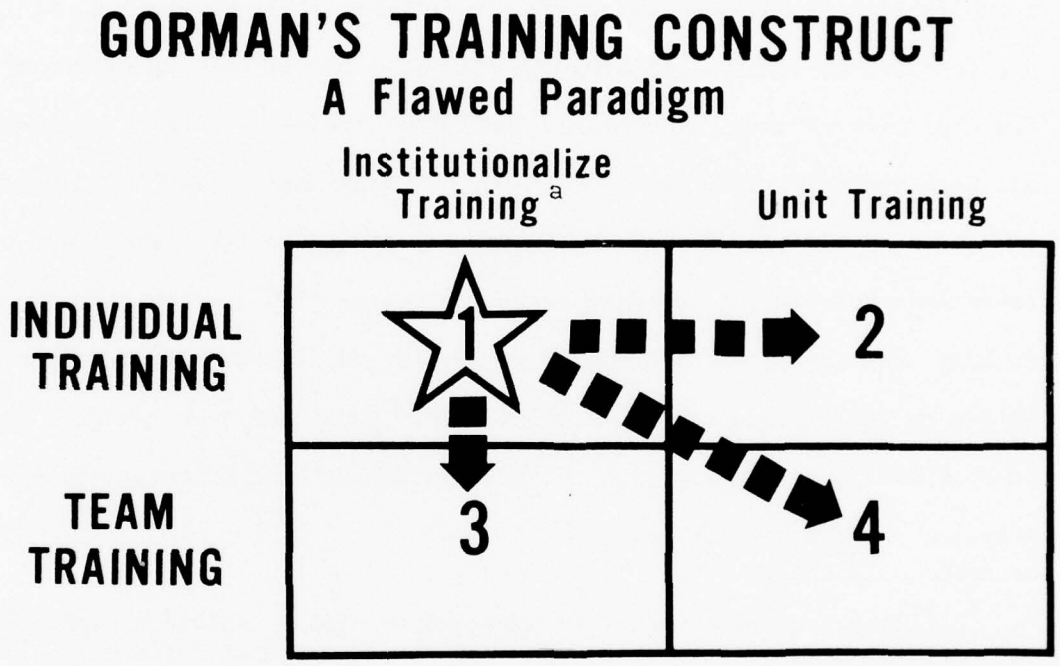


Fig. 26. Gorman's training construct--a flawed paradigm

SOURCE: Interview with Maj. Gen. Paul F. Gorman, Deputy Chief of Staff for Training, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia, 31 January 1974.

[a]The Army School System

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[1]Formalized schooling represents only 10 to 20 percent of a soldier's career. For the remaining 80 to 90 percent of an enlistment, the soldier is trained individually or collectively by a unit. Yet, training resources have traditionally been allocated in an inverse manner to these proportions. U.S., Department of the Army, U.S. Army Training and Doctrine Command, Analyzing Training Effectiveness (Fort Monroe, Va.: U.S. Army Training and Doctrine Command, 29 April 1975), pp. 16-17.

soldier learns all the requisite skills of his next assignment in an idealized school training environment, the organizational experience is unchallenging by comparison. Gorman asks the rhetorical question: Is it possible that the schools and training centers are doing too complete a job in formalized skill training? In response to this question, it is hypothesized by Gorman that Army training will be improved by extending the expertise of institutionalized individual training to unit individual and team training. For example, TRADOC is doing many things to bring the expertise of the Army School System to the soldier in the field. One of these endeavors is the Training Extension Course (TEC), a new dimension in Army training.[1] The TEC system is soldier validated, school prepared, self-paced multimedia instructional packages that have been designed to improve the job proficiency of soldiers in combat arms units of the Active Army and Reserve components.[2]

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[1]TEC is a training system designed to assist individual soldiers and unit commanders to increase job proficiency and unit readiness. It consists of a Bessler Cue-See stand-alone 8 mm film projector and cassette tape player and prepackaged film and tape media prepared by branch schools for use in the units in the field. The schools prepare the basic instructional material which teaches (or reviews) the baseline skills for various combat arms MOSs. Contractors then pretest the material with a minimum of 30 soldiers in the field who are currently working in this skill area before it is mass produced and distributed. Over 600 lessons are in development and 69 lessons have been distributed to all combat arms battalions in Active Army and Reserve components worldwide. By November 1975, a typical battalion will have a lesson inventory of between 74 and 112 lessons. Interview with Col. Franklin A. Hart, President, Combat Arms Training Board, Fort Benning, Georgia, 18 June 1975.

[2]A combat arm is a branch (Infantry, Armor, and Artillery) of the Army whose personnel are directly involved in the conduct of actual fighting. U.S., Department of the Army, Dictonary of United States Army Terms, AR 310-25 (Washington, D.C.: Government Printing Office, 22 December 1969), p. 104.

The TEC system and other new initiatives give recognition to the validity of the Gorman paradigm.[1] It allows expertise of the Army School System to be brought to the unit for training individuals and teams. In accepting this concept, it is then possible to suggest that computers might provide the media for bringing service school quality instruction to the soldier in the field. At the present time, each major Army post has a base computer system, and it is anticipated that within the decade of the 1980s new military information systems, called the Army Tactical Data Systems (ARTADS), will bring even more computer equipment to Army posts. These computers and their associated terminals offer a computing capability that could include a mission of training the individual soldier. In fact, the advent of this equipment promises to provide the Army with more computers in the field than are now available in the schools. As early as 1971, the Army staff suggested that research be undertaken to assess the utilization of these future ARTADS computers.[2] A study was conducted in

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[1] A typical developmental option is offered here to demonstrate the potential of computer utility in the future on the basis of the growth of computers in the Army and the computers' capability for handling this level of detail. While interviewing an officer closely associated with TEC development, he suggested that TEC will grow, and it is natural to see the next step of development as a recording of the materials on video tapes and showing them on CRT terminals driven by a local computer system. (The TICCIT system--see above, p. 32--is currently capable of digitizing video tapes for computer terminal use.) Interview with Col. Bernard B. Quedens, TRADOC Training Devices Requirements Office, Fort Benning, Georgia, 18 June 1975.

[2] A typical memorandum began as follows: "With several efforts currently underway to develop and field tactical data systems, it is likely that there will be a considerable data processing capability at tactical unit level during the 1980 time frame. During peacetime, the conduct of tactical operations may not fully utilize this capability. It is therefore recommended that research efforts be initiated to investigate a potential secondary role for these systems, that of supporting unit and individual training requirements when the systems are not required for

1973 to determine the feasibility of using a tactical computer at Fort Hood, Texas, for instructing infantrymen in their specialty.[1] This test proved to be quite successful, and, as of the writing of this report, other follow-on work is being conducted by the Army Research Institute.

By the end of 1974, the Army had successfully demonstrated a fully transportable programming language (PLANIT). This programming language breakthrough means that courses (courseware) can be written in one programming language and used in any of the several different ARTADS computers. At the present time (1975), the Army Research Institute is writing courses, recording them on cassette tapes via a commercial computer, and sending them to Fort Sill, Oklahoma, to be used on a militarized TACFIRE computer.[2] Project ABACUS personnel were instrumental in the development of embedded training (CAI lessons) for ARTADS.[3]

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tactical operations." U.S., Department of the Army, "Request for Research in Applications of Tactical Data Systems for Training," a memorandum from the Assistant Chief of Staff for Force Development to the Chief of Research and Development, 10 November 1971.

[1]William G. Hoyt, Alfred K. Butler, and Fred D. Bennik, Application of Tactical Data Systems for Training (Washington, D.C.: System Development Corporation, July 1974), p. 1.

[2]Personal letter from James D. Baker, Supervisory Project Director, U.S. Army Research Institute, Washington, D.C., 13 January 1975.

[3]Since 1965, when the Army began studying the feasibility of computer based training at Fort Monmouth's Signal School, the Army's nucleus of CAI-CMI experts has been increasing. During the period from 1972, when the Army approved the Signal School's study recommending the procurement of a prototype system, until March 1975, when the contractor began delivering the system, the Monmouth group has been engaged in activities to advance the Army's program to make computers a more significant part of the training process. Before the prototype system was named the Computerized Training System (see above, p. 73), the Army placed all instructional computer development under project management and designated the work as Project ABACUS. The Monmouth group of CAI-CMI experts under project management continued

The Use of Post Computers for Individual Training

The emphasis now shifts from the conceptual to the empirical. Using the data collected in the field, the various topics which help define the orientation of the Army toward computer supported instruction are discussed in such a manner as to include pertinent comments from the members of training commands and the school system.

As a means of testing some of Gorman's training construct notions on the staff and faculty, a question was asked of staff personnel concerning the use of post, base, and station computers for individual training.[1] The majority (56 percent) of the staff respondents felt that some use could be made of installed post computers to train individuals. If this alternative were adopted, the Army could take advantage of computers that are already on hand as a means of reducing capital outlay for single purpose (training only) computers. Secondly, computers are already installed, so the lead time for the Army to move to computer based training could be shortened.[2]

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to respond to field and training command suggestions for CAI development. In addition to courseware development of the communications-electronics courses to be taught on CTS, the ABACUS personnel were engaged in the development of integrating (embedding) CAI lessons into the ARTAD systems. The CAI training for operators mentioned above is much like the Air Force SAGE operator CAI training (see above, p. 10, n. 2), and the CDTS approach used in Air Force base-level computer systems (see above, p. 65). Personal letter from Col. G. B. Howard, Commander, U.S. Army Training Aids Management Agency, U.S. Army Training and Doctrine Command, Fort Eustis, Virginia, 7 April 1975; and interviews on 24 August 1973 and 29 May 1974.

[1] See staff question 9, appendix G, p. 321 below.

[2] The idea of using post computers for individual training is deferred as a topic for further research. See below, p. 253.

Computer growth in the Army

The discussion relative to post and tactical computers is associated with the question of the growth of computer use in the Army. Figure 27 provides visual evidence of this growth. Although the growth of computers in the government and the DoD continues to spiral upward, the Army has reached and sustained a plateau since 1970. Yet, the total computing power of the Army has continued to increase. For example, the second generation computers have been replaced by the latest models.[1] The new third generation computers, with greater speed, capacity, and ability to handle a host of terminal devices, contribute to an environment whereby individual training could be accomplished with greater teleprocessing capacity.[2]

Computer terminal growth

The computer terminal is the primary interfacing device between the student and the computer in on-line systems. Through this medium, lesson material is presented, responses are recorded, and information is transmitted to the central processor for analysis of the student's responses and requests. Sophisticated terminals are capable of presenting textual materials, graphics, and audio.[3]

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[1]Interview with Lt. Col. Robert W. Otto, Chief, Plans Group, Management Information Systems Directorate, Department of the Army, Washington, D.C., 20 January 1975. Although not reflected in figure 27, the Army's computer capacity has grown steadily and continues to do so. However, data on the Army's computing capacity have not been recorded on an annual basis.

[2]The term "teleprocessing" is defined as the use of telephone, telegraph, or microwave transmission lines to link terminal devices to the computer over great distances.

[3]Currently, three general terminal configurations are available: (a) simple teletype terminals, which allow typewriter-type interaction between student and computer; (b) intermediate terminals which, in addition

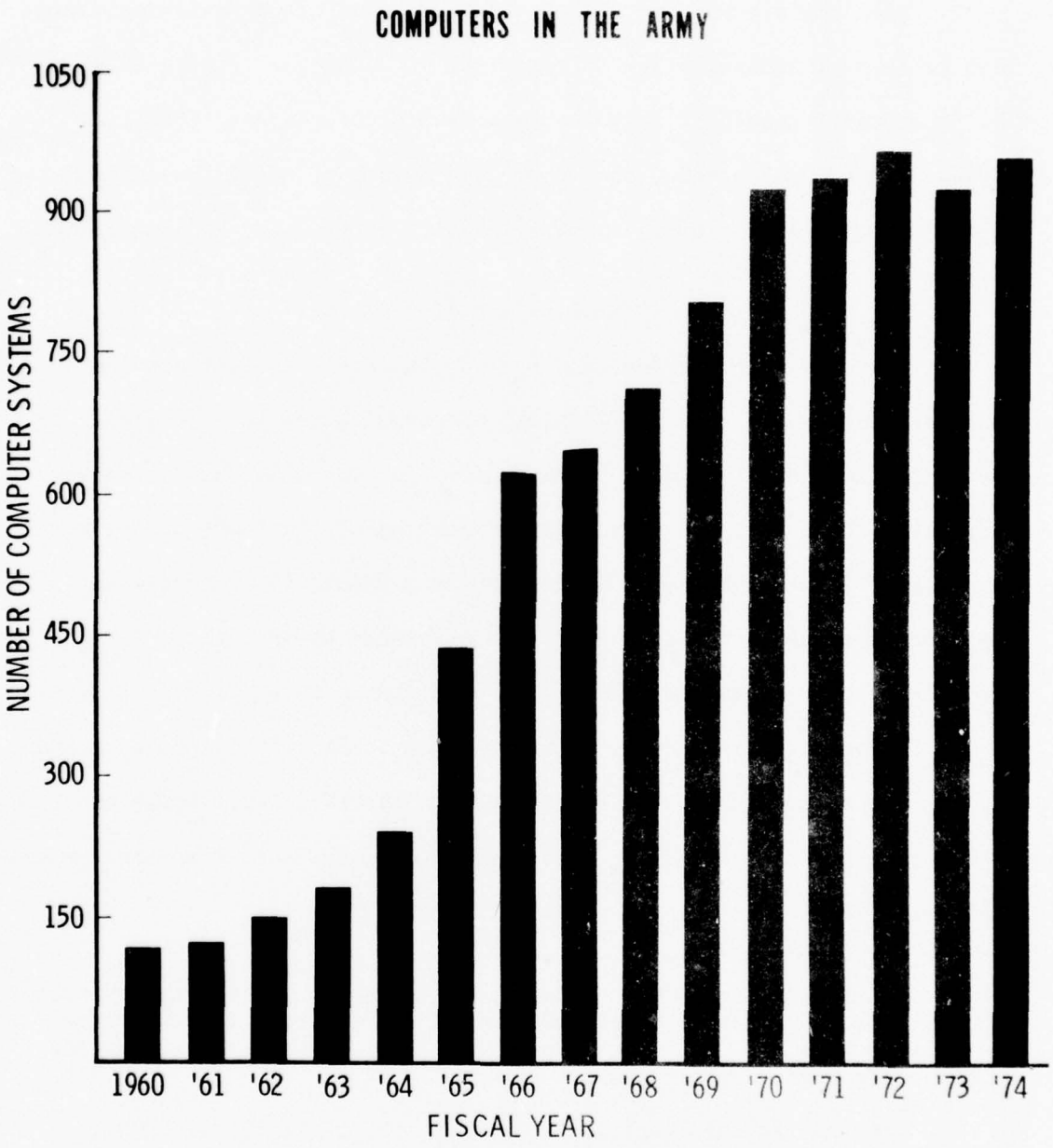


Fig. 27. The growth of computers in the U.S. Army

SOURCE: U.S., General Services Administration, Inventory of Automatic Data Processing Equipment in the United States Government, for Fiscal Years 1965 through 1974 (Washington, D.C.: Government Printing Office, December 1965 through December 1974.

NOTE: This inventory includes commercial central processing units; tactical computers are therefore excluded.

The Army's expanding use of computer terminals provides evidence that individual accessibility to computers is enhanced. Figure 28 shows the exponential growth of computer terminals since the Army's initial purchase in 1966. Further, this increased number of terminals contributes to the atmosphere of growing computer utility in training and education.

The Consolidation of Training

This research was designed to gain information about service sentiment concerning the acceptability of Gorman's training construct to move more individual training to the unit. To this end, the instructors were asked the question: Where will initial specialty (MOS) training take place?[1] The majority of instructor respondents (50 percent) envision training as being centralized so that a few large bases will do all the initial specialty training. This form of training is gaining popularity in the Navy and in the Air Force, where a particular skill is now taught at only one base. The Navy's successful CMI operation in Memphis has led to the concept of establishing three large computer based training systems--San Diego, Great Lakes, and Memphis.[2] Likewise, the large Advanced

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to teletype features, include optical projection (e.g., cathode ray tube); and (c) complex terminals which include audiovisual film display, typewriter keyboard, and light pen (e.g., the PLATO plasma terminal and the TICCIT color receiver terminal).

[1]See instructor question 5, appendix F, p. 291 below. MOS, or military occupational specialty, is a term used to identify a grouping of duty positions possessing such close occupation or functional relationships that an optimal degree of interchangeability among persons exists. A fixed number is used to indicate a given MOS. AFSC is the similar code for the Air Force, and NEC and sub-specialty codes are used for Navy personnel.

[2]Interview with Lt. Ronald E. Renfro, Director, U.S. Navy Basic Electricity and Electronics School, San Diego, California, 3 June 1974.

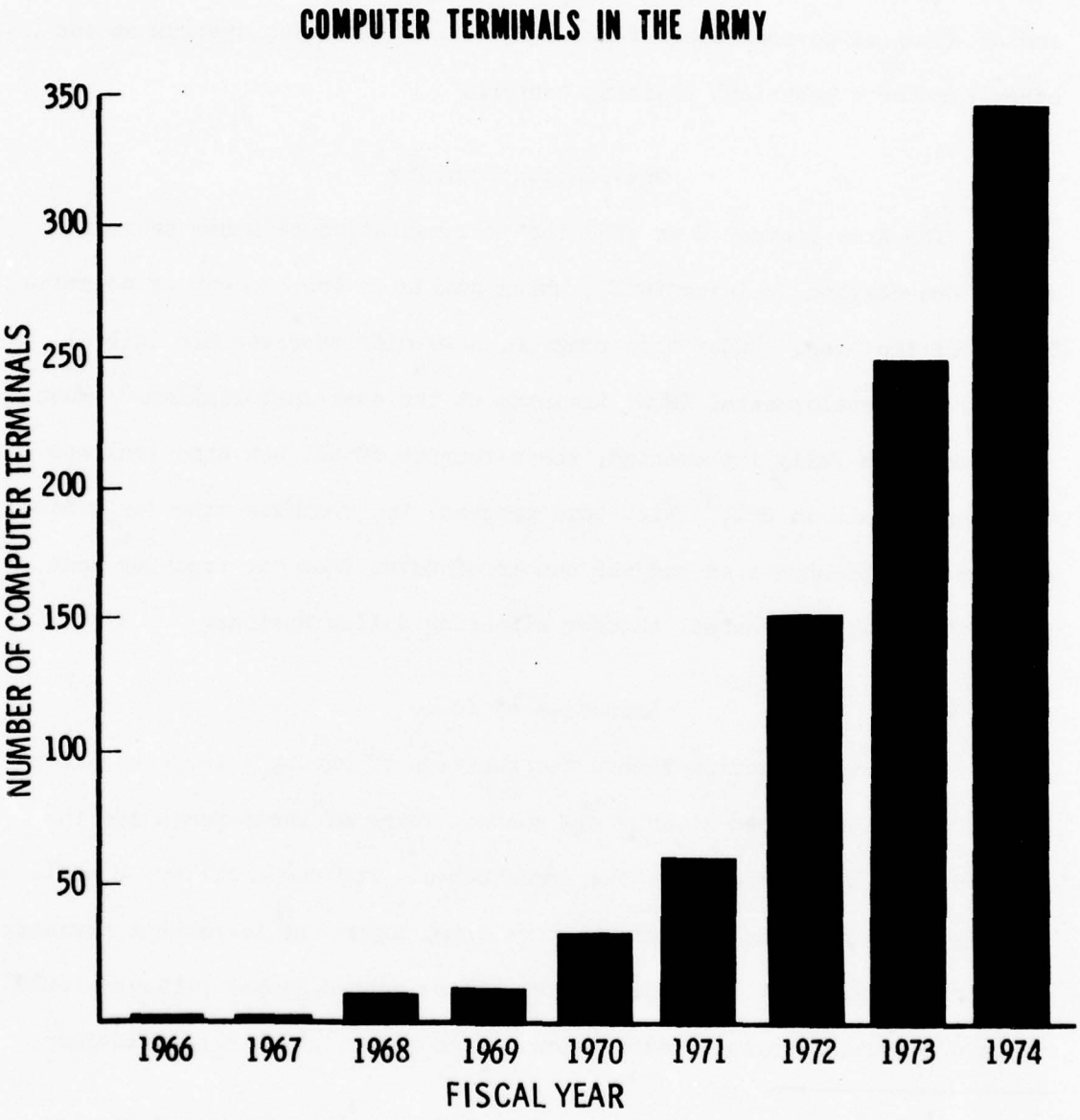


Fig. 28. The growth of computer terminals in the U.S. Army

SOURCE: Interview with Irene M. Kadis, Inventory Management Division, U.S. Army Computer Systems Support and Evaluation Agency, Washington, D.C., 27 January 1975.

NOTE: This inventory represents nontactical or commercial-type computer terminals.

Instructional System being tested at Lowry Air Force Base may lead to the installation of several other large computerized training systems at the other Air Force technical training centers.[1]

One-Station Training

The Army announced in 1974 the implementation of a new program called One-Station Training (OST), which builds on the concept of consolidation of training. Under this program, a soldier receives his initial (basic) and developmental (MOS) training at the same installation.[2] When the concept is fully implemented, three-fourths of all new Army trainees will participate in OST.[3] With this program, the training time for a new soldier will be shortened and the number of moves from one training base to another will be reduced, thereby effecting dollar savings.

Economies of Scale

The Army is moving toward the position of having a large majority of its trainees trained at only six posts. Three of these posts are the homes of the Infantry School, the Armor School, and the Artillery School. These schools have the educational technology expertise to package training which can be given at the other posts. These instructional packages could include computer assisted instruction, video tapes, and other audiovisual

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[1]Interview with Col. Robert E. Wilkinson, Directorate of Development and Acquisition, Deputy Chief of Staff, Research and Development, Department of the Air Force, Washington, D.C., 18 January 1974.

[2]Maurice L. Lien, "Army Implementing One Station Training," The Retired Officer, March 1974, pp. 11-12.

[3]"One-Station Concept Cuts Trainees Moves," Army Times, 22 May 1974, p. 2.

materials. The concept of packaging instruction for use on computer terminals at different posts is now under development by the Army.[1]

The chiefs of the training commands of each of the military services are cooperating through the Interservice Training Review Board to eliminate duplication of military training. It was reported in March 1975 that a review of low-density courses has allowed the consolidation of thirty-seven courses into eighteen.[2] It is not unusual to see airmen training with soldiers at the Army Ordnance School. In the future, all Navy and Air Force helicopter pilots will receive their primary training at the Army's Aviation School.[3] Thus, it can be seen that training is being consolidated within the Army and among the military services to the advantage of economies of scale.

The Cost of Hardware and Software

An issue related to where most computer based training will take place is the realization that expensive capital investments for such systems are most effective in situations of high-volume usage, such as providing skill (MOS) training for more than a hundred thousand trainees annually.[4] Spreading the cost of software and courseware over a large

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[1] See above, p. 102.

[2] U.S., Department of Defense, Military Manpower Training Report for FY 1976 (Washington, D.C.: Government Printing Office, March 1975, p. XI-3.

[3] Interview with Col. Robert E. Morton, TRADOC Representative to the Interservices Training Review Board, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia, 21 June 1974.

[4] In fiscal year 1975, more than 126,000 soldiers were programmed for MOS training at one of the six training centers or sixteen branch schools. They will be trained in one of fifty-one entry level MOS training programs. Telephonic interview with Major Anthony P. Sabino, Programs and Resources Division, Deputy Chief of Staff for Training, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia, 14 January 1975.

base is important in the realization of cost benefits. Closely connected with cost benefits is the course life expectancy and stability of the instructional material.[1] The more basic or fundamental the skill, the more likelihood there is that the same material can be used repetitively over the years with little requirement for revision. Many common skill courses, like automotive repair and basic electronics, can be shared by one or more military services, which further spreads the costs.

The "How" of Training in the 1980s

Having completed the discussion of the training organization climate for change toward greater use of computer technology, this chapter now shifts its focus to the staff and faculty sentiments relative to future methods of instruction and the problems associated with the development of these methods.

It was reasoned that staff and faculty opinions on the most prevalent types of training methods for the 1980s could provide an indicator of what the Army should be using in that time frame. In the field of training and education, it has been observed that what the educators (or trainers) believe should be the method of teaching usually turns out to be the method used. As long as this deterministic logic continues to apply, the responses to several staff and instructor questions will contribute to a better understanding of the future.

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[1] Since considerable investment is required for conversion to computerized material, a minimum course life-cycle expectancy of eight years was considered a reasonable standard in a study of CAI instruction. U.S., Department of the Army, U.S. Continental Army Command, Task Group Report on Computer Assisted Instruction (1972), p. c-4.

Methods of Instruction for the 1980s

Table 12 shows the consolidated responses of three survey questions that probe for opinions about future training methods.

Computer assisted instruction was ranked the highest as the type of training method predicted to be most prevalent in the 1980s. This response was not anticipated considering the background of the respondents. Only 35 percent of the staff members interviewed had a computer background.[1]

TABLE 12

COMPARISON OF STAFF AND INSTRUCTOR OPINIONS THAT RANK TRAINING METHODS FOR THE 1980s

Rank	Staff Ranking[a]	Instructor Ranking[b]	Instructor Ranking[c]
1	CAI	Self-paced individualized instruction	Computerized training systems including CAI, CMI, and other media
2	Self-paced training	Computerized instruction	Methods of today but improved with use of TV, films, etc.
3	Conventional methods	On-the-job training	Conventional methods
4	Television	Conventional classroom training	CMI

SOURCES: (a) From staff question 5 (see appendix A), which asked for the "most prevalent types of training methods for the 1980s."

(b) From instructor question 6 (see appendix F), which asked for "instructional processes that should be emphasized."

(c) From instructor question 10 (see appendix F), which asked for the "dominant mode of military instruction in the 1980s."

NOTE: Staff question 5 was open-ended. The responses are not summarized in appendix G, but a frequency distribution is as follows: 21 percent CAI; 17 percent self-paced training; 15 percent conventional methods; 10 percent television; and 37 percent other.

[1] Summarized from the demographic data recorded on each interview guide.

These staff interviews indicated that the staff foresees the computer in a teaching (CAI) role and in a management (CMI) role for technical skills but that the conventional methods of classroom instruction will continue to be used. The staff expects the conventional methods to be augmented by more audiovisual media, which may bring the return of television to the military classroom.[1] The expansion of self-paced, individualized instruction using programmed texts in learning centers is already suggesting this trend.[2]

The other, and perhaps more influential, opinion at an Army service school is that of the instructor. As alluded to previously, the instructor can be either a barrier to progress or an agent of change.[3] His role in computerized training is more fully discussed in chapter 6, but as part of the assessment of the prospects for change, it is timely to consider the instructors' views of instructional methods for the

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[1]In the mid-1950s, television was thrust into the classroom, touted by its advocates as the media to revolutionize teaching. After the installation of rather expensive TV studios and classroom receivers, the systems fell into disuse because of the high personnel, maintenance, and operating costs. By the mid-1970s, the television industry had matured, miniaturized its components, and featured the video tape. The USMC's Com-Elec School at Twentynine Palms may be a model of the future instructional approach. CAI, TV, and film production are in one branch along with all the conventional audiovisual equipment. No media is pushed to the exclusion of the others; rather, the instructor is challenged to use the most cost-effective media.

[2]A learning center is an instructional system, normally in the form of a carrel, which uses audiovisual devices such as 35 mm slides, film strips, movies, and television to control learning experiences. A recent survey of thirty-seven learning centers concluded that saving of time and increased training effectiveness were generally reported with these systems. However, little usable cost documentation is available for determining cost-effectiveness. Dennis J. Sullivan, Edgar A. Smith, and Ronald H. Filinger, A Survey of the Present State-of-the-Art in Learning Center Operations (Culver City, Calif.: Hughes Aircraft Corporation, February 1974), pp. 1-13.

[3]See above, p. 5.

1980s. It is shown in table 12 (page 111) that the instructors agree with the staff that computerized training will rank as one of the top two training methods in the future.

The written comments of the instructors contained many suggestions about the future use of a combination of these training methods. Their key message was that no one method would be dominant over a strategy that included many media and methods on a day-to-day basis. A number of instructors expressed concern that the presence of lower mental aptitude trainees in the military service would tend to influence the methods instruction selected. For example, students in the higher mental aptitude levels would use self-paced instruction, whereas students with lower mental aptitude would be taught with multimedia techniques that rely less heavily on reading ability.

Computer or Conventional Instruction

Following a series of questions of the staff and faculty about future methods of instruction, three subsequent questions were designed to obtain the instructors' feelings concerning the future of computers and conventional instruction.

First, the instructors were asked if computers are bound to become less prevalent in the instructional process by the 1980s.[1] Of the twelve questions that asked for an agree or disagree response, this one brought forth the most uniform reaction. Eighty-five percent disagreed (combining disagree and strongly disagree) with the proposition that computers are bound to become less prevalent by the 1980s. Only seventeen instructors

[1]See instructor question 11, appendix F, p. 297 below.

(4 percent) felt that computers would become less significant in the future.

In contrast, the instructors were asked in the second question for their position concerning the future of conventional training.[1] The majority (56 percent, combining disagree and strongly disagree) of the instructors felt that for the conventional eight-hour military training day, five days a week, using the normal lock-step approach would not be dominant in the 1980s.[2]

The third and final question of the set designed to gain the instructors' impressions about future training systems described a futuristic computer based training process. The question asked whether a fully computer-directed instructional system would typify their service's training in the 1980s.[3] Fifty-one percent of the instructors did not feel that their service's training would be so described in the 1980s. In their written comments, twenty-one instructors expressed the opinion that this was a dehumanized approach, which would never come about because of the need for humans as a part of the training process.

One can surmise from these questions and their responses, as well as those previously discussed, that computer based training will be in vogue in the foreseeable future, but faculty members do not

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[1] See instructor question 12, appendix F, p. 298 below.

[2] Lock-step instruction is the nonindividualized approach, which is highly structured from the standpoint of class starting dates, scheduled classes, completion dates, and en masse instruction. Unfortunately, the question was viewed by at least a dozen respondents as being biased because it was unwarrantedly pejorative.

[3] See instructor question 13, appendix F, p. 299 below.

envision a totally computerized system that would eliminate the human instructor.

The Furtherance and Hindrance of Computers in Training

Thus far, attention in this chapter has been focused on the prevalence of computer based training in the 1980s. The emphasis is now shifted to those factors that may accelerate the movement toward computer supported training. Then, the barriers to progress in the computerization of training are offered in contrast to this movement.

Factors that could cause a shift to computers

The instructors were asked to select two driving forces that could cause a significant shift toward greater use of computers.[1] The responses to this question were not strongly polarized on any particular thesis. However, "demonstrated cost-effectiveness" was the most often selected response (21 percent) for generating movement to more computer based training. The next most important issue was the educational objective, improved job performance (18 percent); followed by a wider margin were the next two factors, student acceptance and instructor motivation. On the basis of this survey, it is suggested that the factors that may cause a significant shift to greater use of computers are: (1) cost-effectiveness, (2) improved job performance, (3) student acceptance, and (4) instructor motivation.

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[1]See instructor question 7, appendix F, p. 293 below.

In contrast to the specific response data, the instructors' written comments provide clearer insight into the forces of change. Several comments gave rise to the notion that elements of change are linked together. First, the instructor needs to be motivated to experiment with and convert instructional material to computer application. Further, top-down pressure on the part of the school or training command staff is often counter to a shift to more computer use. This observation is based on the opinion of instructors that effective application requires keen faculty interest and conviction that the material to be presented by computer would be more effective than, or at least equal to, the media presently used. Once the faculty member has been thus convinced, the student tends to respond to his instructor's enthusiasm. A third component of successful instructional computer use is the school staff. It is at this juncture that the school staff needs to be the supportive element, for anything that the instructors believe in and the students like must not be all bad. Concurrently, however, the issue of cost-effectiveness is linked to the faculty-student commitment. When assured of greater cost-effectiveness, the officials of the training command normally take an advocate's role to help fund the new training strategy. This role is the support the schools need--not generalized directives to "improve training."

During times of constrained budgets, an easy place to reduce training costs is in developmental training systems. For example, the project officer at the Military Police School confirms that a fledgling CAI program must have the "wholehearted pecuniary support of the decisionmakers and the support of school instructors to meet with

success."[1] Similarly, the officials of the Air Force School at Keesler terminated a series of PLATO tests because it was felt that they duplicated other Air Force programs and the dollars saved could be used more effectively in other training programs.[2]

Barriers to the use of computers

The instructors were asked to identify the barriers to the use of computers in training.[3] Just as cost-effectiveness ranked high as a furtherance to the use of computers in training, the cost of computer systems was chosen as the principal hindrance (25 percent). The attitudes of students (8 percent), instructors (5 percent), and staff (8 percent) were not considered as much of a deterrent to further computer use as was "someone in authority to make a decision now"--the second ranking response (13 percent). The third choice of barriers was the organizational climate (10 percent), which has already become evident through the previous examination of positive factors.[4]

The most noteworthy written comments on this question centered on the observation of the faculty that change comes slowly, even in military training systems, which have traditionally led the nation in the application of technological advances. As one instructor wrote, "Ya gotta have

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[1]Personal letter from Lt. Robert A. Hallowell, Jr., Media Officer, U.S. Army Military Police School, Fort Gordon, Georgia, 8 January 1975.

[2]Personal letter from Col. David W. Sandlin, Chief, Operations Division, USAF School of Applied Aerospace Sciences, Keesler AFB, Mississippi, 17 December 1974.

[3]See instructor question 9, appendix F, p. 294 below.

[4]See above, pp. 115-16.

believers." This type of response ties closely to organizational climate, mentioned as a positive factor for change. Without support for the notion of computer based training at the faculty, staff, and training command levels, little progress is possible. Even a neutral attitude at one of these levels means a veto to a program.

The barriers identified by the military instructors are similar in several respects to those found in the high school and college environment, as revealed in a 1972 study sponsored by the National Science Foundation.[1] This study identified the factors inhibiting the use of computers in instruction as follows: (1) high cost, (2) fear of change, (3) ignorance of the computer's potential, and (4) loss of student contact.[2] On the issue of cost, the military instructors are in accord with the faculty surveyed in the foundation's study. The remaining three factors bear close relationship to the attitude and organizational climate barriers identified by the respondents in the military services. The similarity of problems suggests that practitioners in the field--both civil and military--will continue to benefit from an interchange of information.

The complex factors hindering the shift to widespread use of computers in training have been identified above. The principal dimension appears to be that the driving force to nurture CAI development is demonstrated cost-effectiveness. The other counterviews focus attention on the attitudes of instructors and school leadership toward the instructional use of computers.

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[1]Anastasio and Morgan, Factors Inhibiting Use of Computers in Instruction.

[2]Ibid., pp. 35-36.

Evidence presented early in this chapter has demonstrated that the organizational climate for Army training is ready for and, in fact, receptive to computer technology. Subsequently, the section on the "how" of training showed that the staff and faculty are of the opinion that computer based training will be a featured method of instruction in the 1980s. The final portion of this chapter focuses on a projection of field data to suggest the growth paths for instructional computer use for the next decade.

The Future of Computer Based Training

Evidence of future events is cautiously labeled as conjecture; yet, such evidence can be given a degree of substance by extending time series data. The findings can increase in credibility if the collected data are complete and of an adequate time span to support a statistical analysis. These criteria were applied to the follow-on survey data to project the instructional use of computers into the 1980s.[1]

The data on student contact hours was computed because this measurement is a derivative of the number of students and the time a student used the terminal. All student contact hours recorded by Army institutions between 1963 and 1974 were plotted in figure 29. A simple linear regression analysis was then performed to extend these historical data to 1989. To visualize the growth in Army student contact hours, the regression data to 1985 were also plotted in figure 29. The current data (heavy dots) show that the Army is already nearing 1.5 million student contact hours. The forecast projects that the Army will reach

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[1]The analysis to support the projection of data is at appendix I.

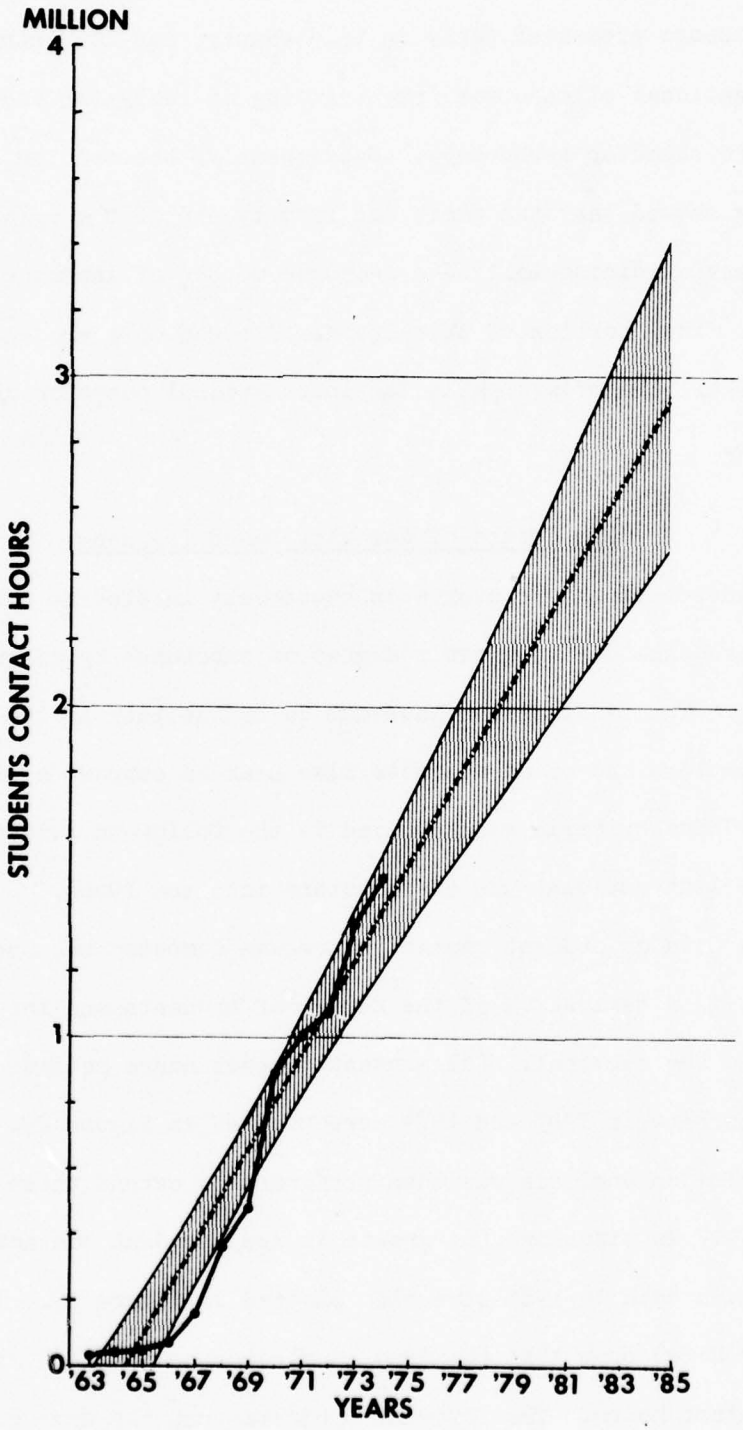


Fig. 29. A linear projection of Army computer supported student contact hours in training and education to 1985. This forecast is based on a simple regression analysis of current data (1963 to 1974). The 95 percent confidence limits are shown as the shaded area on either side of the dashed trend line.

2.25 million student contact hours in 1980, and nearly 3 million by 1985. The confidence band (95 percent) suggests the optimistic and pessimistic views, but, in either case, it appears safe to assume that the Army will be utilizing several million more student contact hours in training in the 1980s, if current trends continue. This figure would represent a 100 to 330 percent increase in computer based training by the end of the 1980s.

Prospects

On the basis of these data, what are the prospects for the Army in the 1980s? The Army has reason to change its training methods, and change is nothing new. This time, as in the past, change will be forced because of economics and will be possible because a new technology promises efficiency. As instructional use of the computer begins to show signs of maturity, its applications are gaining acceptance as genuine aids to learning--not just another interesting training device.

Tight budgets are causing consolidation and centralization of training, and at the same time educators are suggesting that self-paced instruction is essential to efficient training of the volunteer force.

Because of its increasing cost-effectiveness as the student load rises, the computer offers an alternative training strategy to the Army. Yet, the computer has the capability to deal with each student on an individual basis, even if the class is as large as several thousand, which is of too great magnitude for human individual treatment by an instructor.

As computers and terminals become more numerous on the Army post, impetus is being given by TRADOC to consider their use for training the individual soldier. The transportability of software requires improvement before this can happen. In the meantime, the service schools' staff and faculty project that the Army will see computer based training as a prevalent instructional strategy in the 1980s, although instructors will not vanish from the platform. Rather, the computer will be used to do that which it does extremely well--handle the routine, repetitive, yet often rigorous tasks which now consume an inordinate amount of the instructor's time.

Tests currently underway should demonstrate that computer based training can be cost-effective and also produce a better trained soldier. Given this impetus, the Army will continue its leadership into the 1980s as the dominant service in the field of computer supported training.

CHAPTER 5

THE IMPLICATIONS OF COMPUTER BASED TRAINING ON THE ADMINISTRATION OF STUDENT PERSONNEL

Introduction

The material presented in this chapter addresses the subsidiary research question: What impact will the instructional use of computers by the Army have on the administration of student personnel? Responding to this question, the student component of the training process becomes the center of attention as three major areas are analyzed. First, the linkage between self-paced individualized instruction and the future student profile is examined as an indicator of student expectations for training in the 1980s. Then, the role that computer based training can play in attracting and retaining personnel in the service is evaluated. Finally, some student benefits of computerized training are analyzed by using comparative studies.

Manpower and Personnel

Since the first part of this research report dealt with strategies, progress, and prospects of computer based training, an explanation of certain terms relating to manpower and personnel was deferred to this chapter to place the definitions in proximity to the chapters of their use. This chapter, and the two following, focus on the manpower and personnel management implications of instructional computer use on the

human components of the training process--the student, the faculty, and the staff. As a foundation to a clearer understanding of manpower and personnel terms as defined by the Army, the following definitions give insight into the scope of these two areas and reflect the Army's basic commitment to human resource development.

> Manpower management--The planning and programming of military and civilian manpower strengths by function and/or command, in consonance with strength and budgeting limitations; determination of manpower requirements; allocation and control of military and civilian spaces; development of criteria and standards of manpower utilization; appraisal of manpower utilization; and distribution of manpower.[1]

> Military personnel management--The process of planning, organizing, directing, coordinating, and controlling the procurement, training/education, utilization, separation/retirement, development, and motivation of military personnel to assist in the successful accomplishment of the organizational mission. It includes all procedures related to: military job analysis and evaluation; position classification; personnel classification, assignment, and utilization; maintenance of an adequate system of records and reports required for the development of successful operation of the Army personnel system; development of individual potential; and development of an organizational climate that enhances the attitude, motivation, commitment and sense of well being of soldiers and their families.[2]

In simpler terms, manpower is related to expressing personnel strengths in numbers, while personnel is related to the individuals required to accomplish the assigned mission.[3]

The remainder of this report draws attention to the manpower and personnel management implications derived from the application of computer

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[1]U.S., Department of the Army, Dictionary of United States Army Terms, AR 310-25 (Washington, D.C.: Government Printing Office, 25 November 1974), p. 313.

[2]Ibid., p. 329.

[3]Ibid., pp. 313, 386. These simpler terms have given rise to the cliche that describes manpower as the management of spaces and personnel as the management of faces.

supported instruction to Army training. The first interface area to be examined is that of training, as the typical student is considered in the context of modern instructional technology. Then, the role that computer based training might have on procurement and separation is analyzed from the standpoint of recruitment and reenlistment. Finally, the benefits of CAI are evaluated as they contribute to the development and motivation of personnel.

The Student and Self-Paced Individualized Instruction

A discussion of the shortcomings of traditional classroom training situations is presented to set an initial frame of reference and report on recognized inherent limitations in methods of classroom training. There are four major limitations, as follows: (1) inadequate mastery of all the training objectives by some of the students, (2) waste of student time due to inefficient learning sequences and pacing of the class to average or below-average learning rates; (3) variation in the quality of instruction, both between instructors and by the same instructor, from day to day; and (4) patterning instruction to some hypothetical average rather than to the needs of individual students.[1]

Recognizing these limitations, it is appropriate to foresee the replacement of many of the traditional patterns of course structure. Fixed periods of instruction, standard grading, set spans for courses, and rigid subject matter decisions may cause bored students to grope for rote answers and suppress their spontaneous ways of acquiring

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[1] John D. Ford, Jr., and Dewey A. Slough, Development and Evaluation of Computer Assisted Instruction for Navy Electronics Training: Alternating Current Fundamentals. A research report (SRR-70-32) (San Diego, Calif.: Naval Personnel and Training Research Laboratory, 1970), p. 1.

knowledge.[1] Without drastic changes in the technology of classroom operation, it seems highly unlikely that little more than cosmetic improvement can be expected.

To meet the growing demand for rendering instruction more personalized and more responsive to the individual needs of students, the Army has adopted a philosophy of training that embraces self-paced individualized instruction. Learning principles used to form the basis for the conduct of individual training include the following:

> For various reasons, people learn at different rates. Therefore, soldiers are permitted to learn a skill at their own rate. This principle allows a soldier to practice a skill at his own pace, that is, to go quickly through the sequences if he feels confident, or to take more time and ask for help if needed.[2]

Although some Army schools have been using self-pacing since the late 1960s, the pronouncement of this TRADOC policy has given rise to a rebirth of service school interest in integrating self-pacing wherever practical. For example, self-pacing tests in skill (MOS) training for armor crewmen, engineers, supply clerks, and helicopter mechanics have shown an average savings in training time of 26 percent, with equal or higher achievement levels.[3] The Army has identified self-pacing as a

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[1] "Too Much Schooling," Time, 19 June 1972, p. 44.

[2] U.S., Department of the Army, U.S. Army Training and Doctrine Command, Army Basic Training Policies and Administration, TRADOC Supp. 1, AR 350-1 (Fort Monroe, Va.: U.S. Army Training and Doctrine Command, 1 August 1973), p. 5.

[3] These favorable results have caused the Army to calculate a savings of 14,400 man-years of effort through the self-pacing of all 240 MOS courses. If this savings is realized, the equivalent of an army brigade could be added to the force structure. Major General Paul F. Gorman, "The Challenge of Army Training," a paper presented at the Conference on the Application of Advanced Training Technology, Fort Gordon, Georgia, 18 June 1975.

key "win" area for improving institutional (branch schools and training centers) training efficiency and effectiveness.

Survey Results

The acceptance of self-paced individualized instruction and its forecast place in the military in the 1980s was explored in staff question 10, as shown in figure 30. Each person in the staff survey was asked whether or not self-paced instruction would be the norm for training in the future. Sixty percent of the staff felt that self-paced individualized instruction would be the norm in the 1980s. The magnitude of the responses for self-pacing certainly indicate an acceptance of the future expectation of this concept of training. These pro-respondents also commented that self-pacing will be the norm because it has proved to be economical. Their perception of economy was explained as effectual, cost saving, time saving, and conserving of the instructor's time. Many respondents reasoned that the self-pacing strategy is attractive to the services because it is so much more interesting and challenging to the student than the lock-step method.

STAFF QUESTION 10. In the 1980s, will self-paced individualized instruction be the norm?

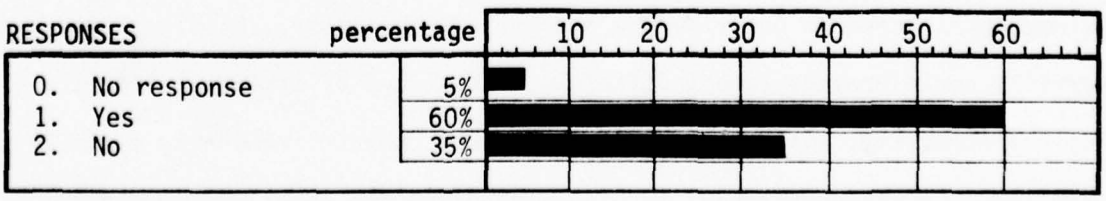


Fig. 30. Responses to staff question 10--self-pacing

The staff respondents who felt that self-pacing would not be the norm in the 1980s stressed the need for the human element in training--instructor contact and peer relationships. There were indications that self-pacing equates to a liberal, casual mode of letting the student "do his own thing." These staff respondents felt that the pace of training was a prerogative of command and should not be delegated to such inexperienced personnel as students. Their comments raised the question of how to schedule, plan, and allocate resources if the duration of the course is left up to the individual.

The comments of the staff respondents on self-pacing led to the conclusion that schools use self-pacing because it saves time, but self-pacing could be improperly understood if the human factors were not discussed. The student and the self-paced material do not represent a closed loop. The staff respondents cautioned that the instructor is absolutely essential for a properly motivated student. Close monitoring by the experienced instructor allows the development of a relationship that prods, encourages, and challenges the individual student to optimum learning in the self-paced environment.

A Student Profile

The discussion above about the self-paced student gives rise to a more basic need to describe the student of the future. Such a student profile could provide school officials with a list of student categories, by preferability, against which their limited computer resources could be applied. It is anticipated that the student of the 1980s will enter a military learning environment that may be significantly different from the

learning environment that he has previously experienced in the civilian sector. This new military learning environment will include a private work area, known as a learning center (or carrel), where the student will progress at his own pace.[1] This environment will encourage the student to be an active rather than a passive learner. In other words, the student must make some overt act or there is no learning. He is corrected, reinforced, and remediated in an almost automatic mode. Hands-on training will permeate the whole process to make practical the tasks he is seeing and hearing. An instructor will be available as needed, and subsequently on a one-to-one basis.

Although this scenario is being experimented with today, it does not apply to all military students of the all-volunteer force. In an effort to obtain some sentiments about the type of student that should be trained by computer, the instructors were asked to identify the categories of students that could be trained most efficiently and effectively by computerized instruction in the 1980s. The question posed to the instructors and their responses are shown in figure 31. The response indicated that 31 percent of the instructors were of the opinion that entry-level enlisted training would be the prime category for the application of computerized instruction. Another 17 percent were of the opinion that enlisted personnel beyond entry training would be effectively trained by computers. These responses are consistent with those of the instructors

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[1]Sullivan, Smith, and Filinger, Learning Center Operations, p. 8.

who felt that 50 percent of all entry training would take place at a few large bases.[1]

INSTRUCTOR QUESTION 19. What two categories of students could be most efficiently and effectively trained by computerized instruction in the 1980s?

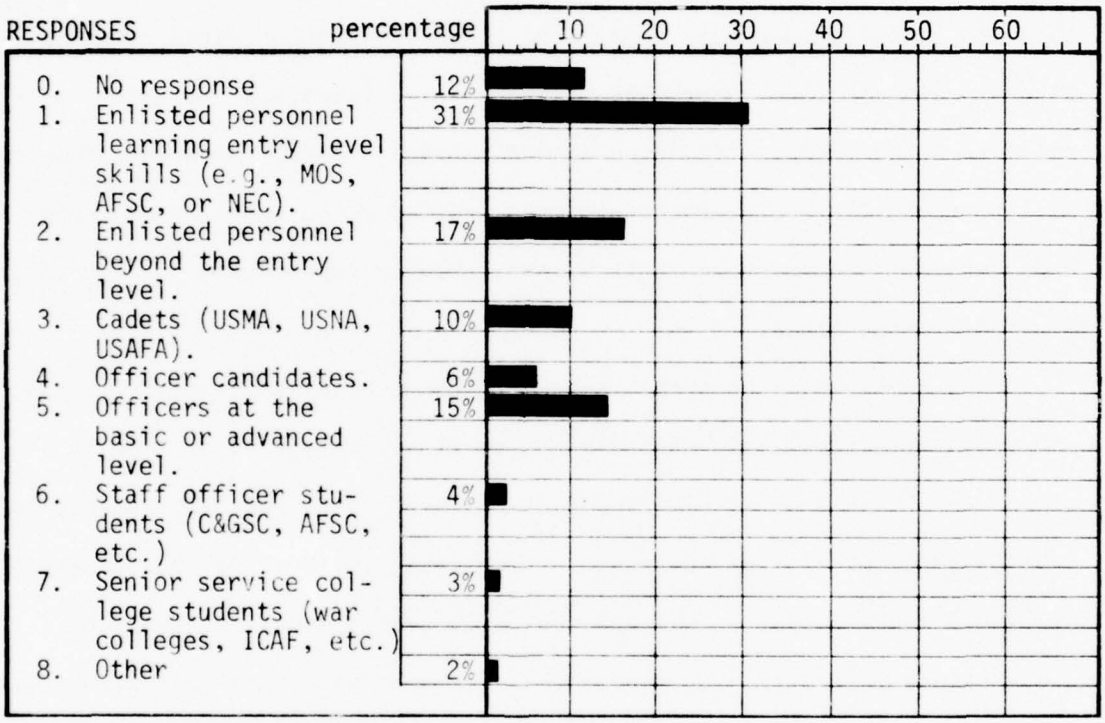


Fig. 31. Responses to instructor question 19--categories of students

Approximately 33 percent of the instructors' written comments suggested that it is inappropriate to select a "best" category, because computerized training is applicable to all categories. On the other hand,

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[1]A parallel idea was developed in instructor question 5. The discussion included the concept that entry-level training would be consolidated at a few large bases as a move to take advantage of the large student training capacity envisioned with the computer management of instruction. See above, p. 106.

a number of the instructors pointed out that lower aptitude personnel would be better candidates for computer based training. Several studies have documented this relationship between CAI and student aptitude levels.[1] For example, a study of Army electronics training demonstrated that three aptitude levels of students (high, middle, and low) averaged CAI course completion times faster than conventional instruction. The higher aptitude level students averaged 49 percent faster than students taught by conventional methods, and the middle level was 17 percent faster, but the lower aptitude level students averaged 32 percent slower.[2] The attrition (washout) rate was zero with CAI. Since the computer provided sufficient patient and impersonal drill and testing, the lower aptitude student was remediated until the appropriate achievement level was attained. The longer completion time under CAI provided the lower aptitude student an opportunity to graduate successfully rather than be washed out of the course. Under conventional training, the high-, middle-, and low-aptitude students spend the same number of weeks in a course but with different achievement levels and a 5 to 10 percent attrition rate.

Another profile type of question was asked of instructors regarding their perception of the all-volunteer enlistee and computerized instruction. Comparing the volunteer to the draftee, the question gave the respondents the option of suggesting that the volunteer possesses a

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[1] John D. Ford., Jr., Dewey A. Slough, and Richard E. Hurlock, Computer Assisted Instruction in Navy Technical Training Using a Small Dedicated Computer System: Final Report, a research report (SRR-73-13) (San Diego, Calif.: Naval Personnel and Training Research Laboratory, November 1972), p. 8; and Kiesling, "Economic Analysis of Educational Technology," pp. 992-94.

[2] International Business Machines Corporation, A Feasibility Study of CAI in U.S. Army Basic Electronics Training (Gaithersburg, Md.: IBM Corp., February 1968), p. vii.

lower educational level, is younger, and enlists to learn a skill. The distribution of responses, as shown in figure 32, is unimpressive and indecisive. The written comments of a number of instructors, however, yielded a significant observation that computerized training should be saved for the "smarter students," who were perceived as having the motivation and educational level to take advantage of the proven efficiency of CAI. The instructors thought that the lower aptitude student needed the personal touch of the instructor. These responses demonstrate the need for enlightenment of instructors regarding the proven effectiveness of the computer in dealing with all ability levels found in the military services.

INSTRUCTOR QUESTION 20. Recent offical surveys indicate that: Compared to the draftee. today's typical enlistee has a lower educational level, is several years younger, often enlists to learn a skill, and tends to sign up for a unit of choice which allows visits home on weekends. Therefore, training by computerized instruction will be more appropriate than using conventional methods.

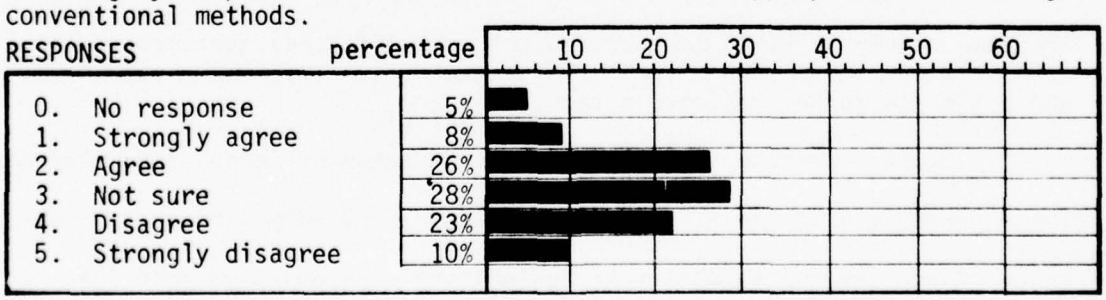


Fig. 32. Responses to instructor question 20--today's enlistee

It is concluded from these findings that computers can be used to support many categories of students with different mental abilities. The instructors identified the entry-level training as the most appropriate single category for computer use. The entry-level instruction concept

leads to the next section of this report wherein the impact of computer based training upon the recruitment process is assessed.

Recruiting and Retention

About 77 percent of all training and education in DoD is conducted for the purpose of training new entrants to the military services to the point where they are capable of being productive members of their assigned organization.[1] The remaining 23 percent of all training and education imparts more advanced skills and insures continuous development of the service member. The training establishment that carries out this mission requires 230,000 people and consumes $6 billion of the defense budget.[2] This large commitment of resources has one major goal: train the person for the job. To this end, the recruiting programs of the military services place emphasis on joining the military to learn a skill. Recruitment advertising is often seen as focusing on the "what" of training as an attractive feature. Yet, a logical extension of this advertising campaign psychology would be to ask: Is the "how" of training of interest? Will the "how" be a factor in attracting or retaining people for the services? To shed light on these questions, both staff and instructor views were sought in the surveys.

The Impact of CAI on Recruiting

The staff survey had a two-part question to assess the impact of CAI on recruiting. The questions and responses are shown in figures 33

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[1] U.S., Department of Defense, Military Manpower Training Report for 1976, p. xiii.

[2] Ibid., p. ix.

and 34. The staff's responses to this two-part question were a somewhat surprising two-to-one vote which inferred that computer based training will have an impact on recruiting. Whether all the services will advertise training technology in their recruiting programs remains to be seen. The

STAFF QUESTION 11. a. Will the presence or absence of modern instructional methods like computer based training have an impact on recruiting efforts by your service?

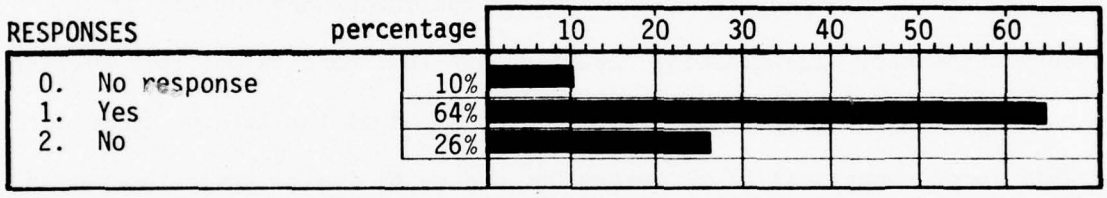


Fig. 33. Responses to staff question 11a--impact on recruiting

STAFF QUESTION 11. b. Will the presence or absence of modern instructional methods like computer based training have an impact on recruiting efforts by your service? If so, where do you see the greatest impact?

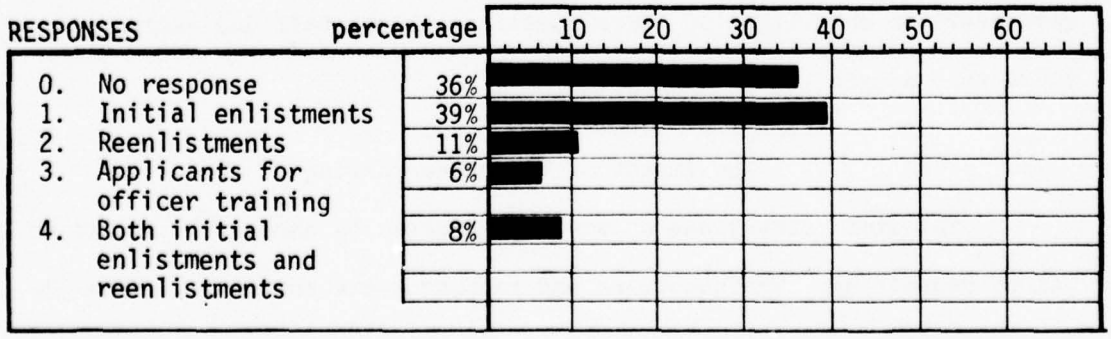


Fig. 34. Responses to staff question 11b--greatest recruiting impact

Marine Corps, however, is showing photographs of its communications-electronics CAI training at the recruiting offices to give young people an idea of the training methods they can expect in the Marine Corps. Initial indications suggest that such information has been helpful in Marine recruiting.[1]

In evaluating the staff responses to the above questions by military service, it is significant to note that sixteen out of seventeen of the Air Force staff officials that were interviewed indicated that the presence of computer based training will have an impact on recruiting. The project manager of the Air Force Advanced Instructional System indicated that the Air Force has begun to invest heavily in telling this story.[2]

The staff responses to the second part of the question Where do you see the greatest impact? reflected the dominant sentiment that the greatest impact would be in initial enlistments (39 percent). The staff respondents commented that an awareness of the use of computers in the training of a particular service should be an enticement to enlist. Furthermore, it would give the enlistee a positive feeling about participating in new training technology in a modern, up-to-date organization.

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[1]Interview with Lt. Col. Robert B. Mason, Deputy Director, U.S. Marine Corps Communications Electronics School, Twentynine Palms, California, 4 June 1974.

[2]Interview with Dr. Joseph Y. Yasutake, Advanced Instructional System Project Manager, Lowry Air Force Base, Colorado, 5 June 1974.

A Reason to Enlist

Question 15 of the instructor survey carried slightly stronger wording concerning training methods as a motivator to enlistment. It was designed to probe into the question of whether a young person would enlist in the military service just because a particular service offered computer based training. When asked this question, the instructors responded that they did not feel that this would be the determining factor, as shown in figure 35.

INSTRUCTOR QUESTION 15. How do you feel about this? The youth of the 1980s could be motivated to enlist because of modern training methods, such as computer based instruction.

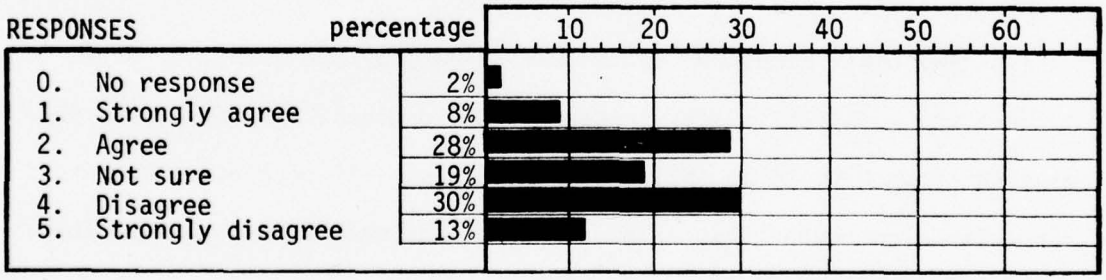


Fig. 35. Responses to instructor question 15--motivation to enlist

The "agree" responses aggregated 36 percent (8 percent strongly agree and 28 percent agree) and were subordinate to the "disagree" responses, which aggregated 43 percent. This response indicates that the majority of the instructors who expressed an opinion did not feel that the youth of the future would be motivated to enlist because of computer based training. The key word is "motivated " The instructors' comments distinctly reveal that they think computers could influence a person's decision (as

expressed in staff question 11a and b above), but they generally disagree that computers would be the causative factor in an enlistment decision. An analysis of the responses to instructor question 15 by military service shows that the Marine Corps disagrees with the other services. In other words, the Marine Corps instructor respondents perceive that the youth of the future could be motivated to enlist because of CAI. This position stems from empirical evidence that it has helped their enlistment program.[1]

Reason to Reenlist

The next question to be discussed relates to the instructors' opinions about reenlistment. The analysis of responses to this question completes the discussion of the impact of CAI on the recruitment and retention programs of the services.

Instructor question 17 is a follow-up question to the one previously discussed. It asked whether the availability of some form of computerized instruction for career development would influence a person to make the military his career. It should be noted that even though the wording of this question, as seen in figure 36, is not as strong as the previous question--"influence" a decision rather than "motivate" to enlist--the instructors did not feel strongly about the suggestion. The responses to the two "agree" categories and the two "disagree" categories show that the instructors oppose this proposition by a 4 percent margin.

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[1]Photographs of the CAI training at the Marine Corps Communication-Electronics School have been distributed to the Marine Recruiting Stations on the West Coast. The Marine recruiters indicate that the photographs have been helpful in telling the training story, and a number of decisions to enlist can be attributed to them. Interview with Captain Allen D. Crosier, Training Services Officer, U.S. Marine Corps Communication-Electronics School, Twentynine Palms, California, 4 June 1974.

INSTRUCTOR QUESTION 17. What is your thought on this? The availability of some form of computerized instruction for career development throughout a service person's tour would have an influence on a decision to make the military a career.

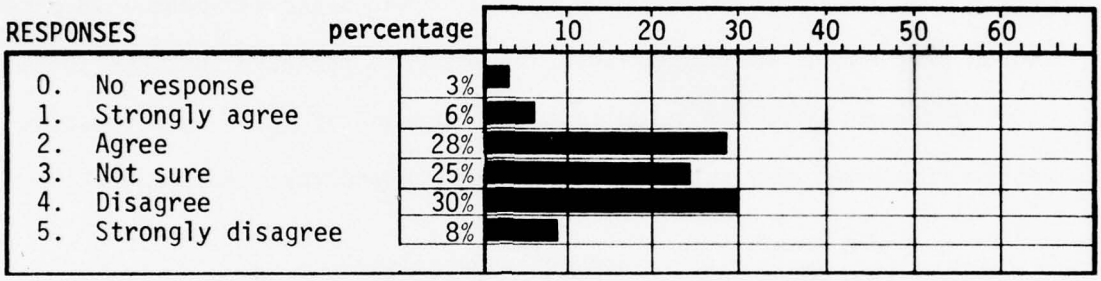


Fig. 36. Responses to instructor question 17--reason to reenlist

Through analysis of the responses, it was possible to identify groups of instructors who thought that the presence of computer based training would influence service career decisions. The Air Force and the Marine Corps supported the view that CAI could have an influence on re-enlistments. This sentiment is believed to be traceable to the use of CAI material in Marine Corps recruiting and the practice of the Air Force to advertise its modern training technology.

The written comments of the instructors indicated that their views on this question contrasted with those of the staffs. On the questions discussed thus far in this report, written comments have mostly been constructive or positive. The written comments on question 17, however, were quite different. Almost 50 percent of the instructors registered disbelief that computerized training could have any influence on career decisions. Such statements as "Come on now!!!" and "You must be kidding!" typify this group of naysayers.

The Benefits of Computers

Earlier in this report, in the discussion of prospects for computer based training, a number of points were made concerning factors which would help or hinder progress in this field.[1] Complementary to these points is a discussion of the benefits of computers from the student perspective. Three positive attributes of instructional computer use bearing on student acceptance are examined in this section.

The method of data presentation for this section begins with an illustration of the quantifiable data in the form of three separate tables. In the first of these, an analysis of the significant military service studies addressing the benefits of computer based training is presented in summary form. The second table presents the instructors' survey data, which reflect instructor views on the greatest benefits of instructional computer use. The third table shows the staff officials' views on positive attributes of computer based training that would be significant enough to tip the economic scales to this new technology in instruction.

Following the presentation of these tabular data is a discussion of each of the three main categories of benefits of CAI--student attitude, student achievement, and time saving in training--with respect to the military service studies, the instructor survey, and the staff interviews.

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[1] See above, pp. 115-19.

Military Service Studies

Many military service tests and studies over the past several years have focused on the effectiveness of CAI, as a new teaching strategy, compared to conventional instruction. Some of the more significant findings, as summarized in table 13, are as follows: (1) student attitude toward CAI is considered generally more favorable, (2) the achievement level of CAI students is usually higher, and (3) CAI normally reduces training time by one-third.

Student attitude is found to be the most elusive benefit to quantify. Many studies have made only passing reference to student feelings toward computer based training; others have attempted to quantify this subjective benefit.[1] Achievement level data were much more prevalent in objective form. However, most researchers were satisfied with the conclusion of "statistically significant," when it would have been more meaningful to the reader to see references to achievement level expressed in relation to the skill gained or to performance on the job with the newly acquired skill.[2] The time saving attribute of CAI was the best documented of the benefits.[3]

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[1]See below, p. 144. In the Navy CAI studies, several attempts were made to quantify the attitude of students toward CAI. The scale used in their studies was a Likert-type scale, which seemed to be effective in establishing that students have a positive feeling toward CAI. Interview with Dr. Richard E. Hurlock, U.S. Naval Personnel and Training Research Laboratory, San Diego, California, 3 June 1973.

[2]In the one Air Force and two Army studies referred to in table 13, the data were summarized with the statement "significantly higher," or some similar reference. It would have been more helpful to have the results reported in a percentage form (i.e., 2% higher or 20% higher), as in the first three studies included in table 13.

[3]In each study, a form of conventional instruction was used for the control group. This element of uniformity allows meaningful comparison among the studies.

TABLE 13

A SUMMARY OF COMPUTER ASSISTED INSTRUCTION BENEFITS AS FOUND IN MILITARY STUDIES

Military Studies	Student Attitude toward Computer Assisted Instruction (CAI)	Achievement Level Compared to Conventional Instruction (CI)	Time Saved CAI vs CI*
Naval Electronics Training at San Diego using IBM 1500 CAI System from 1970 to 1973[a]	Above average to outstanding.** Suggested 70 to 80% of instruction be given by CAI	5 to 10% higher than CI group	39 to 45%
Naval Academy at Annapolis using Teletype/IBM 1500 CAI System from 1967 to 1972[b]	Overwhelmingly positive	2% higher. Statistically significant in 3 of 20 sets of examinations	None, but more material covered
Marine Communications and Electronics Training at Twentynine Palms using UNIVAC CAI System in 1970[c]	Highly motivated	20% higher scores	35%
Army Morse Code Training at Ft Devens using Sylvania/Honeywell CAI System from 1970 to 1971[d]	Favorable	Significantly higher	28%
Army Communications and Electronics Training at Ft Monmouth using IBM 1500 CAI System from 1969 to 1971[e]	Highly favorable	Higher	35%
Air Force Electronics Training at Keesler AFB using Lincoln Training System in 1972[f]	Favorable	Consistently higher	37%

SOURCES: (a) John D. Ford, Jr., Dewey A. Slough, and Richard E. Hurlock, Computer Assisted Instruction in Navy Technical Training Using a Small Dedicated Computer System: Final Report (San Diego, Calif.: Naval Personnel and Training Research Laboratory, November 1972).

(b) Jesse L. Koontz, Final Report on the Naval Academy's CAI Project (Annapolis, Md.: U.S. Naval Academy, February 1972).

(c) William G. Kemple, R. J. Modell, and F. J. Blaisdell, "Production Level CAI in the U.S. Marine Corps," a paper presented at the Sixth Naval Training Equipment Center and Industry Conference, Orlando, Florida, 13-15 November 1973.

(d) William R. Tracey, "Computer-Assisted Morse Code Training," a paper presented at the Second Symposium on Cost Effective Learning through the Application of Computer Technology, Washington, D.C., 21-22 February 1973.

(e) Vincent P. Cieri, "Development of a Computerized Training System for Future Army Training," a paper presented at the Second Symposium on Cost Effective Learning through the Application of Computer Technology, Washington, D.C., 21-22 February 1973.

(f) Robert C. Butman and F. C. Frick, The Lincoln Training System: A Summary Report (Lexington, Mass.: Lincoln Laboratory of Massachusetts Institute of Technology, 3 October 1972).

NOTES: *Conventional classroom instruction is abbreviated "CI."
**On the average, the students rated CAI as 4.5 on a 5-point scale with 5 being outstanding.

The Instructor Survey

The instructors were surveyed for their views on the leading benefits of using computers in the instructional process. These data were developed from instructor question 16, which asked each instructor to choose three benefits from a list of ten.[1] The instructors indicated that the top-ranking benefit is that CAI offers greater uniformity in the quality of training. By their written comments, the instructors explained that the computer does not experience good and bad days, as instructors do, but rather, offers a consistent quality of instruction. The second-ranking benefit identified by the instructors was that computer based systems save time as compared to conventional instruction. A summary of the ranking of benefits as indicated by the responses to the instructor survey is shown in table 14.

TABLE 14

A SUMMARY OF LEADING BENEFITS OF CAI AS PERCEIVED BY THE INSTRUCTORS BASED ON RESPONSES TO INSTRUCTOR SURVEY QUESTION 16

Rank	Benefit	Percentage of Responses
1.	Offers greater uniformity in the quality of training	19%
2.	Saves time	16
3.	Flexibility to handle varying training loads	13
4.	Ability to adapt to differences	11
5.	Easier to be assured that educational objectives are met	10
6.	Saves money	6
7.	Produces quality instruction	6
8.	Reduces the dropout (washout) rate	2
9.	Favored by the students	2
10.	Students perform better on the job	1

[1] See instructor question 16, appendix F, p. 302 below.

Although the instructors did not select one benefit as being significantly dominant over the others, it is evident from their responses and written comments that they appreciate the power of the computer to do things instructors can not easily do--produce uniform training, save time, handle varying training loads, and adapt to differences in ability.

The Staff Interviews

The staff officials were given a two-part question about CAI benefits. They were asked first to identify all the positive attributes of computer based training that would offset the significant costs of these systems.[1] Then they were asked to select from a list of nine benefits the one that they felt would tip the economic scales from conventional instruction to a form of computerized instruction.[2] A summary of the responses to this question is shown in table 15.

TABLE 15

A SUMMARY OF POSITIVE CAI ATTRIBUTES IDENTIFIED BY THE STAFF BASED ON RESPONSES TO STAFF QUESTION 14

Rank	Benefit	Percentage of Responses
1.	Reduced training time	37%
2.	Fewer instructors required	17
3.	Better performance after training	12
4.	Higher student achievement	9
5.	Flexibility to handle varying training loads	8
6.	Greater uniformity in the quality of training	5
7.	Reduced attrition (washout) rate	3
8.	Student preference	2
9.	Generates instructor motivation	1

[1] See staff question 14a, appendix G, p. 326 below.

[2] See staff question 14b, appendix G, p. 327 below.

The staff respondents were quite positive in their perception of the capability of CAI to save time (37 percent). It is interesting to note that the staff respondents identified a requirement for fewer instructors as the second-ranking attribute, yet the instructors did not even place it on their list of ten benefits.

The Three Leading Benefits of Computer Based Instruction

The several military service studies summarized above, along with the survey results of this research, provide the background data that allows an examination of the three leading benefits of computer based instruction: student attitude, student achievement, and time saving in training.

Student attitude

As mentioned in the introduction to this portion of the chapter, few studies have been successful in quantifying student acceptance of computer based training. Nonetheless, the available data on student attitude provide some insight into the subjective sentiments of students as regards CAI.

The Navy studies summarized in table 13 used a five-point scale to solicit student attitude toward CAI. With the scale ranging from 1 to 5, the value of 3 meant that the student's attitude toward CAI was above average; a rating of 5 equated to an attitude of outstanding regard for CAI. Three separate studies included 10,197 student contact hours, using a computer terminal in a CAI mode. A total of 760 students involved in these three studies gave CAI an average rating of 4.5 points. When the students were asked to identify the aspects they liked best about CAI, they

listed self-pacing and active individualized instruction, immediate feedback, and clear and interesting instruction, in that order.[1]

In the five other military service studies reviewed, the subject of student attitude was always considered favorable, but a few went even further to establish a degree of satisfaction, which ranged from "overwhelmingly positive" to "favorable."[2]

It is noted that both the instructors and the staff considered student attitude next to last in a list of CAI attributes, as seen in tables 14 and 15 (pages 142, 143). Seeking to understand this response, eighty-six instructor written comments were reviewed. In no instance did an instructor write a comment that made reference to the benefit of a student's positive or negative attitude toward CAI. Conversely, the staff responses on the subject of student preference provided numerous comments, and thereby provided an opportunity to evaluate its placement of next-to-last in both surveys. The staff respondents' comments are generalized by the following two statements:

1. "Students like computer based training because it is new, interesting, and dynamic"
2. "Even though the novelty can wear off after a week or so, CAI is still an active learning process that is preferred by the majority of students in the experiments"

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[1]Ford and Slough, Computer Assisted Instruction, p. 23; and Richard E. Hurlock, Development and Evaluation of Computer Assisted Instruction for Navy Electronics Training: Inductance, a research report (SRR-71-22) (San Diego, Calif.: Naval Personnel and Training Research Laboratory, 1971), p. 17.

[2]For example, during the Army Morse Code testing, students were asked to indicate their attitude concerning CAI as either favorable or unfavorable. The majority marked their questionnaire "favorable." The Army communications training study provided the students with a feedback form that included an attitude question with the following range of responses: highly favorable, favorable, neutral, unfavorable.

The need for student acceptance is critical, and up to this time the student has been pro-CAI. Fortunately, accepting the fact that the student is favorably disposed toward CAI, the staff and instructors are able to focus their attention on the other attributes of CAI--the quality of instruction and a reduction in training time.

Student achievement

From an educational standpoint, the training decision makers seem to be satisfied with a recommendation for conversion if the advocates of computerized training will assure them of at least equal student achievement. Like student acceptance, achievement level is not subject to precise quantification or accurate validation. In most studies, comparisons were made between control and CAI groups with equal distribution of aptitudes in each group. In such comparative tests, CAI has demonstrated at least equal if not higher achievement, as shown in table 13 (page 141). The achievement level of the CAI students in the military service studies reviewed were all higher than those of the conventional instruction control group. The differences in achievement ranged from 2 percent to 20 percent higher on identical performance tests given at the end of each type of instruction.

An achievement test is used as one measure of the quality of learning with a particular learning strategy. The quality of learning is a function of several other factors. The instructors offered the opinion that the prime benefit of CAI is greater uniformity in the quality of training.[1] In fact, 19 percent of the instructors ranked this factor

[1]See table 14, p. 142 above.

as the main benefit of using computers in the instructional process. Greater uniformity, as suggested by the instructors, is interpreted to mean that more graduates of a CAI course than of a conventional training course possess the skills needed on the job. They attribute this uniformity in quality to the fact that the computer is more consistent in lesson delivery than are the instructors. The computer never has bad days or leaves out material. Most importantly, the computer does not let the student advance until essential fundamentals of the lesson being studied are comprehended and demonstrated through practice.

The designing of CAI lessons requires a careful analysis of the instructional material to be converted. The challenge of course content causes the instructor to validate the tasks to be presented on the terminal with respect to the established educational objectives of the course.[1] Once the instructor is satisfied that the material is relevant, the goal of meeting these objectives becomes more certain because the computer will require mastery of one objective before the student is allowed to proceed to the next.[2] In response to instructor question 16, 10 percent of the instructors felt assurance of meeting educational objectives to be the fifth most important benefit of computer based training.[3] The computer patiently drills the student, and, although this drilling may cause the student to take longer to complete the course than he would by the lock-step mode, several benefits accrue. The students learn step by step, at their

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[1]Wallace Feurzeig, Computer Systems for Teaching Complex Concepts (Cambridge, Mass.: Bolt, Beranek and Newman, 1969), pp. 48-53.

[2]This concept is an integral part of the S-3A Instructional Media Selection Algorithm. See above, pp. 29-32.

[3]See table 14, p. 142 above.

own pace, so they graduate when they have assimilated the course material rather than by virtue of some theoretical time schedule. As indicated earlier, the notion of self-pacing leads to reduced attrition--a lower washout rate.[1] Students unable to keep up with a lock-step class are either washed out or made to recycle with the next class, whereas the computer will adjust to the student's learning rate. Another salient aspect of the data on attrition collected from studies is that CAI impartially identifies potential academic failures early in the training process.[2] The data on student progress are made available by the computer, indicating whether a lower aptitude student can eventually complete the course or should be changed to a different specialty. Both the students and the instructors save time if the low-aptitude students are identified early.

The capability of the computer system to adapt to individual differences falls within the general concept of individualized instruction. Eleven percent of the instructors ranked this benefit near the top of the benefits mentioned in their responses to question 16.[3] A pedagogical technique of branching is used in the development of computer based instructional material to overcome student barriers to progress.[4] For

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[1] In the instructor survey, reducing the dropout (washout) rate was ranked 8th of the benefits of CAI, as shown in table 14, p. 142 above. The staff respondents placed reduced attrition (washout) rate as 7th in a list of positive CAI attributes, as shown in table 15, p. 143 above.

[2] Vincent P. Cieri, "Development of a Computerized Training System for Future Army Training," a paper presented at the Second Symposium on Cost Effective Learning through the Application of Computer Technology, Washington, D.C., 21-22 February 1973.

[3] See table 14, p. 142 above.

[4] Albert and Bitzer, Advances in Computer-Based Education, p. 28.

example, the computer provides internal branching to overcome a student's deficiency in a certain area and external branching for the student to move to new subject matter. By using this hierarchical lesson design, the student completes the material in a minimum of time, yet adequate performance is assured before he moves to the next module.

In this section on student quality, heavy reliance is placed on the instructor survey data because of the instructor's more direct and personal involvement in the teaching process. However, in closing the discussion, it is appropriate to note that the staff regarded higher student achievement as a significant benefit, ranking it fourth in importance.[1]

Time saving in training

The time saving attribute of CAI has tended to be the pivotal argument to justify the expenditure of funds for conversion to the new, high technology systems.[2] Because of the subjective nature of the two

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[1] See table 15, p. 143 above.

[2] The cost-benefit studies required by the Department of the Navy as justification for new computer based training systems have all rested their case on a saving of both student and instructor time. Saving in learning time is translated into a larger student throughput in a given period of time as compared to conventional instruction. The instructor time saved has allowed them to reduce the number of spaces required and to cut total school manning. The student and instructor cost saving then shows more than enough to offset the cost of hardware, software, and courseware when amortized over an eight-year period--the estimated life of a computer system. The two internal DoD documents that demonstrate the application of the cost-effectiveness criteria of reduced instructor personnel are: U.S., Department of the Navy, U. S. Marine Corps, "Computer Aided Instruction (CAI)," a letter to the Assistant Chief of Staff, G-3, Headquarters, U.S. Marine Corps, from the Director, Systems Support Group, Washington, D.C., 29 February 1972; and U.S., Department of the Navy, "Computer Assisted Instruction (CAI)," a letter fo the Chief of Naval Operations from the Commander of Naval Air Forces, Pacific Fleet, San Diego, California, 29 June 1972.

previously dissussed benefits--student attitude and student achievement--it is reasonable to assume that the saving of training time will continue to be the dominant quantitative factor in proving the cost-effectiveness of computer based training. Thus, it is important to consider this benefit the one most relevant to the life of computer based instructional systems.

The studies highlighted in table 13 (page 141) suggest that CAI training has reduced conventional training time from 28 to 54 percent. The computer is not the sole contributor to this saving of time. The instructor is an important source of time saving also. Time saving often derives from a fresh look at the training material, the elimination of superfluous items, the rearrangement of the sequence of presentation, and the examination of each teaching point in the light of established learning objectives.[1] This purging of course materials by the instructor added to the self-pacing nature of the computer based systems yields the time saving. For example, the Air Force Advanced Instructional System is required to achieve at least a 25 percent reduction in training time with equal or better training performance.[2] Thus, the available studies reflect a rule of thumb for saving training time in computer instructional systems ranging from 28 percent to 54 percent, as compared to conventional instruction.

In addition to a saving in scheduled training time, computer assisted instruction often reduces the amount of outside study needed for completing

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[1]See above, pp. 147-48.

[2]U.S., Department of the Air Force, "General Specifications for the Advanced Instructional System Performance and Design Requirements, Statement of Work," a contract with McDonnell Douglas Corporation, Washington, D.C., 17 April 1972. These data are not included in table 13, p. 141 above.

the course. In the previously mentioned Navy tests, the students estimated that they required less than half as much outside studying for CAI as for regular classroom instruction.[1]

In the instructor survey, 16 percent of the instructors ranked saving in training time as the second most important benefit of CAI.[2] In reading their comments, it was interesting to note that frequently the perceived saving was their own time. They pointed out that the administrative burden of testing, grading, and progress recording is now placed on the computers so that they are able to capitalize on this time saving benefit. Consequently, they have more time to deal with the student on a personal basis.

The staff's view of positive attributes of computer based training places reduced training time as the most important benefit.[3] Further, 37 percent of the staff respondents selected time saving as the prime factor that could tip the scales from conventional instruction to computer based instruction.[4] Unlike the instructors' comments, those of the staff were focused on the amount of time the student would save. Upon evaluation of their comments, it appears that the staff made an automatic mental conversion of the time saved into the shortening of course length.

Training is often regarded as a nonproductive period of time that must be invested in each new entrant. It is therefore believed that by

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[1] Hurlock, Computer Assisted Instruction, p. 20.

[2] See above, p. 142.

[3] See above, p. 143.

[4] See table 15, p. 143 above.

training at a faster pace, a soldier can go to the job sooner and thereby lower the total manpower requirement. Shorter training time can be directly translated to a reduced turnover rate. This reduction in turbulence was mentioned earlier as a feature of the one-station training concept and as a goal of the all-volunteer force concept.[1]

No report was made in the summary of studies shown in table 13 (page 141) relative to reduced training time at the Naval Academy. It still takes four years to educate a midshipman, but the computer has allowed the faculty to cover more material than ever before. The student is challenged more in his homework knowing that the routine computational part of all assigned problems is quickly handled on the computer.[2]

Another benefit related to saving instructional time stems from the idea that computerized training could allow the military services to do away with their rigid class opening and closing dates. Students could be permitted to begin courses whenever they report for training and complete the course of instruction at their own pace. This procedure could eliminate the traditional military fanfare of commencement and graduation exercises.

The saving of time can be realized as a cost avoidance only if the military personnel system is adjusted and made responsive to assigning students as they complete computer supported courses.

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[1]U.S., Department of the Army, Training and Education, a statement by Major General George W. Putnam, Jr., before the Committee on Armed Services, U.S. Senate, 93d Cong., 2d sess., 1974. Also, see above, p. 108 and below, p. 221.

[2]Interview with Captain Philip A. Charest, Director of Computer Services, U.S. Naval Academy, Annapolis, Maryland, 13 June 1974.

Since this is a matter more closely related to the staff than to the faculty, only staff opinions were solicited on the question of how to avoid wasting the time saved in computerized training systems. The following open-ended question was posed during the structured interviews:

> Staff Question 8. The self-pacing feature of computerized training systems could do away with course opening and course graduation dates. How can the personnel assignment function be adapted to avoid wasted time between assignment to training and reporting for duty from training?

The staff responses are categorized as shown in table 16 and listed by the percentage of frequency of mention during the interviews. The most popular method is called "computer prediction." It is a system currently in use at Lowry Air Force Base, Memphis Naval Air Station, Fort Gordon, and

TABLE 16

SUMMARY OF STAFF SOLUTIONS TO AVOID WASTING TIME BETWEEN TRAINING COMPLETION AND THE NEXT ASSIGNMENT

	Percentage of Frequency of Mention
Computer prediction plus progress checks for continuous update	21%
Block training requirements given the school and allow them to meet assignment dates (decentralized)	17
Computer controlled with link to personnel center computer	14
No problem; we are doing it now	12
Just don't know; too complex	9
Need to completely overhaul the whole personnel system to make it responsive to the field	7
Keep it scheduled and add more training or OJT for faster learners	5
Don't change to accelerated training	4

Keesler Air Force Base.[1] This predictive approach is also part of the design of the Army Computerized Training System (CTS) and the Air Force Advanced Instructional System (AIS).

The Marine Corps school at Twentynine Palms supports a concept of decentralization to allow the schools to meet the training requirements and assign qualified personnel on the dates prescribed. This approach could easily work for the school that trains all personnel in a particular skill for a particular service. It may not be appropriate, however, to meet the needs of the multiple training site system used by the Army.[2] Linking the computer for the training activity to that of the personnel center is the third choice. This linking is a viable alternative and is certainly within the state of the art from a technological standpoint. It is also consistent with the design of the new CTS and AIS projects.[3]

There were negative aspects of the staff responses that should be recognized. Four percent of the staff respondents offered the opinion that the military services should not adopt the self-paced or accelerated training systems.[4] Another 5 percent of the staff respondents indicated

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[1]The latter two applications are not computer based, but self-paced. In each instance, the students are taking programmed instruction, which allows them to complete the courses at their own pace. Interview with Lt. Colonel Robert G. Foster, CTS Product Manager, Fort Gordon, Georgia, 18 June 1975; and telephonic interview with Lt. Larry E. Johnson, Training Resources Applications Branch, USAF School of Applied Aerospace Science, Keesler Air Force Base, Mississippi, 25 November 1974.

[2]This may be a diminishing problem as the Army moves toward the one-station training concept over the next few years. See above, p. 108.

[3]CTS is described above, pp. 73-77; AID is described above, pp. 66-70.

[4]See table 16 above, p. 153.

that they would rather continue with scheduled training and add more training or use on-the-job training for fast learners.[1] In effect, this procedure would penalize the fast learning students and keep them in the training situation in a make-work environment. It is reported that both Keesler Air Force Base and Fort Devens have experienced a human motivation problem when orders are published early, based on a predicted graduation date. For example, when the orders are to an undesirable location, the student often starts learning slower with the objective of being sufficiently slower to cause a new projected course completion date to be established. This change in projected completion prompts a change in reassignment, hopefully to a better location. However, when this situation was corrected and students understood that the assignment would not be changed, even though their projected completion date was altered, the lapses into slow learning waned.

The Student Perspective

The benefits that accrue to both the individual student and the Army School System can be realized only through diligence of the instructors and staff members to make computer based systems effective. Just as the instructors have caused conventional systems to be successful in the past, they must strive to cause computer based systems to be beneficial.

The application of computer technology to the individualizing of instruction provides a promising means of overcoming some of the deficiencies of group instruction. Computer support of training permits precise control of input information to the student, immediate processing

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[1] See table 16, p. 153 above.

of student responses combined with presentation of appropriate feedback information, branching, and collection and processing of highly detailed student response data.

Even though computer based training is an appealing instructional strategy, it is not likely to be the motivating factor for enlistment into the service. The career soldier would be pleased that his service is using computers in training. But again, it is not likely to motivate a reenlistment decision.

With very few exceptions, the student's attitude toward computer based training is favorable. It reduces boredom on the part of the gifted and the fast learner by providing advancement to higher levels of instruction when he is ready, irrespective of education upon entry into the training, time spent in class, or aptitude scores. CAI boosts the achievement level of the slow learners by providing a patient, impartial, and consistent tutor. It minimizes any harm done by poor teaching since uniform, quality material is provided to all.

Computer based instruction is not a panacea for the training ills of the military services. It does have the potential, however, of giving the student personalized learning at his own pace. The student responds positively to this mode.

CHAPTER 6

FACULTY STAFFING CONSIDERATIONS ARISING FROM COMPUTER BASED INSTRUCTION

Introduction

Roger Levien points out that decisions about the instructional use of the computer will not be made by a single rational decision maker on the university campus.[1] Rather, such decisions will be divided among at least three major groups--students, faculty, and administrators--each of which assigns different rankings to the various costs and benefits of an instructional choice. While no one group has sufficient authority to bring about widespread use, each generally has sufficient voice to veto such use. Thus, the attitudes of these three groups are very important. In the military services, these same groups exist with only slight descriptive changes. The students and their attitudes were covered in chapter 5. The faculty group referred to by Levien is synonymous to the faculty at the service school, and the attitudes of this group are examined in this chapter.[2] The administrators are comparable to the

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[1] Roger E. Levien, The Emerging Technology (New York: McGraw-Hill Book Co., 1972), p. 535. Levien directed this study for the Carnegie Commission on Higher Education. He is currently Director of Washington Domestic Programs of the Rand Corporation.

[2] To clarify the use of certain terms in this chapter, the following definitions pertain:

Faculty--A collective term referring to the entire teaching and administrative force of a military school, college or academy

Faculty member--Synonymous to instructor; a teacher.

Webster's New Collegiate Dictionary, 1974 ed., s.v. "faculty."

staffs at training command and departmental level (e.g., Department of the Army, DA; and Department of Defense, DoD) where the aggregate allocation of training resources takes place. The attitudes of this third group are examined in chapter 7.

Although student attitudes toward CAI are important, it was found in chapter 5 that the driving force for changes in military training tends to originate in the school faculty. Yet, in the dozens of studies addressing the introduction of new technology, very little recognition is given to the faculty member's role as a motivator of change.[1] Faculty members tend to be the innovators, discoverers, and perfectors of new training methods. Staff personnel are called upon to support the innovators in their quest for new ways of teaching by providing the necessary resources. When working in concert, the staff and faculty clearly control the present and future direction of the instructional process in military schools, colleges, and academies.

Yet, the introduction of change has its hazards. "Almost nothing new works" is a common expression. It is not meant to reflect a defeatist attitude but a simple recognition that innovation is a high-risk venture. Peter Drucker identified three major risks in innovation:

> The first is that it will make obsolete current practices and patterns of operation.

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[1]Typically, these studies included a section on student attitudes and achievement but devoted little attention to the faculty member. Some of the more significant comprehensive studies of the services include: U.S., Department of the Army, U.S. Continental Army Command, Task Group Report (1972); U.S., Department of the Navy, U.S. Naval Personnel and Training Research Laboratory, Computer Assisted Instruction in Navy Technical Training Using a Small Dedicated Computer System, a final research report (SRR 73-13) (San Diego, Calif.: Naval Personnel and Training Research Laboratory, November 1972); and Jesse L. Koontz, Final Report on the Naval Academy's CAI Project (Annapolis, Md.: U.S. Naval Academy, February 1972).

> The second is that it will fail.
> The third is that it will succeed--but in succeeding it may produce unforeseen consequences that create new problems.[1]

In chapter 4, the assertion was made that the teacher is often considered a barrier to the introduction of computers in training--at least in civilian schools and colleges.[2] Teachers are thought to be obstacles to computer use because they fear those unforeseen problems mentioned by Drucker. Is this fear present in the military services? Are military members fearful of innovation? Or, are they the agents of change? Change can be initiated from within the organization or from the outside. Lee Grossman indicates that today's change agents are a new breed, not professional outsiders but people inside the organization.[3] Are military faculty members the agents of change for CAI or barriers to change?

Computers are creating change agents in other ways, too. Chris Argyris points out that agents are needed to make complex computer systems work.[4] The users of these systems often cannot psychologically cope with the impact of the required changes. Therefore, acceptance of computer based training systems may be slowed unless the proponents are prepared to deal with the behavioral aspects of the system as a means of insuring its successful operation.

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[1] Peter F. Drucker, Technology, Management, and Society (New York: Harper and Row, Publishers, 1968), p. 131.

[2] See above, pp. 117-19.

[3] Lee Grossman, The Change Agent (New York: AMACOM, 1974), p. 13.

[4] Chris Argyris, "Management Information Systems: The Challenge to Rationality," Management Science, February 1971, pp. B275-92.

Responding to the problems posed by the questions above, the following subsidiary research question is addressed in this chapter: What manpower and personnel management considerations arise in faculty staffing should computers become a significant part of the Army's training process? The focus of the chapter is on the faculty members at the school level and the concern for faculty resistance versus the role the faculty members might undertake as agents of change.

The Faculty and CAI

In considering the impact of technological change, one portion of this chapter describes the faculty's role in computer assisted training, revealing its attitudes and fears and the new problems to be faced. Another portion examines the manpower implications at the school level.

The Computer Based Training Instructor

The recent emphasis placed on the importance of technology that expands the learning opportunities for students gives the impression that instructional media will soon replace the faculty members or reduce their importance in general. Such thoughts seem ill-founded. The function of the new technology should be to expand the capabilities of faculty members and relieve them of the need to prepare repeatedly for and personally deliver elementary course segments that change very little from year to year. New technology should provide time-saving ways of drilling students in knowledge that must be mastered if the rest of the course is to be understood and should expand the instructor's resources

for demonstration and illustration. It should also give them more time to prepare new lessons and courses, meet with students in small groups, and provide individual counseling.[1] Yet, all of these capabilities will be of no avail if the faculty member has a negative attitude toward CAI and effectively hinders its application. The military instructor's attitude in this regard is examined in the next section.

The Instructor's Attitude

Throughout the data gathering process for this report, it was observed that some of the most impressive progress in the use of computers in training was inspired by the initiative of individual faculty members who grasped the potentials of the new techniques and applied them to their own teaching. On the other hand, the respondents to the instructor survey freely admitted that resistance by the instructors can severely slow the progress of computer based training. It is recalled that the discussion in chapter 4 indicated that the attitudes of instructors were ranked second only to cost as significant barriers to the use of computer technology.[2]

Negative attitudes of instructors

Hundreds of instructor and staff comments have been woven into this report. Most of their observations were positive and supportive of

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[1] Carnegie Commission, Fourth Revolution, p. 65.

[2] See above, pp. 117-19. The instructor survey did not contain a question that specifically asked instructors: What is your attitude toward CAI? However, considerable information relative to attitude was developed--both positive and negative.

the concept that computers can and will play a significant role in future military training and education. Now and then, however, a sense of grumbling, discontent, or disenchantment with the presence of computers in training was observed. Some of this negativism may be explained by the average rate of 7 percent "no response" to the survey questions. Although these negative data are not very informative, such written comments as "It will never happen!" "Won't work!" and "Old ways will prevail!" were received. These comments, presenting the counter position, represent less than one-half of 1 percent of the instructor respondents.[1]

Another example of the instructors' negative attitudes was that detected in the question discussed in chapter 5, which called on the instructors to identify three benefits or advantages of CAI.[2] Twelve of the 409 instructors participating in the survey took time to write comments that said, in effect, there are no advantages. Their comments could be considered more emotional than constructive. Comments illustrative of the negativism found were: "It's a crutch!" "There are no great benefits!" and "Saves time and money, but teaches nothing!" The following discussion highlights the positive opinions of the instructors.

Favorable attitudes of instructors

Four instructor questions are used in table 17 to demonstrate the favorable attitudes evident from the survey. Again, the questions

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[1]Compared to the average of fifty-five comments on each question, only two or three were dissenting remarks. As appropriate, these counter-views are integrated into this report.

[2]See above, p. 142.

were not asking specifically for a positive or negative attitude, but were seeking positive instructor sentiments toward computer based systems. Contrasting the high percentages shown in table 17 with the 7 percent "no response" attitude and the negative comments mentioned in the preceding section, it is evident that the military instructors surveyed have a highly positive feeling toward the future use of computers. It should be pointed out, however, that the population of the survey was limited to instructors who make some use of the computer in the instructional process. Therefore, the positive response shown in table 17 could be anticipated to some extent. The intensity of their belief in CAI was more impressive from the 289 written comments of the instructors than from their responses to the four questions.

TABLE 17

SUMMARY OF RESPONSES TO SURVEY QUESTIONS REFLECTING INSTRUCTOR ATTITUDES TOWARD CAI

Question	Percentage of "Agree" Responses
The goal now is to find the best way to computerize instruction (instructor question 8)	72%
The dominant mode in the 1980s will be some form of computer based training (instructor question 10)	59
Computers in the instructional process will be prevalent in the 1980s (instructor question 11)	85
Today's conventional methods will not be dominant in the 1980s (instructor question 12)	56

NOTE: Most of these questions have been generalized for illustration. The complete questions and data analysis are found on respective question summary sheets at appendix F.

Although the instructors' thoughts were specifically oriented toward the respective questions, their attitudes toward computer based instruction systems may be summarized as follows:

> As instructors using computers on a daily basis, we know their limitations, but most importantly, we appreciate their potential. The essential ingredient to better computer application is top-level support and a long-range plan for implementation. Thus supported, we can deliver a new quality of instruction to the student. We know these systems can and will work.[1]

Another aspect of instructors' attitudes was covered in the staff survey, which probed for the motivation for instructors to use CAI. The staff officials were asked to identify the one positive attribute that would tip the scales from conventional instruction to a form of computerized instruction.[2] Of the nine choices offered, "generates instructor motivation" was the last choice, with only one vote. One implication that may be drawn from this response is that the staff officials of military service schools are not likely to buy expensive computerized training systems for the purpose of boosting instructor morale. The staff members made it clear during the personal interviews that faculty motivation with respect to using computers at their school is not of major concern.[3]

Faculty motivation was more specifically addressed when the instructors were asked to select the factors that would motivate an instructor in computerized training systems of the future. Their responses are summarized in figure 37.

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[1]This "quotation" is a composite of 289 written instructor comments on instructor questions 8, 10, 11, and 12.

[2]The question, staff question 14b, is discussed in chapter 5. See above, p. 143.

[3]During the ninety-two interviews with staff officials, only two made any reference to the fact that computer based training would motivate faculty members.

INSTRUCTOR QUESTION 26. What two factors will motivate an instructor in the computerized training systems of the future?

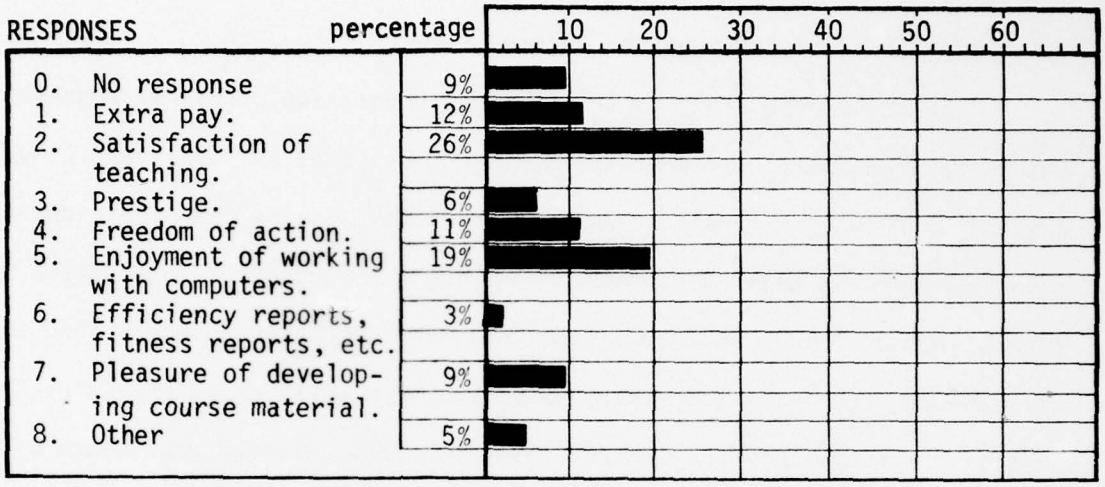


Fig. 37. Responses to instructor question 26--factors to motivate

The positive motivation of instructors toward CAI is reflected clearly in the figure. The leading factor (26 percent) selected by the respondents is "satisfaction in teaching." The second-ranking motivator (19 percent) listed by the instructors was one of the enjoyment of working with computers. These responses are consistent with the positive written comments previously mentioned.[1] They suggest that the military instructors are not as fearful of computers as their civilian counterparts seem to be.[2] A possible explanation for the positive attitude of the military instructor who uses computers is that he is younger, more mobile, and less committed

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[1] See above, p. 164.

[2] The study by Anastasio and Morgan (Factors Inhibiting Use of Computers in Instruction) discussed above (p. 118) places great emphasis on and registers the highest concern over the negative attitude of teachers toward CAI and their fear of its impact on their career.

to teaching as a career; thus, he feels less threatened by experimenting with this new technology.[1]

The Matter of Pay

In the recent study by the Carnegie Commission on Higher Education, which explored instructional technology, a portion of the final report was devoted to faculty motivation and attitude. Recognizing that most institutions reserve the major decisions concerning the conduct of instruction for the faculty, the Commission concluded that a faculty member's need for advancement is one of his primary interests when considering the introduction of change into the instructional process.[2] Advancement means a salary increase, a raise in rank, professional growth, and prestige.

To obtain parallel attitudes on the military instructor's need for advancement, extra pay and personal evaluation were made a part of the list of choices on the instructor question shown in figure 37.[3] The instructors (12 percent) listed extra pay as the third-ranking factor of motivation in computer systems of the future. A corollary question (instructor question 25) about extra pay was asked to obtain agreement or disagreement of the respondents to the proposition of awarding special pay for instructors qualified in computerized instructional methods. The responses are summarized in figure 38. The instructors in agreement with

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[1]The demographic data collected in the instructor survey indicates that the majority of the respondents had less than two years of experience with computers. By observation in the field while administering the survey, it was estimated that the typical instructor is about twenty-five years old.

[2]Carnegie Commission, Fourth Revolution, p. 65.

[3]See above, p. 165.

the idea of skill pay represent 47 percent of the responses; 39 percent were opposed. In analyzing the responses by military service and status, it was apparent that the dominance of enlisted personnel in the survey population heavily influenced the nature of the final outcome. When considering only the officer instructor respondents, the outcome was inversed--33 percent were in favor of special pay, and 54 percent were against it.[1]

INSTRUCTOR QUESTION 25. Just as proficiency and other skill pay is awarded to certain skills in the military, it is appropriate that this type of pay be authorized to instructors qualified in computerized instructional methods.

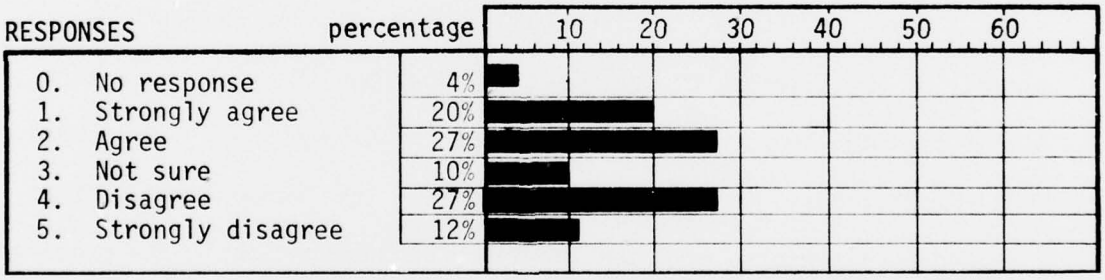


Fig. 38. Responses to instructor question 25--skill pay

In the majority of their written comments, the instructors opposed the issue of skill pay, even though their responses to instructor question 25 expressed a more positive position.

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[1]Additional pay in the military can come in several forms, i.e., the Army awards proficiency pay (pro pay) to eligible soldiers serving in a shortage specialty, for superior performance, or for special duty assignments. The instructor specialty (MOS) is not a shortage specialty, so it is doubtful that additional pay would be provided under that program. Superior performance pay was suspended in January 1975, and special duty pay currently includes only career counselors, recruiters, and drill sergeants. U.S., Department of the Army, Enlisted Personnel Management System, AR 600-200 (Washington, D.C.: Government Printing Office, 16 December 1974), pp. 6-1 to 6-13; and "News Briefs," Soldiers, January 1975, p. 3.

Some instructors expressed concern about the creation of an inequitable system or the establishment of an elite group. Others indicated that perhaps the single skill does not warrant extra pay. These sentiments seemed to capture the feeling of the instructors. They reasoned that good instructors tend to be motivated by a desire to present quality instruction and to gain enjoyment from working with this new technology. Finally, they seemed to recognize implicitly that the faculty members need to grow professionally and to receive appropriate advances in rank through conventional means.

The Instructor's New Role

There is little question that military instructors will remain central to the learning process in the 1980s, but they will need more diversified knowledge and skills than most faculty members now possess. With computer based training, it is suggested that several specialties are needed to maximize efficient delivery of instruction.[1] The previously mentioned Carnegie study proposed that it will be necessary to carry out the teaching tasks of the future by use of the team concept comprised of the following members:

> Teacher--best understands what needs to be taught
> Instructional Technologist--specialist in the learning process (educational psychologist)
> Information Specialist--one who guides the others to information essential for the preparation of instructional materials[2]

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[1] An early Army study in this area indicated that three skills will be required for CAI lesson development--programmer, illustrator, and subject matter specialist. U.S., Department of the Army, U.S. Continental Army Command, Task Group Report (1972), p. VIII-3.

[2] Carnegie Commission, Fourth Revolution, pp. 71-72.

The team concept is now needed to utilize computer technology. In the past, one faculty member did the teaching, but computer based training suggests the possible need for additional skills. With this concern in mind, the instructors in the field were asked to reflect their experience or offer their opinion about the possibility of the instructor's new role with CAI. Their responses are seen in figure 39.

INSTRUCTOR QUESTION 21. With computerized training systems, how will instructors adapt to carry out their duties?

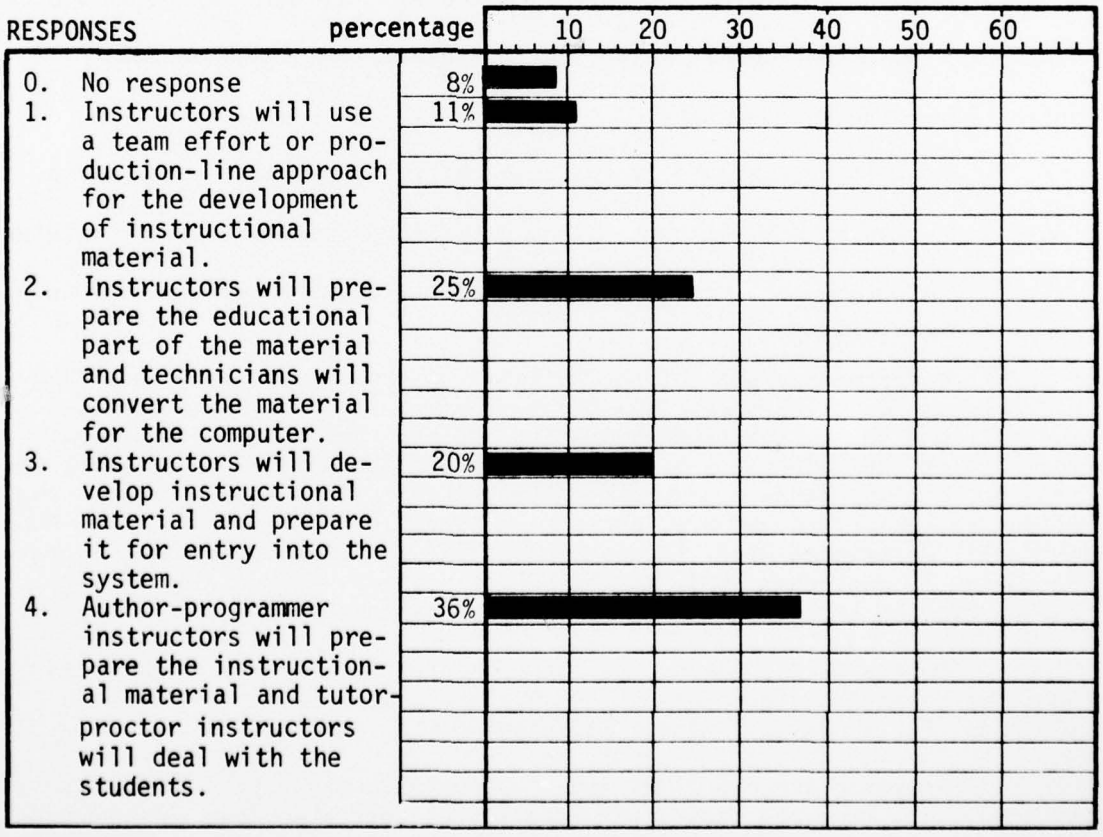


Fig. 39. Responses to instructor question 21--instructor duties

Most responses from the instructors indicate that they visualize (or use) the team concept. Thirty-six percent of the responses reflect that the team would include two elements: the author-programmer instructors to prepare the material, and the tutor-proctor instructors to deal with the students. The second most popular response of the instructors (25 percent) was the concept of a team of instructors for material preparation and technicians for converting the material to the computer media. Such a production-by-function approach was used by the developers of courseware for the TICCIT system now being used at the Northern Virginia Community College and Phoenix College.[1] The Navy's school system includes a two-man team of subject matter specialists (instructors) and an experienced programmer.[2]

The written comments of the instructors expressed their concern that separation of the instructor from material preparation is inconsistent with good military instructional procedures.[3] The respondents indicated

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[1]Under sponsorship of the National Science Foundation, the MITRE and Brigham Young University CAI Group prepared the courseware for these two colleges using this production-line system. Dr. Victor Bunderson, formerly of the University of Texas, conceived the modular development of lessons to allow teams of experts to prepare materials on a much more cost-effective basis than had previously been possible. Interview with E. Ned Burns II, Department Staff (Economic Analysis), MITRE Corporation, McLean, Virginia, 19 September 1973; and MITRE Corporation, An Overview of the TACCIT Program (McLean, Va.: MITRE Corp., January 1974).

[2]Morris G. Middleton, Clarence J. Papetti, and Gene S. Micheli, Computer Managed Instruction in Navy Training, TAEG Report no. 14 (Orlando, Fla.: Naval Training Equipment Center, March 1974), p. 40.

[3]Response choices 1, 2, and 4 of instructor question 21 (see above, p. 169) imply that the instructor is somewhat separated from the preparation of instructional material. The instructor respondents expressed in their comments that such separation causes the instructor to be less effective with the students.

that they would prefer to see the instructor prepare his own material, enter it into the computer, "get the bugs out of it,"[1] and then interact with the students when the material gives them a problem. This approach, which is like the third choice selected (20 percent), has been used by the Naval Academy for more than four years and has proved to be most satisfactory.

These research data suggest that the role of the faculty working with computer based training will include designing the instructional material, programming, tutoring, proctoring, and counseling. The design function is not new to the faculty; however, the logic demanded by the computer will foster the development of systematically organized and straightforward presentation of training materials.

Author-programming languages are being developed since a flexible, easy-to-use language is required if instructors are to be encouraged to put their material on-line. Even though fifty or more languages are now available, the field needs a simple, standardized CAI language to facilitate the preparation of interesting lessons with a minimum of training of instructors.[2] Tutoring, proctoring, and counceling are already being performed by the faculty. It is predicted that the instructor's role in the 1980s will be expanded to include instructional programming.

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[1]The expression is one used in the computer field. It refers to removing errors in programming logic and procedure from the program.

[2]Boeing Computer Services recently completed an eighteen-month study of the state of the art in CAI. The study identified more than fifty different CAI systems or languages presently in use or under development. Kent S. Renshaw, The State of the Art in Computer Assisted Instruction (Seattle, Wash.: Boeing Computer Services, January 1972), p. 9. Also see below, p. 177, n. 3.

The Instructor's Time

Saving an instructor's time may be a premature expectation of computer based instruction. The conversion to new computer based material requires a considerable investment of time for authoring the programs. Typically, the military instructor is called upon to make the conversion of his material, in addition to other duties.[1] Once conversion to CAI has been accomplished, however, instructor requirements can be reduced. For example, the installation of the Fort Devens Morse Code CAI training system caused a reduction in instructor spaces by 33 percent. Of even greater significance is the fact that the system allows the instructors to spend most of their time in a counseling role, rather than in correcting code copy.[2]

Because the computer cannot reach the reluctant learner, the instructor's role becomes one of motivator, evaluator, and tutor. Incentives and rewards for student accomplishment--learning achievement and learning at a faster pace--are provided by the instructor.

In recognition of the conflicting opinions about whether computer based training will save instructors' time and reduce personnel, the instructors were asked (instructor question 23) to give their estimate of the activities that will occupy most of their time in future computer based training systems. Their responses are seen in figure 40. The top-ranking choices of the instructors--preparing lesson material

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[1] See below, p. 175, n. 2.

[2] William R. Tracey, "Computer Assisted Morse Code Training," a paper presented at the Second Symposium on Cost Effective Learning through the Application of Computer Technology, Washington, D.C., 21-22 February 1973.

(26 percent) and counseling students (20 percent)--are consistent with the pattern of activity previously discussed.[1] The third-ranking response--covering material not covered by the computer (18 percent)--may reflect the need for the instructor in the tutorial role.

INSTRUCTOR QUESTION 23. What is your estimate of the two activities that will occupy most of the time of instructors in any future computer based instructional system?

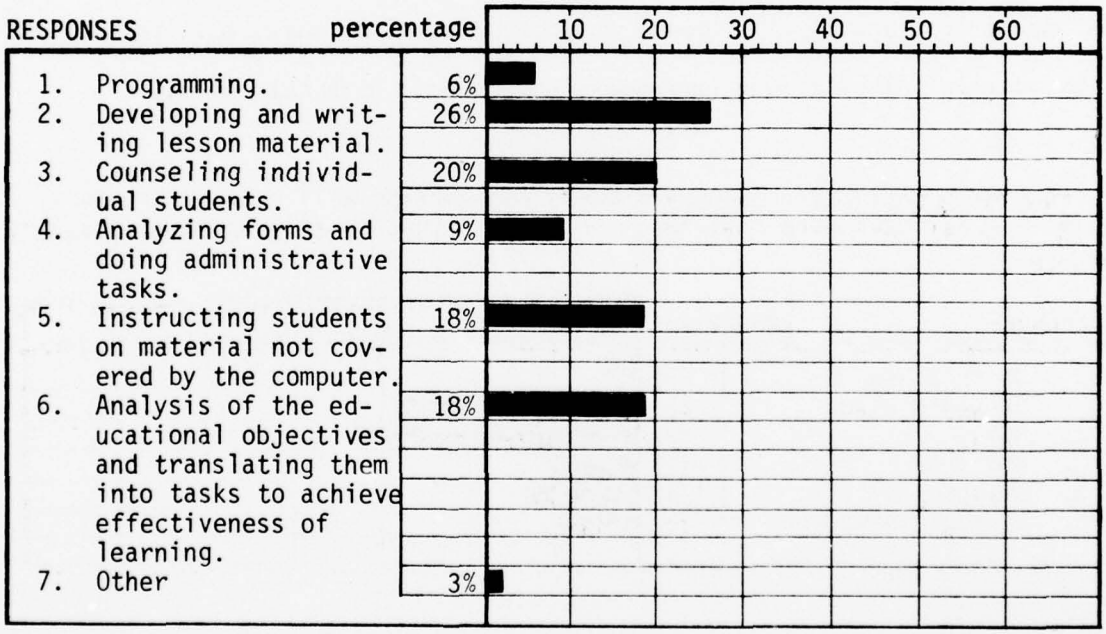


Fig. 40. Responses to instructor question 23--instructor's time

The written comments of the instructors once again put the quantified data into perspective. After conversion to computers has been accomplished, the instructor is seen as spending most of his time

[1] See above, p. 172.

with the students, assisting the slow learner when the program is not understood, challenging the high achiever, and supplementing the material with small group discussions and interaction. The written comments included the caution that machines do break down. Instructors must remain conversant with the material so they can teach and examine the students during instances of equipment failure.

Continuing in this vein of questioning, instructor question 27 asked whether instructors would expect to spend more time with the students as a result of computer support. Figure 41 shows that the instructors voiced strong agreement (62 percent) with this concept.

INSTRUCTOR QUESTION 27. Computer based instruction will free instructors to do a great deal more individual work with students than was ever possible before.

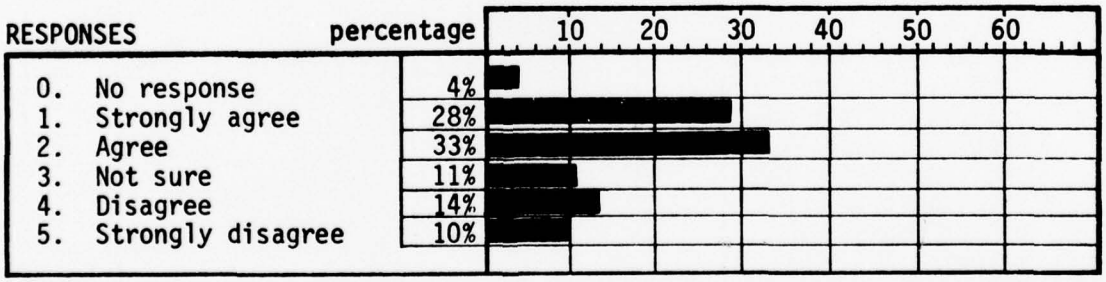


Fig. 41. Responses to instructor question 27--freedom to work with students

Viewing the responses by service shows the Marine Corps and the Air Force expressed even greater agreement than the average response--76 percent and 66 percent, respectively. The written comments evidenced instructors' concern that approval to convert to CAI would automatically

be followed by a reduction in the number of assigned instructors.[1] The respondents wrote that instructors would be hard-pressed to prepare material and deal with students on a personal basis with fewer assigned instructors. This fear may be realistic if instructor reductions are carried to excess. At several schools where CAI is operational, the number of instructor spaces has been reduced without any noticeable degradation of student contact.[2]

This section has focused on the personnel implications from the faculty member's perspective by dealing with such issues as attitude, instructor skills that are required, and the saving of instructors' time. The emphasis will now shift to an analysis of the manpower considerations at the school level.

Manpower Implications for the Faculty

To carry out the training mission, both military and civilian manpower are needed to conduct instruction, operate and maintain equipment, and administer and manage the training establishment. The Army uses

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[1]This has been the case in Navy and Marine Corps programs. To obtain Department of the Navy approval for expenditure of funds for new training systems, the school must show cost-effectiveness. In the past, one of the areas of saving has been instructor spaces. Therefore, these two services have experienced conversion to CAI and CMI and have reduced the number of instructors. See above, p. 149, n. 2.

[2]At Fort Devens, the Morse Code training courseware was developed and put on-line by the contractor. Thus, the instructor spaces could be reduced while the student still gained in instructor contact because of the diagnostic power of the system. At the Marine Corps Communications-Electronics School at Twentynine Palms, much of the conversion had to be accomplished by the instructors at night and on weekends to avoid degradation of student contact time. Interviews with William R. Tracey, Deputy Commandant for Training, U.S. Army Security Agency School, Fort Devens, Massachusetts, 17 June 1974; and Lt. Col. Mason, Marine Corps Communications-Electronics School, 4 June 1974.

104,200 people to train about 400,000 soldiers annually.[1] More than $2 billion are required to fund this training establishment on an annual basis.[2]

A decade ago, Secretary of Defense Robert S. McNamara challenged the services to make training more cost-effective by exploring the potential of a relatively new field called instructional technology.[3] The services have been using computers increasingly in training during this period of time to offset the high costs of traditional training and its low productivity. To keep the costs of training within reason, the productivity of training can be raised by the introduction of computers. The remainder of this chapter focuses on service school manpower issues that are attendant to the introduction of computer based instruction into the Army training situation.

Reduced Instructor Requirements

In chapter 5, it was reported that the staff felt that a reduced instructor requirement was the positive attribute offsetting the cost of computerized training systems.[4] Indeed, both the Marine Corps' and the Navy's computer based systems approved in the past few years have offered

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[1]U.S., Department of Defense, Military Manpower Training Report for 1975, pp. VII-3 and IX-2.

[2]The Army requested $2.8 billion to fund individual training for fiscal year 1975. Ibid., p. X-3.

[3]U.S., Department of Defense, Office of the Secretary, "Innovation in Defense Training and Education," a memorandum for the Service Secretaries, Washington, D.C., 29 June 1965.

[4]See above, pp. 140-44.

a saving of instructor manpower spaces as one of the major cost-effectiveness reasons for adoption.[1] Similarly, the comments of the instructor respondents suggested that the time-saving features of CAI would be realized after the conversion of the initial lesson material had been carried out.[2] The data shown in table 18 provide examples of how much time is required to prepare an hour of instructional material for computer assisted instruction. The wide variance from 35 to 218 man-hours signals an early warning of the problems of setting standards.[3] Conversion figures normally reflect the number of hours required for a team of programmers, artists, education specialists, and instructors to convert the material. The determination of conversion time is complicated by the complexity of the instructional design. For example, to convert an existing programmed text to tutorial CAI is not nearly as time-consuming as preparing a new simulation.[4]

The evidence of these studies and survey opinions suggests that instructor manpower will be saved through the use of computer based

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[1] See above, p. 175.

[2] See above, pp. 172-74.

[3] In Renshaw's study State of the Art in Computer Assisted Instruction (see above, p. 171, n. 2), high school teachers were given a user's manual, which introduced them to the coaching-prompting approach to lesson preparation, but no other instructions on how to prepare CAI lessons or how to use the system. They preplanned their lessons and then entered, edited, and tested them. After the lessons were prepared, selected students were invited to take them to test their validity. The students all scored well, and no errors were found in the lesson structure. The total effort involved in developing these lessons ranged from sixteen to twenty-four man-hours per hour of instructional material. Roger H. Simonsen and Kent S. Renshaw, "CAI--Boon or Boondoggle?" Datamation, March 1974, p. 98.

[4] Interview with Lt. Col. W. Darryl Hansen, Simulations and Computer Directorate, ICAF, Washington, D.C., 29 April 1974.

TABLE 18

SUMMARY DATA ON THE NUMBER OF HOURS REQUIRED TO PREPARE ONE HOUR OF MATERIAL FOR COMPUTERIZED TRAINING

Military Service	Type of Material Prepared	Man-hours Required to Prepare an Hour of Course Material
USMC	Communications-Electronics Material[a]	35
USAF	Precision Measuring Equipment Course[b]	80
USAF	Vehicle Repairman Course[c]	160
USA	Signal School Material:[d]*	
	Optimistic estimate	88
	Most likely requirement	150
	Pessimistic estimate	218

SOURCES: (a) William G. Kemple, R. J. Modell, and F. J. Blaisdell, "Production Level CAI in the U.S. Marine Corps," a paper presented at the Sixth Naval Training Equipment Center and Industry Conference, Orlando, Florida, 13-15 November 1973.

(b) F. C. Frick and D. Karp, Use of the Lincoln Training System for Task Simulation in the Support of Performance Laboratory Instruction (Lexington, Mass.: MIT's Lincoln Laboratory, 8 June 1973), p. 9.

(c) U.S., Department of the Air Force, "CAI Management Plan for Implementation of PLATO IV in the Special Purpose Vehicle Repairman Course," a letter from TWSTC to TTOE, Chanute AFB, Illinois, 5 August 1974.

(d) U.S., Department of the Army, U.S. Continental Army Command, Task Group Report on Computer Assisted Instruction (Fort Monmouth, N.J.: U.S. Army Signal Center and School, April 1972), p. Z-E-20.

*NOTE: A range of man-hours was developed on the basis of the experience of converting the course material for the communications-electronics course to reflect the most (pessimistic) and least (optimistic) times times required to prepare an hour of course material.

training once the conversion to computerized training has been completed. It is premature to stipulate the amount of saving, however, until more empirical data can be accumulated on the manpower required for the conversion process.[1] Although it is not possible at this time to predict the extent of manpower saving, it is appropriate to address an associated problem of the substitution of capital equipment for manpower.[2]

Substituting Capital for Labor

Since the industrial revolution, it has been demonstrated that the substitution of capital equipment for manpower usually increases output and efficiency. Many educators have suggested the need for revolutionary changes in teaching technology as a practical alternative to increasing the productivity of a labor intensive profession.[3] The degree to which instructor manpower spaces can be reduced by the introduction of computer technology is difficult to estimate.

As a means of exploring this issue, the instructors were asked in the present survey if the substitution of capital (computers) for labor (instructors) should reduce instructor manpower spaces in the future. Figure 42 contains a summary of the instructor responses. Forty-three

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[1] It was concluded in a recent study that the coaching-prompting (non-programming) approach to lesson preparation, along with other techniques used in the latest author languages, offers the potential of reducing lesson development costs by up to 90 percent and the overall cost of CAI by 50 percent. Kent S. Renshaw, Computing Technology: Research Report on Computer Assisted Instruction (Seattle, Wash.: Boeing Computer Services, January 1972).

[2] A procedure for estimating instructor time saving is suggested as a topic for further study. See below, p. 255.

[3] Lawrence P. Grayson, "Costs, Benefits, Effectiveness: Challenge to Educational Technology," Science, 17 March 1972, p. 1216.

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percent of the instructors disagreed with the proposition that instructor manpower spaces could be reduced; 34 percent felt that computers could be effectively substituted to save spaces.

INSTRUCTOR QUESTION 18. It is said that using computers in the instructional process substitutes some "capital" for "labor." Therefore, instructor spaces should be reduced by the future application of computers to training.

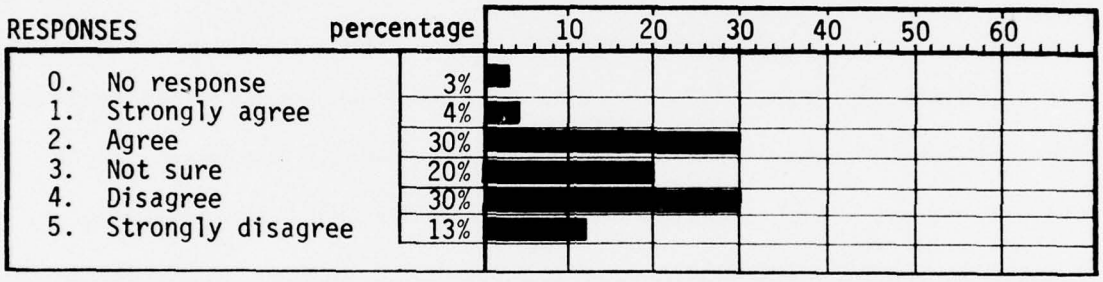


Fig. 42. Responses to instructor question 18--substituting capital for labor

Even though 20 percent of the instructors were not sure of the effect of substituting capital for labor, it is of interest that there were more written comments on this question than on any other in the survey. Almost 25 percent of the instructor respondents provided written comments. The most frequently expressed idea was that there would probably be no change in instructor manpower spaces but, rather, that instructor time would be utilized to attend to the numerous duties that instructors have had to ignore in the past or to perform new duties necessitated by computer use. The most popular category of comments centered in the thought that there would be a slight reduction of manpower spaces but that instructors could not be eliminated altogether. Other instructor comments indicated agreement with the proposition that a

reduction of instructor manpower spaces was possible but that no overall manpower saving would occur because such spaces would be required to staff the specialists of either the computer system or the materials preparation team. The data shown in table 19 represent the instructor manpower saving reported in several military studies. Yet, it is observed that these studies do not equate to a conclusive position. A true manpower reduction of 33 percent for Army Morse Code training was possible because the courseware was prepared by contract, and, since that time, minimal maintenance has been required.[1] The Marine Corps made a commitment to save a specific number of instructor manpower spaces if the system were installed. Therefore, upon installation, the manpower spaces were removed from the manning documents.[2] The Air Force data presented should be regarded as tentative. The Lincoln terminal tests were limited by the use of a small sample, and the instructor manpower saving was determined by extrapolation.[3]

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[1]See above, p. 175, n. 2.

[2]U.S., Department of the Navy, U.S. Marine Corps, "Computer Aided Instruction."

[3]Field tests of the Lincoln terminal system involved 165 students. The course material for the test was developed by a team of regular classroom instructors. Data from these tests indicate that students required little assistance from the classroom instructors. This system would make it possible to increase present class size by a factor of two or three and still permit the instructor to devote a major portion of his time to students with special problems or low aptitudes. The tests employed two terminals for every three students, with two shifts of operation. Four instructors worked with forty-eight students for a student-instructor ratio of 12 to 1. F. C. Frick, "The Lincoln Terminal System," a paper presented at the Second Symposium on Cost Effective Learning through the Application of Computer Technology, Washington, D.C., 21-22 February 1973.

TABLE 19

EXAMPLES OF INSTRUCTOR MANPOWER SAVING BY USING COMPUTER ASSISTED INSTRUCTION

Training Situation	Reduction in Instructor-Student Ratio
Army Morse Code Training[a]	33%
Marine Communications-Electronics Training[b]	67
Air Force Lincoln Terminal Tests[c]	78

SOURCES: (a) William R. Tracey, "Computer Assisted Morse Code Training," a paper presented at the Second Symposium on Cost Effectiveness Learning through the Application of Computer Technology, Washington, D.C., 21-22 February 1973.

(b) William G. Kemple, R. J. Modell, and F. J. Blaisdell, "Production Level CAI in the Marine Corps," a paper presented at the Sixth Naval Equipment Center and Industry Conference, Orlando, Florida, 13-15 November 1973.

(c) F. C. Frick, "The Lincoln Terminal System," Journal of Education Technology Systems, Fall 1973, pp. 87-99.

Prospects for Increased Productivity

Thus far in this chapter, two references have been made to increasing productivity.[1] It is timely now to move from an examination of instructor manpower saving to the prospects of increased productivity. To examine this subject in the light of current experience, the instructors were asked in the survey whether the augmentation of instructors by computers offers the most likely alternative to increased productivity in the future. Their responses to this question are summarized in figure 43. Sixty-seven percent of the instructors agreed that productivity

[1] See above, pp. 176-79.

should increase with instructional computer use, while 17 percent of the instructors disagreed.

INSTRUCTOR QUESTION 14. How do you react to this statement? Military training today is still very labor intensive. The augmentation of instructors by machines, such as computers, offers the most likely alternative to increase productivity in training for the future.

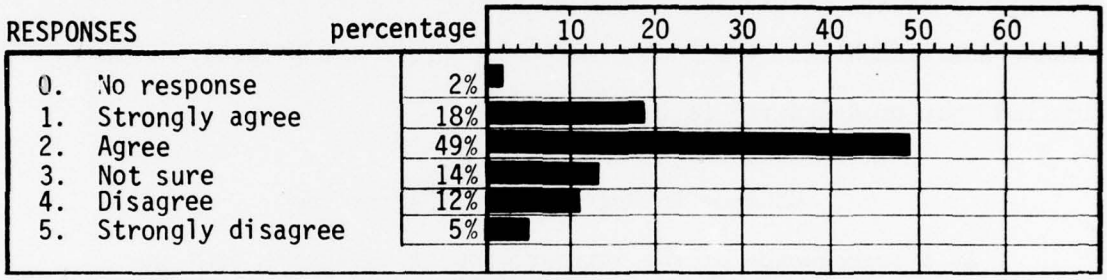


Fig. 43. Responses to instructor question 14--increased productivity

The written comments of the instructors fell into three categories. First, the opponents wrote the most comments. The following representative comment conveys the sentiment of this category: "Machines, especially computers, should not and cannot replace the human instructor." The second category provided constructive comments about the replacement of the instructor by technicians who would write, illustrate, and program the lesson material. They felt that fewer instructors would be required, but the manpower saving would be offset by these added specialists, resulting in a status quo. The third category of comments emphasized the point that the initial manpower requirements, mostly instructors, would be high as the instructional material was being converted, and a reduction of instructor manpower spaces would probably follow.[1]

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[1]See above, p. 175, n. 2.

Specific references to increased productivity were lacking from the instructors' comments to this question. A reduction of instructor manpower spaces does not automatically equate to increased productivity. What may be inferred from the 67 percent favorable response to this question is that a combination of factors apply to account for the improved output. If students learn 33 percent faster with equal or higher achievement and instructor manpower spaces are reduced, it is implied that productivity is increased.

Changes in Organizational Structure

As a consequence of the introduction of computers into the instructional process, certain organizational changes other than manpower saving may occur which affect personnel and manpower management.

In the course of the personal interviews with school staff personnel, the following open-ended question was asked concerning the organizational changes the staff envisioned for faculty members in the 1980s:

12. What organizational change do you envision for faculty members in the 1980s?
    a. Contrast to your current organizational structure?
    b. Tasks you expect faculty will do that are different from today?
    c. Changes in supervision and control?

Although not stated, the implication was that the changes that the respondents would be discussing were those resulting from the application of instructional technology to their training system. It is appropriate to point out, before discussing the staff's responses to this three-part question, that a near majority of the staff expressed the opinion that there would be little or no change resulting from use of

the computer based system. If change were to occur, it would be voluntary and not subject to description at this time.

Changes to current organization

The first part of the interview question asked the staff for an assessment of changes they envision in their current organizational structure. The most frequently recorded comment was that the schools would have a "flatter" organization with a larger span of control, since less day-to-day control is needed in the more systematized training environment. They reasoned that certain mid-level supervisors and managers would be eliminated completely from the structure. This assessment paralleled the opinion of writers almost two decades ago, when the impact of the computer was first being felt in the business world. In 1958, for example, Harold J. Leavitt and Thomas L. Whisler made a number of predictions about the effect of information technology on business firms in the 1980s.[1] One of their prognostications suggested a radical reorganization of middle-management levels which would flatten the organizational structure. Their writings in the 1970s continued to support their earlier belief.[2]

Other comments by the staff indicated that the management function will probably be more centralized because fewer people will be required to carry out the instructional process. Recentralization was another of the predictions made by Leavitt and Whisler in 1958.[3] More recently, in

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[1]Harold J. Leavitt and Thomas L. Whisler, "Management in the 1980s," Harvard Business Review, November-December 1958, pp. 41-48.

[2]Thomas L. Whisler, Information Technology and Organizational Change (Belmont, Calif.: Wadsworth Publishing Co., 1970), p. 37.

[3]Leavitt and Whisler, "Management in the 1980s, p. 41.

1970, Whisler summarized subsequent studies by reporting that, in many cases, a shrinkage of the organization is clearly visible and the number of employees will decline.[1]

Different tasks for the faculty

The second part of this question called upon staff personnel to list the different tasks that they expect faculty members to be performing in the 1980s. The responses related to the earlier discussion of the instructor's new role as a consequence of conversion to computer based systems.[2] The new tasks essential to the development of instructional materials for the computer will require that the instructor be augmented by or work with media and computer specialists. The various staff specialists required to produce CAI lesson modules include: subject matter experts, lesson designers, learning specialists, instructional programmers, coders, system programmers, and computer operators. In small-scale operations, one person may be called upon to perform two or more of these tasks.[3] Given this background, the staff personnel were asked to identify the new tasks that faculty would be required to perform with the advent of computer based training. The most frequently mentioned tasks, in order of frequency, are: (1) programming and courseware development, (2) managing and administering, (3) monitoring and testing, and (4) counseling.[4]

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[1] Whisler, Information Technology, p. 37.

[2] See above, pp. 168-71.

[3] See above, p. 170.

[4] In response to staff question 12b, the staff respondents indicated instructor tasks of the 1980s with the following distribution: programming and courseware development (41 percent), managing and administering (18 percent), monitoring and testing (18 percent), counseling (13 percent) and tutoring (9 percent).

The staff expressed concern that a typical instructor would not normally possess these talents, and staff specialists would have to be available to assist the faculty member. This concept acknowledges the need for the team approach currently used in the development of lesson materials for CAI systems.

Changes in supervision and control

With a change in the tenor of the interview question toward supervision and control, the staff personnel were in general agreement that less control would be required. They reasoned that the computer would be managing and presenting much of the routine instruction. Thus, the instructor would take care of all the exceptions in the instructional situation and generally provide the human touch to unprogrammable details of the learning process. The activities of the faculty would become less structured, since this situation would obviate the necessity for close instructor control. Thus, the instructor would no longer be looking to his supervisor for direction, but would be responding to the needs of the students. The staff personnel also reasoned that students would require less supervision and control because they would be active learners, often directed by a computer program. This reasoning suggests the participative learning concept long envisioned by many educators.[1]

Conversion to computer based training can only be accomplished by skilled manpower. Qualified specialist personnel who possess the types of skills mentioned above will have to be identified, selected, relocated,

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[1]Robert G. Scanlan, "Educational Technology for the Improvement of Current Educational Practices," a paper presented at the Second Symposium on Cost Effective Learning through the Application of Computer Technology, Washington, D.C., 21-22 February 1973.

and sustained to make this type of training effective. The suggestion of the skills required points to the problem that the faculty of the 1980s will not possess all of these additional skills and therefore will require staff specialist support. The realization that new skills will be needed in staffing these new computer based systems highlights the substantive problem of manpower structures and management practices, which is examined in the next section.

Manpower Structures and Management Practices

In an effort to identify the changing face of military instruction with the advent of computer based training, staff survey question 15 asked the staff personnel to identify any changes in manpower structure and management practices stemming from computer based training systems. Figure 44 shows the staff responses to the five component areas of the question, which are discussed separately in this section of the chapter. These five areas are: (1) specialty codes, (2) grade requirements, (3) performance standards, (4) total authorizations, and (5) staffing criteria. (Because of the interdependency of performance standards and staffing criteria, these two areas will be discussed together.)

In addition to the five areas of the staff survey question on manpower structures and management practices, the instructor survey contained three questions pertaining to one of these areas: specialty codes. The data gathered from both surveys are analyzed below.

STAFF QUESTION 15. Do you see computerized training systems changing manpower structure or management practices in the future?

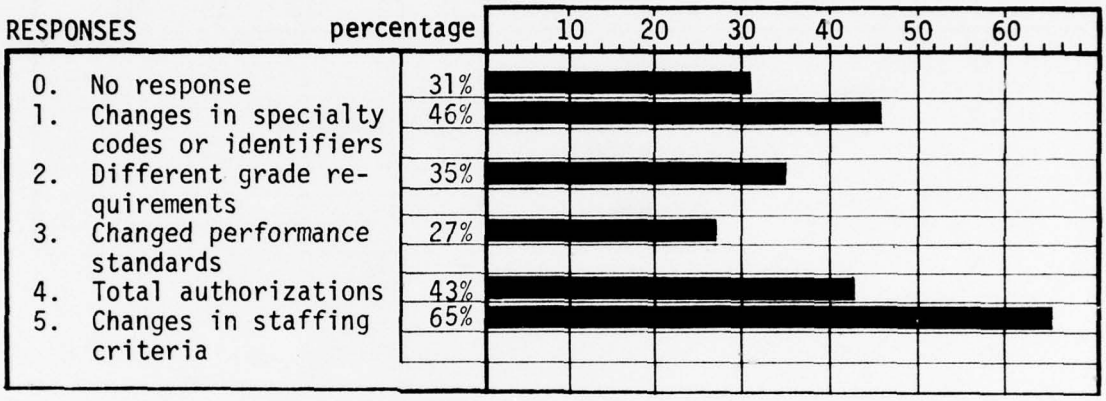


Fig. 44. Responses to staff question 15--manpower structures

NOTE: The staff respondents were allowed to select more than one answer for this question. Therefore, the figure shows the frequency percentage for each response in relation to the ninety-two respondents interviewed.

Specialty codes

The first area of staff question 15 concerned the need to change specialty codes or skill identifiers. Forty-six percent of the staff expressed the opinion that there is a genuine need for change in the skill identifier system for proper management of the skills needed in computer based training.

The instructors were asked, in question 24 of the instructor survey, whether instructors who are trained or experienced in computer based systems should be given unique skill identifiers. Their responses are summarized in figure 45. Strong agreement with the staff is expressed in their response, as 72 percent indicated a need to identify CAI instructors with a special skill identifier.

INSTRUCTOR QUESTION 24. Instructors trained in using computer based training methods should be given a unique MOS, AFSC, NEC, or sub-specialty code or similar skill identifier.

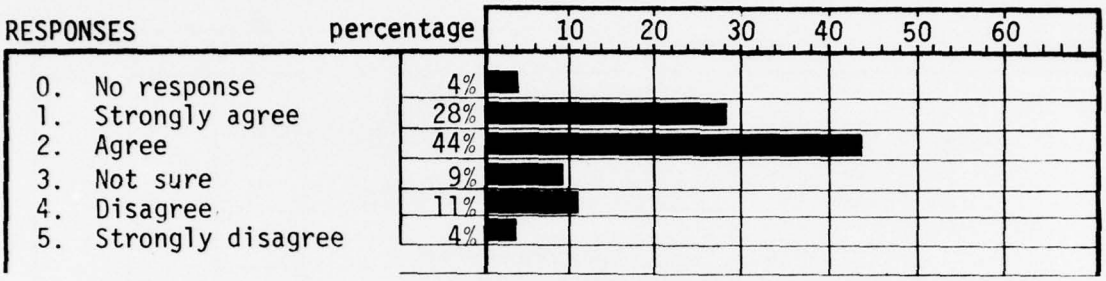


Fig. 45. Responses to instructor question 24--specialty codes

Twenty percent of the instructor respondents were opposed to a special skill identifier and provided a predominant number of the written comments. Thirty-two percent of the opposing comments offered the opinion that all instructors should be able to handle computer instruction. Further, they expressed the view that no elite class of instructors should be created, given extra pay, or treated to special considerations.[1]

Conversely, of the instructor respondents who favored a special code, they rationalized in their written comments that the CAI instructor would have sufficient expertise, through schooling or experience, to justify a special code of identity. They explained that such a code is not a benefit, as is extra pay, but rather, a personnel management tool that would assist in the better utilization of a scarce human resource. Linking the survey suggestions to the reality of present personnel practices, it is noted that the Army currently has a system of identifying officer and enlisted

[1]Opposition to the possible formation of an elite group was previously discussed under the section concerning extra pay. See above, p. 166.

instructors, but there is no provision for a distinction on the basis of the media of delivery.[1] Yet, the precedent for a special qualification may be found in the way computer and aviation technicians are identified. For both of these specialties, identifiers have been added to the basic MOS for the purpose of more effective management of trained personnel resources.

To carry the skill identification process one step further, both the staff and the instructors were asked about the methods by which computer based training instructors might be selected for assignment in the future. During the interviews, the staff officials were asked staff question 13, which is discussed below. The instructor questionnaire contained a companion question (instructor question 22), which is discussed subsequently.[2]

As can be seen in figure 46, the predominant response of the staff (30 percent) to the question on identification and selection of computer based training instructors was that special skill identifiers should be used. The second most frequent response (25 percent) was one concerning a system of selection that would give priority of assignment by virtue of the fact that the person had some computer background. The tabulated

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[1]An officer is awarded an "8" prefix to his primary MOS after spending six months as a full-time instructor in military subjects at an Army Service School or other organized training facility. U.S., Department of the Army, Manual of Commissioned Officers Military Occupational Specialties, AR 611-101 (Washington, D.C.: Government Printing Office, 30 September 1974), p. 8-18. Enlisted men are awarded a similar type of special qualification identifier--an "H" prefix to their MOS. U.S., Department of the Army, Enlisted Career Management Fields and Military Occupational Specialties, AR 611-201 (Washington, D.C.: Government Printing Office, 3 February 1975), p. 3-1.

[2]See below, pp. 193-94.

STAFF QUESTION 13. On what basis do you think instructors will be identified and selected for computer based instructional assignments in the future?

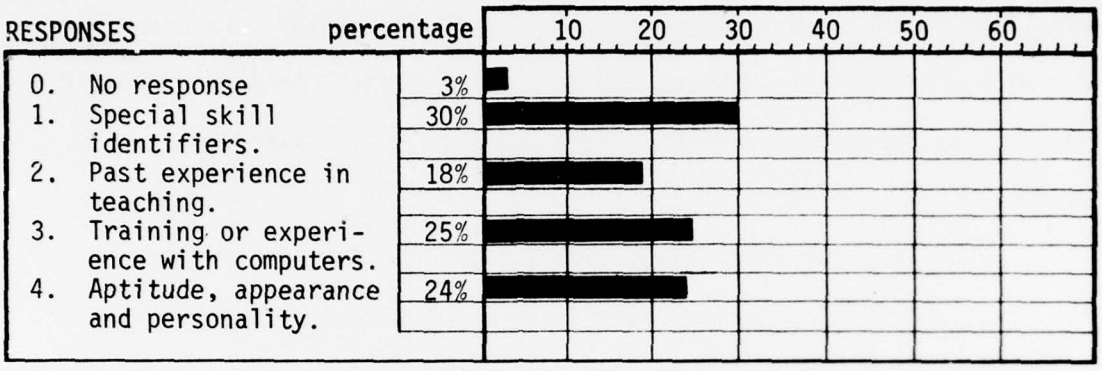


Fig. 46. Responses to staff question 13--instructional assignments

responses were overshadowed by ten articulate comments provided by staff respondents during the interviews as they argued that instructors should be selected first on the basis that they want to teach. The staff interviewees recognized that a strictly volunteer corps may not satisfy all the qualifications for a military instructor, but they felt that volunteers should be given first priority, assuming that they would meet the basic criteria of education, personality, and aptitude. The staff indicated that the key to valid selection of CAI instructors, volunteer or not, would be the amount of teaching experience. It was the judgment of the staff respondents that an experienced instructor can be taught how to handle the computer based system but that the converse is less likely to apply. Further, they suggested that it may not be necessary to select future instructors on the basis of platform presence, because public speaking may no longer be a basic criterion. The staff officials concluded that the emphasis for selection should be on the

instructor's ability to communicate with the students and to fill any voids created by the computerized training system.

Responding to a similar question, the instructors in the survey showed agreement with the staff respondents relative to the two ranking methods of selecting CAI instructors. They switched the sequence, however, to place prior teaching experience as their first choice (27 percent) and possession of a special skill second (22 percent), as seen in figure 47.

INSTRUCTOR QUESTION 22. Select one or more ways in which you think instructors, working with computer based training systems, will be selected for assignment in the 1980s?

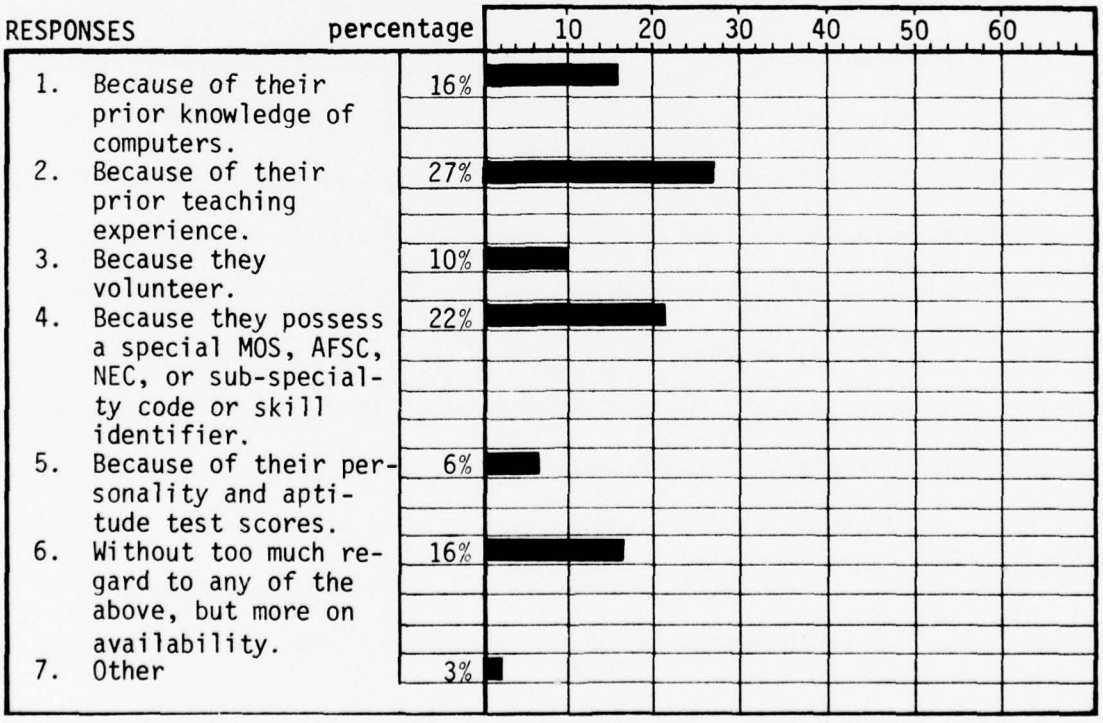


Fig. 47. Responses to instructor question 22--selecting instructors

Sixteen percent of the instructors selected the response "without too much regard to any of the above, but more on availability" as their third choice. Are they voicing acceptance of the traditional personnel system? An analysis of the responses by service, status, and computer experience did not shed any light on this response.[1] A reason for this response was suggested in the written comments of the instructors. The most frequent remark registered the instructors' concern that the assignment system might break down and, for expediency, assignments would be based on availability. The remainder of their written comments appeared to mirror the response pattern of figure 47 (page 193).

Grade requirements

Fifty percent of those responding to the question of grade requirements during the personal interviews with the staff expressed the opinion that computerized training would change grade requirements for the faculty.[2] Their comments suggested that most of the staff believed that the grade structure would be subject to "grade creep." They reasoned that the CAI instructor, whose skills were discussed earlier, would possess many more talents than would today's typical instructor.[3] If the instructor needs to know about computers, instructional design, programming, and educational psychology, the staff respondents cautioned that the military services will have to give more recognition (promotions with attendant pay raises) to these highly skilled people or they will be lost to competing jobs in the

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[1] See instructor question 22, appendix F, p. 308 below.

[2] See fig. 45, p. 190 above.

[3] See above, pp. 168-71.

civilian community. The staff respondents who commented that the grade structure would be lowered were outnumbered by a ratio of two to one. These staff members made their case on the assumption that the reduction in grade would take place because there would be fewer instructors, and this would in turn reduce the overall number of higher ranking supervisors. Also, since the instructor would be working more independently with the students, there would be a further reduction in intermediate supervisors for the instructors.

Performance standards and staffing criteria

As mentioned earlier, the performance standards and staffing questions are discussed together because of their interrelationship.[1] The Army defines performance standards as "the established number of man-hours for the accomplishment of a unit of work."[2] Staffing criteria refer to the use of a properly selected multiplier, ascertained from experience, to determine the number and kind of personnel required in the operation of an organization.[3]

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[1] See above, p. 188.

[2] U.S., Department of the Army, Manpower Management, AR 750-4 (Washington, D.C.: Government Printing Office, 30 January 1974), p. 1-1.

[3] These criteria are used in the development of manpower staffing guides for various types of units or activities. The Defense Integrated Management Engineering System (DIMES) is the principal work measurement system that is used in the overall objectives of DoD resource management. DIMES work measurement and productivity data have been developed and prescribed in Department of the Army standard time data publications. A typical example of this type of manpower document is U.S., Department of the Army, Staffing Guide for U.S. Army Service Schools, DA Pam 570-558 (Washington, D.C.: Government Printing Office, 1 July 1973). It provides guidance for the number and kinds of personnel required to operate a

Against this definitional background, the discussion now returns to the personal staff interviews concerning staff question 13.[1] The staff respondents commented that the performance standard, or "yardstick," referred to as platform man-hours would no longer be the appropriate criterion for the staffing of schools using computers to assist in instructional delivery. It was expressed by these respondents that a different performance standard would have to be developed for this new environment to reflect the new role of the CAI instructor. This standard would have to be changed from platform man-hours to a standard that would encompass material preparation, the conversion of material to computer language, student assistance, and student counseling. A number of the staff personnel officials of Army schools who were interviewed were familiar with the Navy's system of cost-effectiveness analysis, and were critical of it.[2] Yet, it is essential to the Navy school's acquisition of a computer system for training. These respondents referred to the fact that the Navy studies showed a reduction of instructors based on the quickened pace of training and an increased instructor-student ratio. Their criticism centered around the idea that the analysis required by the Navy had caused hasty reductions

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school and contains both performance standards (referred to as "yardsticks") and staffing information to aid in the development of manning documents.

The unit of work, or yardstick, of interest for delivering instruction is platform man-hours, which is the number of instructor man-hours required for actual presentation of periods of courses of instruction. To determine the number of instructors needed, the platform man-hours are factored on the basis of class size and type of instruction. The type of instruction dictates the instructor-student ratio, which is as low as 1:2 for helicopter training and as high as 1:12 for case studies and seminars. Ibid., pp. C-1, C-6.

[1]See above, pp. 191-93.

[2]See above, p. 149, n. 2.

in faculty spaces instead of the development of new performance standards based on empirical evidence.

Sixty-five percent of the staff interviewees indicated that the staffing criteria would change as a result of conversion to computerized training systems, and the direction of change would be toward larger instructor-student ratios.[1] The amount of change in these ratios, however, is unclear. Telephonic interviews with the key manpower officials of each military service who have staff cognizance of this issue confirmed the suggestion that the ratios are expected to change, but revealed that only in one of the services has the degree of change been proposed.[2]

Lesson preparation is another quantification of work that was developed earlier in this chapter and may suggest a new performance standard for CAI instructors.[3] The lesson preparation time for CAI material is the most elusive of all the factors contributing to CAI costs.[4]

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[1] See fig. 44, p. 189 above.

[2] The Navy, in studying the ratio of instructors to students, has suggested that their ratio can be changed from the conventional instruction ratio of 1:7.5 to 1:8 for computer based training. U.S., Department of the Navy, Chief of Naval Technical Training, "Submission of Documentation Update for Computer Managed Instruction (CMI) and Automated Data System (ADS)," a letter from the Chief of Naval Technical Training to the Chief of Naval Education and Training, Millington, Tennessee, 1 April 1974. The other services indicated that they were not far enough along in data collection to be able to propose a new ratio that would be applicable to computer supported training. Telephonic interviews with: Coulliard, Department of the Navy, 11 June 1975; Klesert, Department of the Air Force, 12 June 1975; and Lt. Col. Gus Bickerstaff, Manpower Division, DCS Resource Management, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia, 29 May 1975.

[3] See above, pp. 176-79.

[4] The elusiveness of this expense is usually attributed to one or more of the following excuses: (1) lessons are acquired elsewhere at no cost, (2) they are given wide distribution so that costs are shared by a large number of users, and (3) they are equivalent to textbooks in both

Nonetheless, it can be anticipated that in the future it will be possible to develop ratios (hours of instructor-programmer time to prepare one hour of CAI instruction) for the various CAI lesson preparation languages. At that point, such ratios would be made a part of the performance standard documents and used in the establishment of proper staffing criteria for manning the service institutions using computer based training.[1]

Total authorizations

The final topic of manpower changes to be discussed is total authorizations. Forty-three percent of the staff indicated that total authorizations would change as a result of the introduction of computer based instruction. As to the direction of the changes, there was a two-to-one vote for lower versus higher authorizations. The staff respondents suggested that the reduction in authorizations would occur as a result of the saving in instructor manpower spaces even though some specialists would have to be added for material preparation and computer operation.[2] The staff officials who disagreed, suggesting that the authorizations would increase, indicated that it could take fewer instructors to conduct computer based training but the increase in staff specialists would more than offset any saving realized through faculty manpower reduction.

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cost and ease of distrubution. Simonsen and Renshaw, "CAI--Boon or Boondoggle?" p. 93.

[1]The question of performance standards and staffing is recommended for further study. See below, p. 254-55.

[2]The question of instructor space saving was discussed in some detail earlier. See above, pp. 176-84.

Viewpoint--the Faculty

Of the three groups of people who influence instructional decisions, the faculty members are the most active agents for precipitating change in the training system. Military faculty members who use computer assistance in teaching are expected to have more time for dealing with the students' needs. The computer will free them from repeatedly preparing for and delivering routine classes. There may be instances, however, when the instructors manifest no desire to be freed in this manner. More often, resistance by faculty members stems from a lack of understanding of the benefits of computer supported training systems. In the survey of instructors in the military training systems, positive attitudes were evident, along with a high degree of confident expectation for the concept of computer based training for the 1980s.

In linking attitudes to motivation, the instructor survey respondents expressed interest in special pay for instructors who are involved in computer supported teaching. The new tasks that these instructors will be called upon to carry out tend to support this interest. Instructors can be expected to do programming, designing of lessons, conceiving of strategies, and counseling.

The time to handle this new role will accrue from the time gained as the computer based system relieves the instructors of routine training operations. This time saving feature of computer based systems suggests manpower changes, the most apparent of which is a reduction in the overall number of instructors required as the computer becomes a capital equipment substitute for faculty manpower. The substitution effect can lead to changes in the organizational structure of the school by

making the organization flatter and by requiring less supervision and control.

The research data suggest that action should be taken to identify CAI instructors through a specialty identifier, which would facilitate manpower management. The staff interviews indicate that there is a real need to develop new performance standards for computerized training system faculty members in order that proper staffing criteria can be established for the schools. In the absence of validated manpower performance standards, managers will be making decisions on a subjective basis, which could lead to imbalance in the personnel structure of the schools.

CHAPTER 7

MANPOWER AND PERSONNEL ISSUES AT TOP MANAGEMENT LEVELS IN VIEW OF THE INTEGRATION OF COMPUTER TECHNOLOGY INTO THE TRAINING ESTABLISHMENT

Introduction

In the previous chapter, the notion was introduced that the power of change in educational systems is divided among students, faculty, and administrators.[1] The students and the faculty were discussed in chapters 5 and 6, respectively, and attention now turns to the administrators. By way of description, administrators are identified in this report as the chief officials who direct and influence the activities of the service schools. The staffs that exercise this control range from the training command (the U.S. Army Training and Doctrine Command) to the departments (Department of the Army and Department of Defense). Congress also has an influence over the military education and training system through budget appropriations, and therefore it will be included in the discussion of the interest of top management levels in the integration of computer technology into the training establishment.

In this chapter, the following subsidiary research question is addressed: What manpower and personnel issues will emerge at top management levels as computer technology is integrated into the training establishment? To respond to this question, the chapter is divided into

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[1] See above, p. 157.

three parts, one for each of the following three major organizational entities: (1) the U.S. Training and Doctrine Command, (2) the Department of the Army, and (3) the Department of Defense and the Congress. Under these organizational sections, the applicable survey data are discussed as well as the manpower implications and other personnel issues developed during the course of the research.

The U.S. Army Training and Doctrine Command

The U.S. Army Training and Doctrine Command (TRADOC) was established in 1973 as the Army's primary agency concerned with what is taught (doctrine) and how it is taught (training).[1] This role is carried out by: (1) bringing to the Army new technology and concepts of doing the Army's job of fighting wars, (2) supervising the instructional programs at the training centers and schools for doing that job, and (3) providing training support Army-wide to aid the soldier in learning his job.[2] This scope of responsibility makes clear the keystone position of TRADOC relative to the integration of computer technology into Army training.[3] Yet, the question arises: Do layers of headquarters improve the training process, or would the instruction be facilitated by less control? This concern led to a staff survey question that addressed centralization of control.

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[1] See above, p. 98.

[2] See above, pp. 98-102 for a discussion of TRADOC initiatives to improve Army training.

[3] U.S., Department of the Army, U.S. Army Training and Doctrine Command, Deputy Chief of Staff for Training, "TRADOC Training," a briefing. Fort Monroe, Va., 13 January 1975.

Centralization versus Decentralization of Training

One dialogue developed in the staff interviews concerned the trend toward centralization or decentralization as a result of more computer use in the instructional process. Staff officials were asked to discuss each level of control from the school to the training command, to the service department, and, finally, to the Department of Defense. As shown in figure 48, the respondents indicated that more centralization would be the trend at every level. In fact, for each staff official that mentioned decentralization, at least two others said that centralization would prevail at the various levels.[1] The staff officials reasoned that the presence of computers would bring course development to a central point at the school level, and individual training would then be managed from a single office. The centralization described for the training command related to the command's directing the development of common instructional materials for use at several schools. The staff respondents also expressed the opinion that the training commands would become more concerned with the curriculum of the schools, to the point of centrally developing many aspects of instructional programs as a means of efficiently attaining minimum essential learning objectives.

The military departments received the least number of votes for the levels where centralization would occur. Many of the staff officials explained this low response at the military department level as being

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[1] The nature of this question was such that the previously used method of data display is not too meaningful. The staff would indicate centralization or decentralization at the various levels. Figure 48 shows just the centralization responses. The decentralization responses are included in the summary of data for staff question 16, at appendix G, p. 329.

STAFF QUESTION 16. With more and more computers being used in the instructional process, do you see the trend toward centralization or toward decentralization of training?

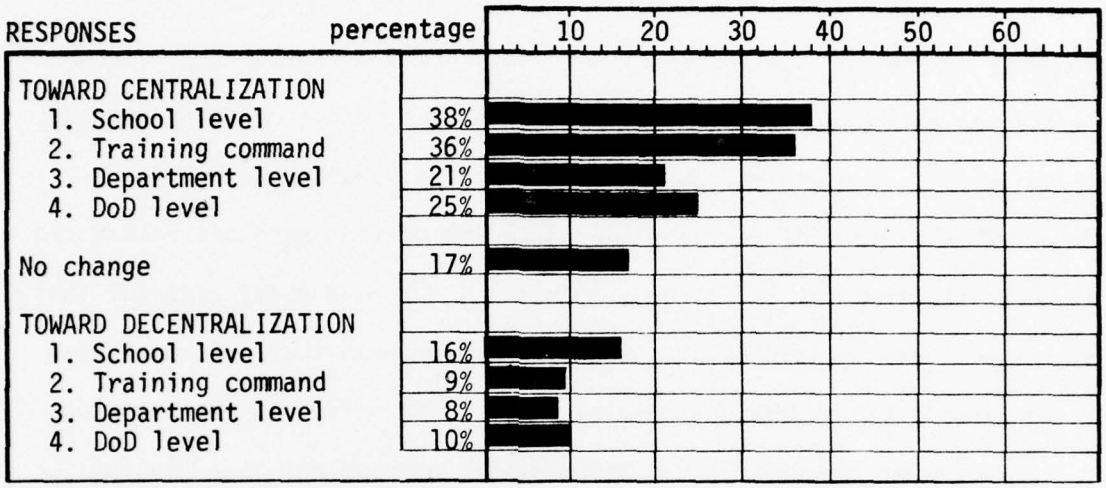


Fig. 48. Responses to staff question 16--centralization vs. decentralization

a result of the initiatives taken by DoD in the years since the Vietnam drawdown. Their comments indicated that the DoD concern for a successful all-volunteer force has brought forth greater top-level interest in the use of modern technology to gain efficiency in training.

Building on the ideas introduced earlier by Leavitt and Whisler, many writers have suggested that the presence of computers will allow a recentralization of activities.[1] These writers were speculating that information would be available to top management so that higher levels of management could control the operations. The concept of recentralization suggests the elimination of some lower-level management positions.[2]

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[1]See above, pp. 185-86.

[2]Whisler, Information Technology, p. 40.

As a matter of efficient use of talented personnel, they envision course development and computer operating personnel centralized at one school location, permitting the centralizing of highly skilled professionals. The staff officials suggested that the training command could take advantage of this concentration of talent within the schools of their command and direct the centralized development of common training materials.[1]

In mid-1971, the Army announced a policy of decentralizing the management of training and thus reversed managerial policies that had been in effect since at least 1942, when the Army Ground Forces (the forerunner of CONARC and TRADOC) was established to serve as the Army's training command.[2] This recent decentralization was aimed at unit training (battalion and smaller size units) to emphasize that the Army should train as it will fight--with a high degree of dispersion and decentralization characterizing the management of tactical commands in future battlefields.[3] The Army recognized that this training policy for units seemed to be about the only area of unit activity in which decentralization was taking place. Logistics are increasingly centralized through computers. Army pay and personnel management has become highly centralized through the use of computer based resource management systems. These observations on Army centralization tend to be congruent with the staff survey responses that point to a certain centralization of training at school and training command levels as more computers become integral to the training system.

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[1] An example of TRADOC directing the centralized development of training materials is seen in the Training Extension Course (TEC) program. Different Army schools were tasked to develop these materials for use throughout the Army. See above, pp. 100-101.

[2] U.S., Department of the Army, "Army Training Policy," message from General W. C. Westmoreland to major commands, Washington, D.C., 30 June 1971.

[3] Ibid.

Organizational Relationships

When the staff officials were interviewed concerning any changes they would suggest with regard to their current organizational relationships or structures (see staff question 17, below), a high level of satisfaction was generally expressed.[1]

> 17. The organizational relationships (chain of command) for training, education, and the development of instructional technology vary by service.
>
> a. Describe your service's structure.
>
> b. Would you suggest any changes?

Four major themes were evident from the personal interviews on this topic. The most frequently mentioned theme was the satisfaction the staff officials expressed in the fact that the Army, like the Navy and the Air Force, has a training command (TRADOC).[2] The Army respondents seemed to be anticipating a good relationship with a higher headquarters that has the singleminded purpose of managing Army training. These attitudes help to explain why the staff respondents acknowledged that more centralization would take place at the training command level, but they perceived it as the school's gain to have the next headquarters share in their training concern. Further, the respondents expressed the hope that the training command would assume a leadership role in emphasizing the use of

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[1] Staff question 17, seen above, was open-ended and generated narrative responses that were not subject to tabulation as were the other questions found in appendix G.

[2] The Navy's training command is called the Naval Education and Training Command at Pensacola, Florida, and the Air Force has an Air Training Command at Randolph Air Force Base, Texas. Interviews with Capt. B. L. Tanner, Director of Programs, Office of the Director of Naval Education and Training, Washington, D.C., 17 January 1974; and Hilton Goldman, Educational Adviser, U.S. Air Force Training Command, Randolph AFB, Texas, while attending the Conference on Instructional Technology for Government Trainers, Washington, D.C., 12 September 1973.

instructional technology at the school level. The staff was acknowledging the organizational level of the training command and its position of staying abreast of the training technology field through contacts with the other training commands and research activities.

The second major theme raised by the staff respondents concerned the establishment of educational technology directorates at each TRADOC school. Shortly after its establishment, TRADOC directed the creation of these directorates to serve as the focal points for the development and integration of modern instructional techniques into the schools' programs of instruction. The staff respondents were of the opinion that this organizational step did much to convey to the schools the TRADOC commitment to new technology and provided the organizational framework for linking TRADOC with the school staffs in such a manner as to create a channel for innovation.

The third and fourth themes developed through staff question 17 relate to the role of the Department of the Army staff in training and the Interservice Training Review Board. These two topics will be discussed later in this chapter under the sections on the Department of the Army and the Department of Defense.

TRADOC Looks to the 1980s

At this time, it is appropriate to consider a few aspects of TRADOC's training philosophy. In TRADOC, the staff officer charged with managing individual training for the Army is Major General Paul F. Gorman.[1] He is assisted in his role by an educational adviser, Dr. Joseph H. Kanner.

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[1]See above, p. 98.

Personal interviews and discussion periods with these two key officials provided insight into the direction of management thought for future Army training.

Kanner began one interview by noting that the Army's instructional mode is "circa 1880."[1] He observed that the Army's training system, like that of most institutions, is highly resistant to change, as evidenced by two examples. First, the success of correspondence courses demonstrates that learning can be accomplished through carefully designed printed material. Second, research has demonstrated that video, multimedia, programmed, and computer assisted instruction provide learning techniques that are equal, if not superior, to conventional instruction.[2] Yet, he observed, the Army is not exploiting self-paced, programmed texts or multimedia training. Appreciating that no system changes itself, Kanner suggested that TRADOC must direct the change from the top down through the schools. He stated that "if we want to make it work, we will have to ignore the staff and faculty's emotional rebuttals that are bound to follow demands for change and go ahead and direct the use of these new technologies."[3] Furthermore, he suggested the following to demonstrate his conviction toward the implementation of instructional technology in future Army training. TRADOC should adopt the following three-point policy:

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[1]Interview with Kanner, 21 June 1974.

[2]For a study that demonstrates this observation, see discussion on pp. 46-49 above.

[3]It is interesting to note the consistency of this centralization philosophy with the survey data on the subject. See above, pp. 203-4.

1. Identify, through an approved plan, those areas most susceptible to benefit by the conversion to instructional technology

2. Set guidelines for conversion by increments of 10 percent to 20 percent per annum for a period of several years[1]

3. Promote (control) the change to automation by reducing the manning document for instructors by 10 percent annually and advertising that the only exception to a "status quo" annual budget would be for a request for funds for the application of more instructional technology[2]

Gorman's espoused philosophy of training is manifested in action, the results of which are current and ongoing. For example, he views the present TEC (Training Extension Course)[3] system as programmed instruction on film with sound. The next phase of TEC could be computer driven, using the post computers and centrally developed instructional courseware.[4] Also, these local computers, used as an extension of the training command, could serve as the transmitter of the latest doctrine.[5] The Army experiences an enormous lag in disseminating current Army doctrine. The frequency of doctrine changes renders most training manuals obsolete before they are published. The lag averages seven years, with five years devoted

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[1]Such a procedure was used at the Naval Academy to overcome the faculty's inertia in incorporating computer assisted instruction into the academic program. The superintendent directed that each department use the computer in 10 percent of its instruction in the next academic year. This goal was raised to 20 percent for the following year. By 1974, more than 200 courses included some form of computer use. Interview with Albert E. Concord, Director of Academic Computing Center, U.S. Naval Academy, Annapolis, Maryland, 5 February 1974.

[2]Interview with Kanner, 21 June 1974.

[3]For a description of TEC, see above, p. 100.

[4]The use of post computers for individual training is a concept developed by Gorman and tested during the survey, as reported on p. 103 above.

[5]Interview with Gorman, 31 January 1974.

to developing and staffing the manual and two years consumed in publication, distribution, and incorporation of doctrine into the training system. Gorman believes that the computer, through a training network, could place training doctrine in a real-time mode. As the instruction is delivered over such a network, it could be constantly revised to reflect current doctrine.[1]

In the early 1970s, before the establishment of TRADOC, General W. C. Westmoreland, the Army Chief of Staff, directed the establishment of a board to consider ways of supporting unit commanders in conducting meaningful and exciting training. Westmoreland began the message that authorized this program as follows:

> The touchstone of military professionalism is dynamic training. No objective we have set for the modern Army can be attained unless its training is well managed, doctrinally sound, and personally stimulating or rewarding for the soldier.[2]

This board was set up to link the unit trainers with the sources of concepts and techniques for modern, productive training.[3]

Although the board's findings were directed toward the unit training situation, the major obstacle to achieving dynamic training was personnel turbulence.[4] The frequent reassignment of personnel has its

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[1]The idea of networks of instruction has been deferred as a subject for further research. See below, p. 254.

[2]U.S., Department of the Army, "Support for Dynamic Training."

[3]The board president was then Brig. Gen. Paul F. Gorman.

[4]Personnel turbulence refers to the reassignment of individuals prior to the completion of a normal (three-year) tour of duty. U.S., Department of the Army, Report of the Board of Dynamic Training, vol. 2: Final Report (Washington, D.C.: Government Printing Office, 17 December 1971), p. 3.

effect on the school system, the unit, and the soldier. The Army has stated in the past that an overall turbulence factor of 8 percent per month is the maximum level of personnel turbulence that combat units can sustain and still remain in a combat deployable training status.[1] Yet, a survey of United States units in 1971 revealed an average quarterly personnel loss of 37 percent. This rate of turbulence amounted to more than 100 percent turnover of personnel per annum, and a monthly rate in excess of 12 percent.[2] The training ramifications of this amount of turbulence is better visualized by relating this turnover to an Army division of troops. The degree of turbulence mentioned above means that 50,000 job changes would take place annually within the ranks of a 15,000-man unit. The major effect of turbulence on training is the unit's resistance to move the soldier again just to get him schooled. The solution to this problem was discussed earlier in Gorman's training construct, wherein he suggested that school-house training must be pushed out to the units rather than requiring the soldier to go back to school.[3]

The Department of the Army

The importance of a stable personnel situation was highlighted by Secretary of the Army Howard H. Callaway when he testified before a congressional committee that there were several major programs that must be continued and emphasized in order to develop the Army force in the

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[1]U.S., Department of the Army, "Strategic Readiness Forces," a message from Assistant Chief of Staff for Force Development to major commands, Washington, D.C., 6 June 1968.

[2]U.S., Department of the Army, Dynamic Training: Final Report, p. 78.

[3]See above, pp. 99-100.

most efficient way. "Among them are: train and use every soldier . . . reduce turbulence."[1] This subject has been a familiar theme in congressional testimony for the past several years as the Army has steadily reduced the number of permanent change of station (PCS) moves by stabilizing the tours of soldiers both in the United States and abroad. From fiscal years 1973 to 1976, the number of moves has been reduced by 15 percent.[2] This concern for personnel stability has been approached through several programs with reduction of PCS moves being the most visible. There are other programs to reduce personnel movement, however. One of these is One-Station Training (OST), to minimize turbulence during the initial stages of training of the new soldier.[3]

The Four-Month Training Restriction

Under the OST program, the initial orders send the soldier to one post for both basic and skill training. Thus, a mid-point move to another post is eliminated, as the soldier remains in the same training unit for up to four months. This program eases the new soldier's transition into the Army, saves training time, and reduces travel costs. The typical soldier receives Basic Combat Training (BCT) and Advanced Individual Training (AIT) as prerequisite to the award of a military occupational specialty (MOS). These two training programs have traditionally been of eight weeks duration each, as a means of assuring compliance with the law

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[1]U.S., Congress, House, Committee on Appropriations, Department of Defense Appropriations for Fiscal Year 1976, Hearings before a Subcommittee of the House Committee on Appropriations, 94th Cong., 1st sess., 1975, p. 182.

[2]Ibid., p. 193.

[3]See above, p. 108.

that directs "full and adequate military training . . . for a period of not less than four months . . . prior to any overseas assignment."[1] In early 1974, the Army reduced BCT by one week, to make it a seven-week program.[2] Many MOS programs (the AIT phase) are offered in the self-paced mode, which shortens periods of training. These programs typically speed up course completion time by 20 to 30 percent.[3] The computer-assisted courses offered at Fort Monmouth and Fort Devens have experienced similar reductions in training time.[4]

Since 1973, the Army has annually proposed legislation to amend the requirement of four months of training prior to overseas assignment. The Army argues that more personnel are completing training in less time as a result of using performance-oriented training, self-paced methods, better media and equipment (including the instructional technologies of video tapes and computer assisted training), and improved training facilities.[5] Presently, soldiers who complete their training in less than four months are given additional "make work" training before going overseas or they are eliminated from consideration for an initial overseas tour. It has been estimated by the General Accounting Office that 184,000

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[1] U.S. Code, Title 10--Armed Forces, vol. 2, ch. 39--Active Duty, sec. 671 (1970).

[2] U.S., Congress, Senate, Committee on Appropriations, Department of Defense Appropriations for Fiscal Year 1974, p. 74.

[3] Telephonic interview with Capt. John A. Crawford, Directorate of Instructional Technology, U.S. Army Field Artillery School, Fort Sill, Oklahoma, 9 December 1974.

[4] See table 13, p. 141 above.

[5] U.S., Department of the Army, "Legislative Proposal--Four Months Minimum Training Requirement," Summary Sheet, 20 June 1973.

man-days would be saved annually if the Army were allowed to reassign a soldier as soon as satisfactory completion of skill level training (MOS) was achieved.[1] At the very heart of more efficient training lies the concept that the soldier goes to the job sooner and is therefore a productive member of the team for a longer time. Stated another way, the saving of 184,000 man-days in a year through the relaxation of the four-month restriction means that the Army would need 500 fewer soldiers in the force structure for that year. Such efficiency is translatable into dollar saving for the Army and would release manpower for other national priorities.

The Role of DCSPER

The Army staff element that is responsible for the management of military personnel is the Deputy Chief of Staff for Personnel (DCSPER).[2] The DCSPER is the focal point for all the related manpower and personnel functions of the Army.[3] Yet, from a practical standpoint, most of its individual training activities have been decentralized to TRADOC.[4] One year after the 1973 reorganization, the Army staff shifted even more

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[1] Ibid.

[2] U.S., Department of the Army, Department of the Army Organization and Functions, AR 10-5 (Washington, D.C.: Government Printing Office, 28 January 1974), pp. 2-9.

[3] See above, p. 124, for a complete list of these functions.

[4] Prior to the 1973 reorganization of the Army, a major general was the Director of Individual Training for the DCSPER. With the establishment of TRADOC on 1 July 1973, staff responsibility for training was lowered by several staff levels, with a lieutenant colonel designated as the head of the training branch.

of its functions to the next lower level of command--TRADOC.[1] In the training area, this included supervision over the U.S. Army Picture and Television Programs, staffing guides for service schools, and the U.S. Army Audio-Visual Agency. These moves toward decentralization appear to be beneficial from a management standpoint. Yet, many of the staff respondents, in answer to staff question 17 (page 206), indicated that some of these staff responsibilities were shifted to the detriment of important programs. They cited, for example, the Computerized Training System (CTS) program--Project ABACUS.[2] The value of CTS was shown through the work of Fort Monmouth's Signal School and CONARC (forerunner of TRADOC). But, to gain funding and support, the program required the approval of the Secretary of the Army, through the Army staff. Because of the shifts of functions from DCSPER, the Army's Chief of Research and Development had sponsored the project.[3] The staffing anomaly was underlined by a memorandum that concluded: "A more appropriate staff proponent would be DCSPER, the staff agency with functional responsibility."[4] Although centralization often reduces the training lag in policy execution, it can also dilute the

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[1]U.S., Congress, House, Committee on Appropriations, Department of Defense Appropriations for Fiscal Year 1975, Hearings before a Subcommittee of the House Committee on Appropriations, 93d Cong., 2d sess., 1974, pp. 685-86.

[2]See above, pp. 75-77.

[3]Interview with Maj. Gen. Charles D. Daniel, Jr., Director of Army Research, Office of the Chief of Research and Development, Department of the Army, Washington, D.C., 22 January 1974.

[4]U.S., Department of the Army, "Approval for Project ABACUS," a memorandum for the Assistant Secretary of the Army (Financial Management), Washington, D.C., 27 September 1972.

championing effect often needed for new programs. It would seem, then, that DA staff support and involvement would do much to bolster the movement toward the use of computer based training systems in the Army.

The Regulation of Computer Systems

Another area of staff procedure addressed by personal interviews with staff officials centered on regulations covering the acquisition of computers, which includes computers used in education and training. The burgeoning acquisition of computers a decade ago caused the Army to exercise control over this growth through a regulatory procedure.[1] Although the scope of the regulation specifically applies to Army Management Information Systems, it includes the full range of automatic data processing equipment bought or leased by the Army.[2] Because of the procedures outlined in this regulation (AR 18-1), several years of study, staffing, and testing transpire before a computer can be acquired. It was the feeling of the staff respondents that computers used in support of training and education should be exempt from such control. Small, single-site systems, like the one recently approved for the Army Engineers School, are not subject to the time-consuming procedures of AR 18-1, but provide an example of the acquisition of a system within a matter of months.[3] Yet, TRADOC, as it plans and develops instructional technology for all the

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[1]U.S., Department of the Army, Army Management Information Systems, Policies, and Objectives, AR 18-1 (Washington, D.C.: Government Printing Office, 10 November 1971).

[2]Ibid., p. 1-1.

[3]Interview with Col. J. J. Lennon, Director of Management Information Systems, U.S. Army Training and Doctrine Command, For Monroe, Virginia, 21 June 1974.

service schools and training centers, is slowed in its progress toward efficient training systems by the safeguards in regulations like AR 18-1. The staff respondents seemed to suggest that the Army staff should give serious consideration to the tradeoff of control over computer systems management and the desirability of preserving the momentum that is developing at TRADOC toward modernization of Army training through the application of instructional technology.

The Department of Defense and the Congress

The final section of this chapter contains a discussion of the initiatives of the DoD and congressional interest in manpower and personnel issues as computer technology is integrated into the training system. Prior to the 1970s, the military services operated autonomous training establishments. Yet, since that time, the DoD and the Congress have taken action that not only places training and education under close scrutiny, but also requires cooperation among the military training establishments for the purpose of saving manpower and dollars.

Centralization in DoD

The question of centralization was introduced earlier in this chapter with a notation that the actions of DoD in this area would be described later.[1] Of interest in this section is the observation by the staff respondents that DoD is tending toward more centralization in training than are the respective military departments (14 percent versus 12 percent).[2] In late 1971, the Congress legislated more DoD involvement

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[1] See above, p. 207.

[2] See fig. 48, p. 204 above.

in service manpower requirements as they asked the Secretary of Defense to report annually the justification and explanation for all force (manpower) requirements.[1] In 1973, the Congress, for the first time, directed the Office of the Secretary of Defense to examine the total training effort of all the services as a system.[2] This legislation has caused the DoD to prepare an annual Military Manpower Training Report, which describes how manpower requirements relate to the demand placed on the military training establishment to supply trained manpower in the services. This congressionally mandated initiative has had a number of effects. The most valuable one is that the services have an opportunity to meet together to review and compare their separate training efforts. This process led the services to conclude that there are a number of training areas that could be combined, consolidated, or modified to meet the common need. The major instrument for cooperation and course consolidation in training is the Interservice Training Review Organization. Headed by the training command chiefs of each service and operating through committees, the organization acts to identify ways of saving millions of dollars each year.[3] One section of the fiscal year 1976 edition of the

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[1] U.S., Congress, House, An Act to Amend the Military Selective Service Act of 1967, Pub. L. 92-129, 92d Cong., 1st sess., 1971, H.R. 6531, p. 16. This act precipitated the annual publication of the Manpower Requirements Report that recommends active duty military and civilian end strength levels for each component of the armed forces for the next fiscal year. The reports justify and explain the manpower requirements in relationship to the national security policies of the United States that are in effect at the time of submission.

[2] U.S. Code, Title 10--Armed Forces, vol. 1, ch. 4--Department of Defense, sec. 138(d), supp. 3 (1974).

[3] A saving of about $.5 million was identified in fiscal year 1973; annual recurring savings for fiscal year 1974 were estimated at $1.3 million. U.S., Department of Defense, Military Manpower Training Report for FY 1976 (Washington, D.C.: Government Printing Office, March 1975), p. XI-6.

training report is devoted to "Progress in Use of Training Technology," wherein current efforts describe how computer technology is used to improve the quality of training and, in some cases, "provides instruction that cannot be provided in any other way."[1]

During the staff interviews, a question was posed with regard to additional efforts of the Office of the Secretary of Defense to improve productivity in the military training establishment. The question and summarized responses are seen in figure 49. The staff officials' responses reflect, in some measure, the achievements of the Interservice Training Review Organization (ITRO). The staff personnel responses gave the impression of consistent agreement that DoD would be taking action in the four areas listed in the interview guide: (1) reduced duplication, (2) increased productivity, (3) exchange of instructional materials, and (4) consolidation of training activities. In the first year (FY 1974) of ITRO activity, a review of 1,171 courses resulted in the consolidation of 37 low-density courses into 18 interservice courses.[2] During the second year, the ITRO focused on the training required in 14 occupational subgroups for consolidation to reduce training duplication. Each service accepted the responsibility for training all of the students in a particular field. As of 1975, there is no longer any training duplication in the 14 areas.[3] The closing of these courses at three of the four service

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[1] Ibid., p. XI-10.

[2] U.S., Department of Defense, Military Manpower Training Report for FY 1975, p. XIII-7.

[3] All the Marines will get their field artillery training by the Army at Fort Sill, Oklahoma; 12 Air Force and Marine construction equipment

STAFF QUESTION 18. Because of the shrinking Defense dollar and the need for improved productivity in the military training establishment, do you think that the Office of the Secretary of Defense will be exerting additional efforts to:

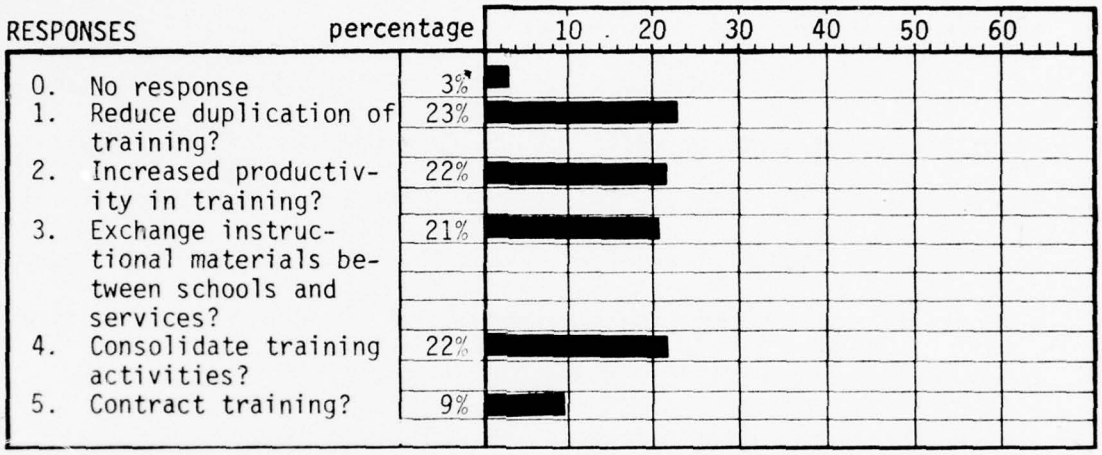


Fig. 49. Responses to staff question 18--defense efforts for productivity

training bases has increased productivity and lowered training costs.

In regard to the third area of action listed in the interview guide, the actual exchange of instructional material has not yet been formalized into a program. However, all of the services are involved in passing materials and publications between service schools and centers on an informal basis.

In many of the staff interviews, the remark was expressed that if the services do not seek efficiency in training, then certainly DoD and Congress will get involved.

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courses have been transferred to the Army at Fort Leonard Wood, Missouri; 15 Air Force and Navy data processing courses have been transferred to the Marine Base at Quantico, Virginia; and so on. Ibid., pp. XIII-XIV.

Congressional Influence

A realistic observation seems to be that most of the congressional influence felt by the military services is buffered by DoD, as the Secretary of Defense provides common or uniform guidelines in response to the initiatives of Congress. The primary tool of control used by Congress is the budget, as exercised through the annual authorizations and appropriations hearings.[1]

An examination of congressional--both Senate and House--hearings on appropriations for fiscal years 1974 through 1976 revealed only a modicum of testimony concerning instructional technology. This observation is consistent with the opinion of the staff officials about congressional action. When the staff interviewees were asked if they felt that Congress would force the military to adopt more computerized training through budget constraints or the passage of directive legislation, 75 percent said "No." Twenty percent took the opposite view and said they thought Congress would force the military to make more use of computers in the training process.[2] Figure 50 summarizes these responses.

Several concepts of congressional involvement were developed during the personal interviews. The predominant view expressed by the staff officials was that Congress would influence the services through budget reductions. The services would then be forced to use computer technology

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[1]Edward A. Kolodziej, The Uncommon Defense and Congress (Columbus: Ohio State University Press, 1966), pp. 433-45; Richard F. Fenno, The Power of the Purse: Appropriations Politics (Boston: Little, Brown & Co., 1966), p. xiii; and Ralph Sanders, The Politics of Defense Analysis (New York: Dunellen Publishing Co., 1973), pp. 170-92.

[2]Five percent declined to state an opinion one way or the other.

in training as the most viable system on the horizon to reduce training costs significantly.

STAFF QUESTION 19. Do you feel that Congress will force the military to adopt more computerized training through budget constraints or the passage of directive legislation?

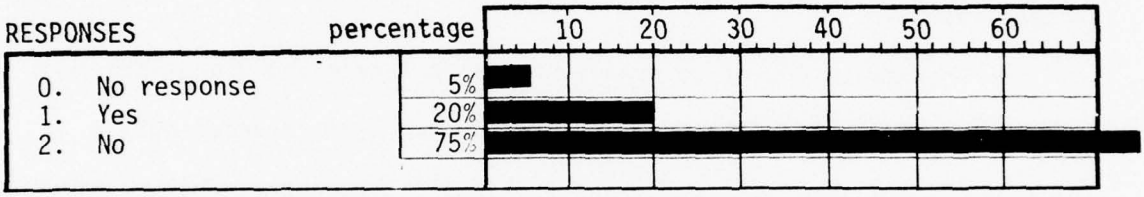


Fig. 50. Responses to staff question 19--Congress and computerized training

Another concept described by the staff respondents implied that Congress normally suggests more modern techniques for a year or two and then directs the services to take action in subsequent years if the services fail to heed its suggestions. An exception to this procedure was revealed in a Pentagon interview. In one of those rare instances when the legislature exceeds the DoD budget request categories, Congress actually appropriated more funds for and directed the purchase of flight (computer driven) simulators to accelerate the implementation of this proven cost-effective system.[1] In reviewing the actions of Congress in the area of training technology, it is apparent that the members of Congress are

[1] In the fiscal year 1975 appropriation deliberations, $200 million was added to the budget for the specific purpose of buying additional flight simulators. As a rule of thumb, the Army helicopter flight simulator yields two hours of flight experience for each hour in the simulator. Interview with Ray Pitman, Director of Training Programs, Assistant Secretary of Defense (Manpower and Reserve Affairs), Department of Defense, Washington, D.C., 11 January 1974.

receptive to the use of automation, if it promotes cost-effectiveness. Yet, in most instances, the military services will have to take the initiative and convince Congress of the value of computers in military training.

A Perspective from Top Management Levels

The top managers of training--TRADOC, DA, DoD, and Congress--manifest a scalar influence over the use of computers for the instructional process. TRADOC is the most active innovator as it seeks to change the face of Army training by introducing more modern instructional technology into the service schools and devising ways of pushing the knowledge and experience of the schools out to the units. At the opposite end of the scale, Congress seems to avoid directing the services in the use of specific training technologies, preferring to let them exercise their own initiative.

Although a certain amount of centralization of training management is seen at all levels, DA has shifted much of its training responsibilities down to TRADOC, just as Congress is looking to DoD and urging it to do more managing in this field. In comparison to TRADOC and DoD, the survey data suggested that DA and its staff agency responsible for training, DCSPER, are not as actively involved in influencing new training technology.

CHAPTER 8

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER STUDY

Summary

In the past four years, manpower costs have become the largest single item in the defense budget. Consequently, military managers are confronted with the challenges of optimizing the effective use of personnel. The long-run goal is to gain optimum defense-dollar effectiveness through a highly skilled defense team with efficient and effective training as a key element. Training should be efficient in terms of cost, and effective from the standpoint of accomplishing quality training in the shortest practical period of time without overtraining or undertraining. The military managers have responded to these challenges by introducing self-paced individualized instruction using a variety of computer based instructional media. This modern instructional technology has placed heavy emphasis on the use of the computer to change the role of instructors from that of a traditional lecturer to that of problem-solving training managers. For more than a decade, computer applications have been developed to support the training process. These applications have grown, and today each military service is heavily committed to some form of computer based training for the future.

Computer applications have been categorized into three major modes:

1. Computer assisted instruction (CAI) involving man-machine interaction in which a multimedia teaching function is accomplished by a computer system

2. Computer managed instruction (CMI), wherein the computer is utilized to grade tests, prescribe lessons to be studied, designate media to be used, schedule equipment and media to be used, and monitor the individual progress of students

3. A computerized training system (CTS), which is the most sophisticated of the three categories and is a totally self-paced training system integrating both the CAI and the CMI functions to become a surrogate instructor, classroom manager, and teaching medium

The effect of these computer systems on future military training has been researched by tracing the progress of the military services and by conducting a three-part survey to determine the emerging role of computers in military training since the early 1960s. The subjective and objective data from the three-part survey were used to anticipate the implications of changing to computer based training systems in the 1980s. On-site data were gathered on computer use in the military services by personal observations and interviews at twenty-four major installations where computer based instruction is being conducted. An average of four selected staff officials at each of these twenty-four installations were the respondents for the first part of the survey. Structured personal interviews were conducted with a sample of ninety-two staff members. This part of the survey is referred to throughout this report as the staff survey. At these installations, a twelve-page questionnaire was administered to all the instructors who were actively involved in the process of using computers to instruct students. This sample included

409 faculty members, and represented a high percentage of the entire population of military instructors using computers in the instructional process. These two parts of the survey provided opinions and reflected attitudes relating to the future implications of computer based instructional systems. The third part of the survey combined statistical data from thirty-seven military installations concerning the amount of computer use from 1963 to 1974. This part was a follow-on survey to the staff and instructor surveys and is referred to as such in this report. Ths results of the three surveys provided the expert opinion and quantitative data that show the use of computers in military training and education and give the evidence of the manpower implications that can be expected for the future.

Alternative Training Strategies for the 1980s

In chapter 2, the many optional training strategies open to the military services are described. The basic question is not so much one of content, or "what" to teach, but rather, one of the teaching strategy, the "how" to teach it.

The spectrum of training strategies is wide. On one end lies conventional instruction, with each group of students entering as a class and progressing through the course. Course presentations feature the lecture, from a standard lesson plan, for eight periods each day. Students who perform unsatisfactorily are recycled through the entire course. On the other end of the spectrum is computerized instruction, in which students pace themselves through a course of instruction using a computer terminal to interface with the lesson material. The daily

schedule is unstructured, because the computer is available to the student around the clock. As individual students attain the required achievement levels, they are advanced and ultimately graduated without regard to fixed course dates or scheduled graduations.

Alternative strategies may be viewed as combining different methods of instruction with various training aids. Traditionally, the military services have used the lecture as a basic teaching method, which is inefficient because of its limited use of the human senses and its lack of student feedback. To overcome these limitations, new technologies have been introduced to appeal more to human senses and to acquire active feedback from students. In addition, such technologies tend to make teaching less laborious. Programmed instruction was widely used in the 1950s, and television reached its zenith in the early 1960s. Then came the computer, with a host of acronyms from CAI to CTS, all of which translate to computers used in support of learning.

The very nature of instructional strategies presents complications that bar precise analysis. These complications stem from the fact that most strategies, in practice, are individually designed in response to a particular training situation. The benefits of using a particular strategy vary considerably and, further, no common element properly quantifies all the potential benefits. Also, comparable cost data on instructional strategies are almost nonexistent. In the absence of these data, many decisions on strategies are made subjectively.

Progress toward Instructional Use of Computers in the Military Services

In chapter 3, the opinions of the respondents in the staff survey suggest the time frames of the development of the various computer applications to military training and education. The major applications of instructional computer use are perceived in three phases. The first phase is the developmental and prototype phase. The respondents indicate that the military services are expected to complete the developmental and prototype phase in the 1970s. The second phase is one in which the application of computers is generally introduced. Staff respondents expect these applications to be completed by 1983. Finally, the third phase is one in which the respondents of the staff survey indicate that the application is generally in use. They expect this phase to be accomplished in the decade of the 1890s.

Further indication of the progress in computer use in support of military instruction is gained by an understanding of the sophisticated level of applications now evident in each of the military services. For example, the major Air Force CAI-CMI effort is the Advanced Instructional System, which features self-paced individualized instruction driven by a maxi-computer that delivers multimedia instruction. This multimillion-dollar system is being installed at Lowry Air Force Base, Colorado, to test the feasibility of delivering a high volume of technical training to a large number of students by using a significant amount of computer supported and managed instruction.

Another example of the sophisticated level of application is the largest computer based training system in use by the Navy, the CMI system at Memphis Naval Air Station. It manages 500 aviation students in several different courses at one time. This time-sharing system is being expanded to electronics training at two other naval bases. The Marine Corps has a good operational example of CAI at its Communications-Electronics School in California. The effectiveness of this system has been proven by the elimination of instructor spaces and a reduction in prescribed course lengths.

The Army's long-term involvement in CAI applications has led to the Computerized Training System currently being used as a prototype model for the Army School System. This mini-computer system incorporates the best features of CAI and CMI to teach electronics skills on an individualized, self-paced basis.

The data from the third part of the survey provided an assessment of the military services' programs toward computer use in instruction. This follow-on survey was conducted at thirty-seven Army, Navy, Air Force, Marine Corps, and Department of Defense level training and education institutions and reported qualifiable data, for the first time, of the progress of the military services in computer supported institutions.

The data covered the period from 1963 to 1974 and included five separate measurements of the extent of computer use by each military service. First, the number of training and education activities using computers in support of the instructional process has grown steadily to the point where thirty-three institutions were using the computer in 1974. The Army uses the computer to support instruction at more schools and

colleges than all the other three services and DoD level institutions combined. A second measure of computer activity is the number of courses that incorporate computer support as a part of the instructional process. The Army leads the services with 217 courses, the Air Force has 210, and the Navy and Marine Corps 102. A third measure of military service involvement in computer based training is the number of students who were trained through use of computers. By 1974, almost a third of a million students had been instructed by computer supported systems, and again, the Army exceeded the other three services and DoD level institutions combined. A fourth indication of military progress toward computer use is measured by the normal pedagogic unit of student contact hours. There is evidence of continuous growth by all the services, but the Army is ahead of the other three services and DoD level institutions with 1,480,000 student contact hours. The Navy has more than doubled its contact hours almost every year and is at the 1,134,000-hour level. A fifth and final measurement used in the survey was the percentage of instruction that is computer supported, in comparison with total instruction. When contrasting computer supported instruction with all other military instruction, the research data revealed that about 3.6 percent of the Navy's instruction is in computer supported form. The Army and the Air Force are both at the 2 percent level.

The Prospects for the Adaptation of Computer Technology to Army Training in the 1980s

In chapter 4, as a continuation of the progress assessment set forth in chapter 3, the prospects for the adaptation of computers to Army training are examined in three areas: (1) the organizational climate, (2) the "how" of training, and (3) the future of Army training.

The first area, organizational climate, focuses on the Army's training command, TRADOC,[1] which is responsible for training and education of the individual soldier and for providing intensive management of the individual training programs. The leadership at TRADOC is dedicated to training excellence in the Army School System and to extending the expertise of institutionalized, individualized training to unit individual and unit team training. The organizational climate at TRADOC is such that modern techniques and technologies are being introduced across the breadth of the Army's training scene. The research data reveal that the Army's total computing capacity is at a plateau, but the terminals for needed student interface are growing at an exponential rate. The respondents of the staff survey indicated that some use could be made of the installed post computers for training individuals. In the instructor survey, most of the respondents envisioned centralized training at a few large bases, where all the initial specialty training will be conducted. This form of training, where a particular skill is taught at only one base, is gaining momentum in all the services.

The second area examined is the "how" of training for the 1980s. The analysis of the staff and instructor opinions revealed that a form of computerized training is predicted to be prevalent in the 1980s. Self-paced individualized training is the instructional process that the respondents indicate will be emphasized in the future. They anticipate that, in the future, a combination of many methods will be used. A number of factors will further the use of computers in training. There are also barriers to computer use. The two driving forces that might

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[1] "TRADOC" is an acronym for U.S. Army Training and Doctrine Command.

cause a significant shift toward greater use of computers are (1) demonstrated cost-effectiveness and (2) improved job performance. In contrast to the driving forces, the barriers to the use of computers in training are thought to be (1) their high cost, (2) lack of a clear decision to implement such systems, and (3) the organizational climate. It is apparent that new technologies in military training systems are evolving gradually. The support of the faculty members, staff, and training command is essential to progress in technological change.

The third area focuses on the future of computer based training. Evidence of future Army computer use in training is cautiously labeled as conjecture. However, data from the follow-on survey indicate that the Army's computer based training is expected to double by 1985. Prototype tests currently underway are expected to demonstrate that computer supported training can be cost-effective and produce a better trained soldier. With this emphasis, the Army is expected to continue its leadership as the predominant service in this field into the 1980s.

The Implications of Computer Based Training on the Administration of Student Personnel

In chapter 5, the linkage between self-paced instruction and the future student profile provided insight into student expectations for training in the 1980s. To meet the growing demand for rendering instruction that is more personalized and more responsive to the individual needs of students, the Army has adopted a philosophy of training that embraces self-paced individualized instruction. When the Army converted a number of basic military occupational specialty courses to self-paced testing,

it experienced an average of 26 percent saving in training time, with an equal or higher achievement level.

The acceptance of self-paced individualized instruction and its forecasted place in the military services was explored in the staff survey. Sixty percent of the staff respondents indicated that they expected self-pacing to be the norm in the 1980s because of its proven effectiveness, its cost- and time-saving value, and its conservation of instructors' time. The staff respondents cautioned that some instructor participation in the learning process is essential for properly motivating students.

On the basis of the data collected, it is anticipated that the student of the 1980s will enter a military learning environment that is significantly different from the learning environment previously experienced in the civilian sector. This new learning environment may include a private work area, known as a learning center, where the student progresses at his own pace and is encouraged to be an active rather than passive learner. Although such a learning environment is in existence today, it may not apply to all military students of the all-volunteer force. In the instructor survey, about 33 percent of the respondents were of the opinion that entry-level enlisted training would be the prime category of student training most efficiently and effectively accomplished by computerized instruction in the 1980s. These respondents suggested that 50 percent of all entry-level training could take place at a few large bases. Other respondents indicated that it would be inappropriate to select a best category for computerized training, because it is applicable to all categories.

The training establishment that conducts the military training mission in the four services requires nearly 250,000 people and consumes $6 billion of the defense budget. This large commitment of resources has one objective--to train the person for the job. To this end, the recruiting programs place emphasis on joining the military services to learn a skill. Recruitment advertising is often focused on the "what" of training as an attractive feature, but the "how" of training is also important. In the survey, by a two-to-one margin, staff officials agreed that computer based training will have an effect on recruiting in the 1980s. Whether all the services will advertise training technology in their recruiting programs remains to be seen. Initial indications suggest that such information has been helpful to the Marine Corps and the Air Force.

The question of whether the availability of some form of computerized instruction for career development would influence a person to make a career of the military produced a split reaction among the respondents. In the instructor survey, by a narrow margin, the instructor respondents conveyed the opinion that the presence of computer based instruction will have a minor influence on career or reenlistment decisions.

The significant positive attributes that would bear on student acceptance of computer based instructional systems can be placed into three categories: (1) student attitude, (2) student achievement, and (3) time saved in training. Student attitude toward computer based training is found to be most elusive. A review of six military studies revealed that when students are asked to identify the aspects they like best about CAI, the responses fall into the following categories:

(1) its self-pacing nature and the fact that it is active, individualized instruction, (2) the provision for immediate feedback, and (3) instruction that is clear and interesting.

The staff survey respondents generalized their sentiments about student attitude by concluding that students like computer based instruction because it is new, interesting, and dynamic. The staff respondents observed that, even though the novelty may wear off, CAI is still an active learning process that is preferred by the majority of students who have used it.

From the standpoint of student achievement, it was found that the training decision makers seem to be satisfied with a recommendation for conversion to computer based instruction if student achievement is at least equal to that with conventional instruction. Like student attitude, the achievement level is not subject to precise quantification or accurate validation. In tests that compare CAI with conventional instruction, CAI has demonstrated at least equal if not higher achievement levels. In fact, all of the known military tests of CAI found student achievement to be higher. The range was from 2 percent to 20 percent higher on identical performance tests.

The time saving attribute of CAI has tended to be the pivotal argument to justify the expenditure of funds for conversion to the new, high technology systems. Military studies suggest that CAI training reduces conventional training time from 28 to 54 percent. The computer is not the sole generator of this time saving. Often, time saving is derived from a fresh look at the training material, the elimination of superfluous items, the sequential arrangement of presentation, and an

examination of each teaching point in the light of established learning objectives. This purging of course materials by the instructor, plus the self-pacing nature of computer based systems, yields the time saving. The respondents of the staff survey viewed the reduction of training time as the most important attribute of computer based training. In the instructor survey, the respondents ranked it as the second most important attribute.

The saving of time can be realized as a cost avoidance if the military personnel system is adjusted and made responsive to assigning students as soon as they complete computer supported courses. Staff survey opinions gathered on the question of how to avoid wasting the time saved in computerized training systems indicated that the most popular method currently used by the services is called "computer prediction." The predictive approach is part of the design of the new Army and Air Force computer based systems now being installed.

Manpower and Personnel Management Considerations that Arise as Computers Become a Part of the Army Training Process

The decisions about the instructional use of computers are vested in three major groups--the students, the faculty, and the administrators. The first group of people involved in these decisions, the students, were discussed in chapter 5. In chapter 6, the second group, the faculty, were examined. The students' power is not one of authority to cause change, but it is sufficient to veto change. The faculty members and the administrators, represented by the layers of staff officials above the school level, clearly control the present and future direction of the

instructional process in the military services. The power to change, however, is accompanied by the fear of failure and the possibility of unforeseen consequences. Thus, the attitudes of the faculty members and administrators toward CAI are crucial to change.

Civilian teachers fear that they will be replaced by computers. Yet, in a positive sense, the use of computer assisted methods should expand the capabilities of teachers. The computer can relieve the teacher of the labor of repeatedly preparing for and personally presenting course segments. The time thus saved can be applied to tutoring, counseling, and developing new material.

In the military, much of the progress achieved so far in instructional computer use can be traced to the individual faculty members who grasped the potential of CAI and applied it voluntarily to their own teaching situation. The general attitude of the faculty members and administrators toward the use of computers in training is positive. In four different questions concerning the future of computers use by the military, highly pro-CAI opinions were recorded by the survey respondents. There is little indication that military faculty members fear the computer. In fact, the faculty chose "enjoyment of working with computers" as a top ranking benefit of CAI.

Another personnel factor is the recognition of skilled work. In the civilian sector, this is normally achieved through promotion. In the Army, it has been traditional to provide extra pay for scarce skills. When asked if extra pay would be appropriate for CAI instructors, a majority of the faculty respondents agreed. However, the comments of these instructors seemed to negate the positive response by pointing out

some pitfalls of such special pay programs. They said that special pay (1) tends to be inequitable, (2) is prone to create an elite group, and (3) is frequently challenged as to whether the specialty deserves such recognition. As far as the Army is concerned, it is a moot question, since the current regulations preclude extra pay in such cases. Therefore, recognition of skill level will be given through promotion.

CAI instructors will also have new duties over those of conventional instructors. The faculty members in the survey indicated that CAI instructors would be working as teams to develop and present material. The most frequent response suggested that the faculty will be a part of either the author-programmer group or the tutor-proctor group. The former group prepares the material and the latter works with the students. Regardless of the approach used, the role of the faculty in programming is the basic difference perceived by the faculty respondents.

A principal benefit of CAI is the saving of time, for both the students and the faculty. Initially, instructors will be spending considerable time in the conversion of material to the computer. But, once the conversion has been accomplished, the benefit of the automated system will be realized, and the instructor will spend more time with the students. Eventually, the use of computers should reduce the total number of faculty members required for the instructional process.

The sheer magnitude of the manpower used in military training establishments makes possible a great potential for personnel saving if efficiency can be increased. And, with the soaring costs of manpower

in the Army, an increase in productivity could contribute to decreasing the manpower need.

Previously conducted studies, as well as the surveys conducted for this report, give strong indications that manpower saving may be achieved in the instructor area when the initial conversion to computers is accomplished. The substitution of machines for people is repugnant to most faculty members, but it is a practical goal of computer use if increased productivity is desired.

The classification of personnel resulting from computerization has led to conjecture about changes in the organizational structure. The staff respondents indicated that the school organization will tend to recentralize as functions are pulled up to school level to support all instruction. The presence of computer based instruction suggests that less supervision and control will be required, or will be possible. The faculty will not be bound by a rigid platform schedule, but will move among the students of one or more classes in a counseling and tutoring role.

Manpower structures and practices are subject to change with the advent of these computer based learning systems. The instructors in the survey gave overwhelming support for some unique specialty code that can identify CAI instructors as skilled personnel assets deserving of special manpower management. Although the Army currently has a system to identify instructors, it would require modification to indicate a computer based instructor. The presence of such an identifier would facilitate the management and assignment of CAI instructors. The survey respondents suggest that unless a special identifier is used, the faculty members

with CAI capabilities would have to be selected on the basis of their teaching experience or their background in computers.

As of the writing of this report, no acceptable standards or criteria exist that would allow development of proper manpower staffing guides. The personal interviews of the staff officials produced almost total agreement that present conventional staffing guides were not applicable to computerized systems. Further, they were unsure of a proper staffing criterion but speculated that the instructor-student ratio would increase noticeably.

Manpower and Personnel Issues That Emerge at Top Management Levels as Computer Technology is Integrated into the Training Establishment

The first two groups of people involved in decisions about the instructional use of computers were discussed in chapters 5 and 6. In chapter 7, the third group, the administrators, were examined. The training commands, the military departments, and the Department of Defense constitute this group of administrators who exert control over military training. Congress is also included as a quasi member of the top level management because of its role in the authorization and appropriation of funds to support the military training effort.

The U.S. Army Training and Doctrine Command (TRADOC) was established in 1973 as the single manager responsible for what is taught and how it is taught in the Army. Opinions gathered in the personal interviews of the staffs suggest that the increased use of computers in the instructional process will lead to the centralization of training at all levels of management. TRADOC is expected to centralize its activities as it

exerts influence on the Army schools. The introduction of modern training technology into the Army training system will change the pace and quality of training. Concurrently, the Deputy Chief of Staff for Personnel, Department of the Army, is expected to move to less centralization as more and more the Army's training functions are pushed down to TRADOC.

In the Army, the major obstacle to effective training is personnel turbulence. To ameliorate turbulence, the Department of the Army has devised ways of reducing personnel movement. A concept of one-station training has been established, which reduces total training time, saves travel costs, and cuts personnel turbulence. The continued presence of a federal statute requiring four months of initial training limits the extent of benefits that can accrue to this program. The Army has sought to have this legislation amended so that the benefits of one-station training, self-paced instruction, and other training efficiencies can be more fully realized.

The staff respondents recognized the increased actions by the Office of the Secretary of Defense in service training matters. Since the early 1970s, Congress has passed legislation that has caused increased involvement of the Department of Defense in military training. This legislation requires the military services to highlight savings generated by the consolidation of training among the military services. When the staff respondents were asked about congressional influence over service training, there was three-to-one agreement that Congress would not direct the military to use computers in the instructional process. However, they were of the opinion that Congress would continue to exert its

influence through suggestions during authorization and appropriation hearings and legislate for change as a last resort.

Conclusions

The information summarized above represents the opinions of the staff and faculty respondents. On the basis of these attitudinal data, it is possible to respond to the following subsidiary questions, and subsequently to address the primary research question of this report.

Subsidiary Questions

Subsidiary question 1

What are the alternative training strategies available to the military services for the 1980s?

It is concluded that a wide range of viable alternative training strategies is available to the military services for the 1980s. "How" to teach is the challenge facing military trainers and educators as increasing pressures develop for cost-effective training and education in the military services. The traditional lock-step method of course scheduling, which features the lecture and classroom demonstration, is laborious and not very effective. In contrast, a computer based system is an advanced instructional strategy that provides a unique learning experience for each student through multimedia methods, proceeding at the student's pace. Computer driven systems are cost-effective and embody sophisticated instructional technology. After a decade of development, computer assisted instruction (CAI), computer managed instruction (CMI), and other combinations of computerized systems represent feasible training alternatives for the 1980s.

The tangible and intangible benefits of a particular strategy vary so much that no universal yardstick has been developed to identify

the optimum media and method of instruction. The costs of the various strategies are, nonetheless, estimated to range from pennies to dollars for each student contact hour. However, there is no agreement on the accuracy of these estimates, and management information and methods do not yet exist to allow comparison of the cost-effectiveness of instructional systems. Lacking these essential data, the military services will continue to design unique instructional strategies that respond best to their particular training situation. The strategies used to train servicemen will be neither exclusively conventional nor exclusively computerized.

Subsidiary question 2

What progress has been made by the military services toward the integration of computers in the instructional process?

It is concluded that the military services are beyond the experimental stages of instructional computer use. Staff experts in the field are of the opinion that the computer will be generally in use in all areas of military training and education by the 1980s. Even though development and prototype work will be completed in the 1970s, not all service schools will be active users of computers in all areas of military training and education.

Using the following criteria, empirical data collected for this research report reveal that the Army has made more progress toward computer use than any of the other three military services or DoD.

1. The Army has more training and education activities using computers to support the instructional process than all the other military services and the DoD-level institutions combined

2. The Army has more courses incorporating computer support than any other military service or DoD level institution

3. The Army has trained more students via computer based training systems than all the other military services and DoD level institutions combined

4. The Army has recorded more computer supported student contact hours than the other military services or DoD level institutions

The research data established that about 2 percent of the military instruction is now computer supported, with the Navy leading the Army and Air Force. The latter two are at about the same level.

It is concluded from the data collected that the military services made gradual advances in the instructional use of computers up to 1965; then, the tempo of activity showed definite signs of acceleration. Between 1969 and 1972, computer use grew at an increasing rate. Since 1972, the rate of growth has been increasing but at a decreasing rate, which may be regarded as a sign of maturity in the field.

Subsidiary question 3

What are the prospects for adaption of computer technology to the Army training system in the 1980s?

The research data supported the conclusion that the Army is causing institutionalized training of the Army School System to move into the field units as a result of training command leadership and the application of instructional technology. Even though the Army's computer power at the post level is growing at a decreasing rate, the number of computer terminals is growing at an increasing rate. It is concluded from the research data that post computers will not be used extensively for individual training in the 1980s. The Army is moving toward the

consolidation of training to reduce travel costs, shorten training time, and bolster morale. This concentration of training activity will facilitate the economies of scale and make the use of computer based training more cost-effective.

It is concluded further from the research data that the methods and media of military instruction in the 1980s will be characterized by the following:

1. The instructional process that will be emphasized will be self-paced individualized instruction
2. The predominant mode of military instruction will be a form of computerized instruction that includes CAI, CMI, and other media
3. Conventional, lock-step, eight-hour military training days will be used less in the future
4. A fully computer directed instructional system will not typify the Army's School System
5. Computerized systems will not eliminate the need for instructors, but rather, free them for tutoring, counseling, and motivating students on a one-to-one basis

The research data supported the theory that computer based training will gain even faster acceptance in the military services through demonstrated cost-effectiveness, better job performance, and greater student acceptance. Conversely, it is concluded that the following obstacles to future use of computer technology exist: (1) cost, (2) someone in authority to make a decision, now, (3) the organizational climate. The extrapolation of historical data supported the conclusion that the Army's computerized training activities are increasing, and a cautious estimate is that they will double by the mid-1980s.

Subsidiary question 4

What impact will the instructional use of computers by the Army have on the administration of student personnel?

It is concluded that the typical all-volunteer force student joins the military service to learn a skill and wants to do so at his own speed, being responsible to himself for skill progression. The research data indicate that computer supported instruction is effective with all categories of students and with various mental abilities. However, cost-effectiveness considerations may cause a predominant use of computers at the entry level of military training.

It is concluded further that the presence of computer based training in the Army will not normally motivate a person to enlist; however, it may have an effect on initial recruiting and reenlistment programs. The military services that have advertised the use of computers in their training systems have met with a favorable recruitment response. The research data supported the conclusion that students are favorably disposed toward interactive computer use in their military courses of instruction. Military students like computer based training because it is new, interesting, and dynamic. Even though the novelty can wear off after initial use, it is still an active learning process that is preferred by the vast majority of users.

It was found that training time can be reduced by approximately one-third when conventional instruction is computerized. This saving is attributed to the self-pacing nature of the instructional model and the associated restructuring of lesson materials, which makes the program more responsive to the identified learning objectives. However, the

opportunity for saving training time is lost unless the Army's personnel assignment system is brought into harmony with the output of the training courses. It was determined that the military student, schooled in a computer based system, will complete the course with an achievement level equal to if not higher than that of students trained in a conventional manner. Computers reduce boredom for the high achievers by allowing them to proceed as rapidly as they desire, and achieve a zero attrition rate in training by patiently drilling the slower student until the required achievement level is attained.

Subsidiary question 5

> What manpower and personnel management considerations will arise in faculty staffing, should computers become a significant part of the Army's training process?

It is concluded that decisions about the instructional use of the computer are made by the faculty members and administrators. They clearly control the present and future direction of the instructional program in the military services. On the basis of the research conducted for this report, it is determined that, while civilian teachers tend to resist the change toward computer based instruction, military instructors tend to support the change to computers and the experimentation with new technology. The general attitude of military instructors toward the use of computers in training is positive. It was observed that the most impressive progress in the use of computers in training was inspired by the initiatives of individual faculty members who grasped the potential of new techniques of delivery and applied it to their own teaching situation. The faculty respondents indicated that teaching will be the

top-ranking factor for providing job satisfaction in computerized training systems of the 1980s. The lower-rank military instructors regarded extra pay as a significant motivator in computer based training systems. The more senior faculty members, however, caution against the use of extra pay as a motivator because such pay programs are often inequitable, tend to create an elite group, and may not be deserved by an instructor group.

It is concluded further that computer supported instructors of the future will be involved in programming. These instructors will be members of teams which develop lesson material, program the instruction, and tutor the students. As computer based systems are perfected, direct instructor involvement as a classroom lecturer will be reduced significantly and will therefore result in a saving of instructor personnel. Because the instructors will no longer be spending a major portion of time in teaching in front of the class, it was determined that they will devote most of their time to developing and writing lesson material and to counseling individual students. There is evidence to suggest that the computer will save the instructor's time in the long run. However, demands on the instructor's time will be high until the conventional lesson material is converted to the computer based system. Studies and documented conversions of systems reveal a definite manpower saving when computers are used in the instructional role. Yet, the majority of the instructor respondents indicated that instructor manpower saving would accrue from the use of computer based instruction but that the spaces gained would probably be more than offset by additional specialists needed to serve as the interface between computers, students, and instructors.

It is also concluded that the introduction of computers into instructional programs will cause changes in the organizational structures, including: (1) a recentralization of functions, (2) a reduction of faculty control, and (3) the creation of new tasks for the faculty. The presence of computers should allow the Army school organizations to recentralize, as many scheduling, management, and administrative functions are elevated to the school level. Faculty members are expected to be freed from rigid class schedules, and therefore require less control as they move from student to student and class to class as tutors, proctors, counselors, and motivators. It was suggested that the manpower structures should include a special skill identification code to foster optimum use of CAI instructors, who are expected to be in short supply in the 1980s. Also, it was determined that the present performance standard of instructor platform man-hours is not valid in a computer based instructional situation. Yet, no alternative performance standard has been devised. Even though this standard had not been established, the staffing criteria, instructor-to-student ratio, is expected to change to reflect an increase in number of students per instructor.

Subsidiary question 6

> What manpower and personnel issues will emerge at top management levels as computer technology is integrated into the training establishment?

It is concluded that the recently established Army training command will continue to centralize training management as it absorbs more of the Department of the Army staff's training responsibilities. It was determined that the Office of the Secretary of Defense has a growing involvement in

military service training, which has been stimulated by congressional interest in more efficient military training. The research data revealed that training management will be recentralized at TRADOC as top-management levels exert increasing pressure for training efficiency and the integration of modern instructional technology into the training system.

The Army staff is acting to reduce personnel turbulence through a one-station training concept that eliminates travel between posts for entry-level training. Repeal of legislation is proposed so that the Army will be allowed to take greater advantage of the training time saved through new efficiency in training.

The research data revealed that Congress is not expected to direct the military services to use computer based training systems. Congress has been exerting its influence, however, through authorization and appropriation hearings. In these hearings, dialogues often occur that shape the plans of the military services without legislation. Nevertheless, some recently enacted legislation is regarded as only the beginning of congressionally imposed reporting requirements, which will force more DoD involvement in military training programs.

Research Question

> What are the manpower and personnel implications that emerge in the military services upon changing to computer based training systems in the 1980s?

It is concluded that as the managers of military training look to the 1980s, they recognize that the strategies of the past do not pertain. In fact, the research of this study indicates that these managers will integrate modern instructional technology into the training strategies

of the 1980s. By the mid-1970s, all of the military services show steady progress toward the use of computers in the instructional process. The survey data reveal that the Army is the leader among the services in use of computers in the instructional role. Despite this fact, it is estimated that only 2 percent of today's military instruction is computer supported. Thus, it would appear that the instructional strategies used to train servicemen in the 1980s will be neither exclusively conventional nor exclusively computer based.

It is found that the Army training system, through its training command, is oriented toward change. The research data suggest that the methods and media of military instruction in the 1980s will be characterized by self-pacing and the presence of computers as conventional lock-step instruction wanes. However, movement toward more computer based training could be accelerated through demonstrated cost-effectiveness, better job performance, and even greater student achievement. Conversely, such obstacles as conversion costs, the lack of timely decision-making, and a resistant organizational climate can slow the transition to greater computer use.

It is further concluded that in assessing the future manpower and personnel implications of military instructional computer use, three human components are integral to the process. These are: the student, the faculty, and the staff. The research data indicated that the first component, the student, is favorably disposed toward the interactive use of computers in military courses of instruction because it is new, interesting, and dynamic. Further, it is observed that computer based training applies to all categories and aptitude levels of students.

It is determined that the second component, the faculty, responds positively toward instructional computer use. The most impressive progress in the use of computers in training originated through the initiative of faculty members who saw the potential of these new techniques and applied it to their teaching situation. For proper management of the military faculty members of the future, they should be identified by a unique skill identifier. They should be identified as specialists in multimedia use, programming, and the counseling of students. The advent of the computer into the instructional process signals a reduction of faculty control, a certain recentralization of functions, and the development of new instructor performance standards and staffing criteria.

It is concluded that the third component, the staff, which is represented by the Army's training command, the Department of the Army, and the Department of Defense, is interested in realizing improved training through the use of modern instructional technology. The Army's training command is seen as exerting increased pressure to produce training efficiency and to integrate instructional technology throughout the Army's training system. To facilitate increasing training efficiency, the Army staff is working to reduce personnel turbulence in the training programs. Finally, the Office of the Secretary of Defense has shown a growing interest in training in the military services, stimulated somewhat by congressional concern for more efficient training.

Recommendations for Further Study

Cost-Effectiveness of CAI, CMI, and CTS

The academic and military training systems have been developing computer based instruction for more than a decade. Yet, there has been no definitive study which demonstrates the cost-effectiveness of one teaching strategy over others. Many studies have dealt with traditional methods of instruction, but few studies have been made relative to the cost of the use of computers in education. There has been a paucity of empirical data on cost comparisons of teaching strategies, from conventional instruction to high-technology instructional systems. The National Science Foundation has sponsored studies at the junior college level, and the military services have studied segments of computer technology, but these efforts are fragmented and fail to look at the total comparative cost implications. A comparative research study is needed to collect and analyze data for a meaningful cost-effectiveness study. The military services will then be able to select a computer application to meet their training situation and have the objective data to support that decision.

Post Computers for Individual Training

Millions of dollars have been invested by the military services in the purchase of tactical and administrative computers. Why not use these operational systems after duty hours or whenever they are free for individual training? The presence of terminals on posts, transportable programs, time-sharing, and data communications can be combined to make efficient use of computer equipment already acquired by the military services. The precise feasibility of this concept is beyond the scope

of the present study, but significant cost saving could be realized if it were feasible to use these existing operational systems.

Networks of Instruction

Within the 1970s, the use of instructional computers is subject to speculation. Taking a long-term view, it is easier to accept the notion that more extensive use of computers in training and education will occur in the 1980s. How will the military services be handling computer based instruction in that time frame? It is suggested that the major training and education activities will continue to develop independently for a certain period. Then, at some point in the not too distant future, it will be technically feasible and cost-effective to link the large, base computers forming an instructional network to achieve widespread distribution of training materials at a real saving. Military training and education installations could have a number of terminals, each capable of communicating with internal computer systems, or externally to other computer based instructional systems over telephone or other communication lines. This type of instructional strategy should be studied, because the implications of such systems will soon have an impact on current management decisions. A description of internal and external instructional networks would be of great benefit to the military services. Studies in this area could then lead to follow-on efforts to describe the steps to be considered today so that the networks of tomorrow could be standardized.

Performance Standards for Faculty Staffing

The advent of computer based systems in the military training process necessitates the development of new performance standards for

faculty performance and staffing. The current platform man-hour unit of work is no longer valid in the computerized training environment. Studies are needed to gather data for the purpose of establishing new standards for measuring faculty performance in the computer area and to aid in staffing. The different types of computer based instruction will have to be assigned factors for the staffing guides to allow for the computation of instructor manpower requirements. Research is required to give definition to the factors appropriate to the various types of computer instruction.

Estimating Instructor Saving

In estimating instructor saving, the CAI proponents specify that the system costs will be offset by a saving in instructor manpower spaces. In several studies, these offset savings have been shown, but they vary greatly. It would be helpful to the military services if a standard could be developed to establish the veracity of manpower reduction claims prior to the approval of any computer based training system proposal. By this means, the military planners could use commonly accepted standards, and managers would be better equipped to challenge overly ambitious cost-benefit analyses. As the services perfect the application of instructional technology to training and education, due care must be given to the manpower and personnel implications of this man-machine interface.

APPENDIX A

STAFF STRUCTURED INTERVIEW GUIDE

DEPARTMENT OF DEFENSE
INDUSTRIAL COLLEGE OF THE ARMED FORCES
WASHINGTON, D.C. 20319

COMPUTERIZED INSTRUCTION SURVEY

STAFF QUESTIONNAIRE
{STRUCTURED INTERVIEW GUIDE}

TO GATHER DATA FOR A RESEARCH REPORT TO BE ENTITLED --

"AN EXAMINATION OF THE MANPOWER AND PERSONNEL MANAGEMENT IMPLICATIONS ARISING FROM THE INSTRUCTIONAL USE OF COMPUTER TECHNOLOGY BY THE U.S. ARMY IN THE NINETEEN EIGHTIES"

BY

GENE T. SHERRON, COL, USA
RESEARCH FELLOW, INDUSTRIAL COLLEGE OF THE ARMED FORCES
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JUNE 1974

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INTRODUCTION

This is a survey to gather information concerning the personnel impact of the use of computers in the instructional process by the military services in the 1980s. The purpose of this questioning is to obtain knowledgable opinion on a range of topics relevant to the research project. The basic research question is: What are the manpower and personnel management implications should the U.S. Army change to computer based training systems in the 1980s?

This question implies continued progress in the development of computer technology as applied to the instructional process in the military. Thus, the report will not debate the feasibility of applying computers to the learning process. Rather, the report accepts the general premise that the services will have the option of using the computer in their training systems in the 1980s. Yet, the extent of its utility for that time frame appears to be directly related to actions taken by the services in the next few years.

Therefore, the initial questions will seek to gain your opinion about the progress, alternative strategies, and prospects for the use of computers in the instructional process. This will set the stage for the general premise of computer acceptance (or nonacceptance) in the military training systems for the future.

The remainder of the questions will deal directly with the human side of this issue. You will note questions that ask you about the student of the future and the impact of the computer on that student. In much of the research conducted to date, the instructor has tended to be the forgotten man. Thus, you can appreciate that your opinion about the role of the trainer in the 1980s is one of the focal points of this data gathering processes.

Then you will note questions about the role of the staff as the military moves into the 1980s. The staffs of interest are that of the school, the training command, and department level.

This project is jointly sponsored by the U.S. Army and the Industrial College of the Armed Forces. This survey has been officially approved by the Department of the Army under the provisions of AR 600-46 and the Department of the Air Force under provisions of AFR 178-9.

Your agency may request a copy of this report which should be available in late 1974.

DEFINITIONS

Although this research deals with computer assisted instruction (CAI), the use of this term has been generally avoided because of the lack of a commonly accepted definition. The following phrases are used interchangeably in the report:

Computers used in instruction	Computer directed instruction (CDI)
The instructional use of computers	Computer assisted instruction (CAI)
Computer based instruction (CBI)	Computerized training systems (CTS)

These phrases include such applications as interactive dialogues, simulations, drill and practice, and computations.

When acronyms like CTS are used in relationship to a particular service, they take on specific meanings. In those instances they will be precisely defined and accurately used in the report.

QUESTIONS

COMMENTS

1. Based on your experience, which U.S. military service has made the most progress toward incorporating computer technology into its instructional system?

   a. Army
   b. Navy
   c. Marine Corps
   d. Air Force
   e. Coast Guard

2. a. Looking to the 1980s, which service do you feel will be the leader in the use of computers to assist in the instructional process?

   1. Army
   2. Navy
   3. Marine Corps
   4. Air Force
   5. Coast Guard

   b. What gives you this impression?

3. In comparison to all of the training in which your service is currently engaged, indicate to what extent you think it is using computers to assist in the instructional process?

   a. 0 to 5%
   b. 6 to 10%
   c. 11 to 20%
   d. 21 to 30%
   e. 31 to 50%
   f. Greater than 50%

4. Projecting your thoughts to the 1980s, how much of the instruction do you feel will have some degree of computer support or involvement?

   a. 0 to 5%
   b. 6 to 10%
   c. 11 to 20%
   d. 21 to 35%
   e. 36 to 50%
   f. 51 to 66%
   g. 67 to 90%
   h. Greater than 90%

QUESTIONS

COMMENTS

5. What do you feel will be the most prevalent types of training methods used by the military in the 1980s?

6. a. Five to ten years from now, at what level do you think the bulk of computerized training will be taking place?

   1) Entry level training
   2) Mid career level training
   3) Senior level training

   b. What makes you think so?

7. What types of training do you feel will be most susceptible to computer assisted or supported instruction?

   a. Technical skill training
   b. Sciences vs humanities
   c. Field skills
   d. Tactical decision making skills

8. The self-pacing feature of computerized training systems could do away with course opening and course graduation dates. How can the personnel assignment function be adapted to avoid wasted time between assignment to training and reporting for duty from training?

9. With the increased presence of computers on posts, bases, and stations, to what degree will they also be used to train individuals? For example:

   a. Administrative computer systems (e.g., USAF's Base Level B-3500s)
   b. Operational or field tactical data systems (e.g., Army's TACFIRE, TOS^2, CS^3, etc.)

QUESTIONS

COMMENTS

10. a. In the 1980s, will self-paced individualized instruction be the norm?

    b. Why so?

11. a. Will the presence or absence of modern instructional methods like computer based training have an impact on recruiting efforts by your service?

    b. If so, where do you see the greatest impact?

    1) Initial enlistments
    2) Reenlistments
    3) Applicants for officer training

12. What organizational change do you envision for faculty members in the 1980s?

    a. Contrast to your current organizational structure?

    b. Tasks you expect faculty will do that are different from today?

    c. Changes in supervision and control?

13. On what basis do you think instructors will be identified and selected for computer based instructional assignments in the future?

    a. Special skill identifiers

    b. Past experience in teaching

    c. Training or experience with computers

    d. Aptitude, appearance, and personality

QUESTIONS

COMMENTS

14. a. A computerized training system represents a significant investment on the part of any organization. What do you feel are the positive attributes of computer based training that will offset those costs? For example:

1) Reduced training time
2) Fewer instructors required
3) Higher student achievement
4) Generates instructor motivation
5) Better performance after training
6) Student preference
7) Reduced attrition rate
8) Flexibility to handle varying training loads
9) Greater uniformity in the quality of training
10) Others_____

_____

b. Of those selected above, which one (or ones) do you feel could tip the scales from conventional instruction to a form of computerized instruction?

_____

_____

15. Do you see computerized training systems changing manpower structure or management practices in the future?

a. Changes in specialty code or identifiers

b. Different grade requirements

c. Changed performance standards

d. Total authorizations

e. Changes in staffing criteria

QUESTIONS

16. With more and more computers being used in the instructional process, do you see the trend toward centralization or toward decentralization of training?

    a. School level

    b. Training command level

    c. Department level

    d. Defense level

17. The organizational relationships (chain of command) for training, education, and the development of instructional technology varies by service.

    a. Describe your service's structure?

    b. Would you suggest any changes?

18. Because of the shrinking defense dollar and the need for improved productivity in the military training establishment, do you think that the Office of the Secretary of Defense will be exerting additional efforts to:

    a. Reduce duplication of training?

    b. Increased productivity in training?

    c. Exchange instructional materials between schools and or services?

    d. Consolidate training activities?

    e. Contract training?

COMMENTS

QUESTIONS

COMMENTS

19. a. Do you feel that Congress will force the military to adopt more computerized training through budget constraints or the passage of directive legislation?

    b. If so, in what ways?

20. I would like to ask you to look over this figure. It is an estimate of the use of the computer in military education and training both past, present, and future. What are your time frame estimates for each of these categories?

    a. Academic administration

    b. Calculation

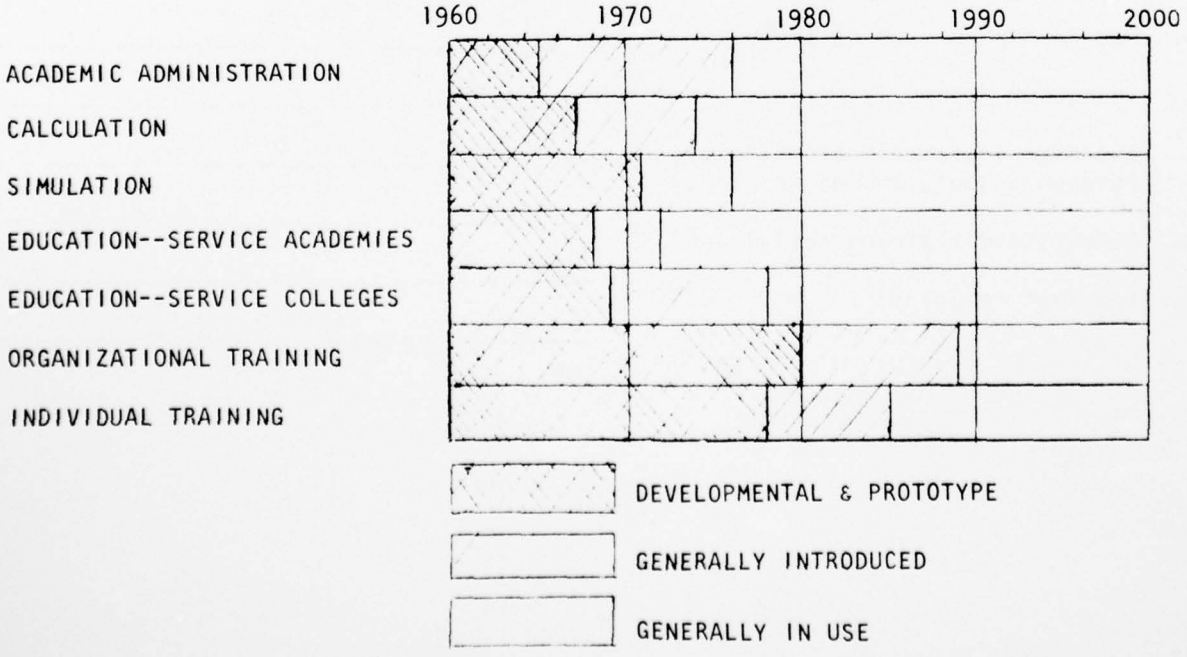
    c. Simulation

    d. Education (service academies)

    e. Education (senior service colleges)

    f. Organizational training

    g. Individual training



APPENDIX B

INSTRUCTOR QUESTIONNAIRE

BIOGRAPHICAL DATA

Control Number

Different groups of people entertain differing opinions about this subject. So, it is intended that the data collected from this survey be analyzed by different groupings and in the aggregate. Please indicate your status in these various categories.

Thank you for your cooperation.

SERVICE AFFILIATION
1. Army
2. Navy
3. Marine Corps
4. Air Force
5. DOD
6. Other _____

STATUS
1. Commissioned
2. Civil Service
3. Other _____

POSITION
1. Commandant or Commander
2. Director of Instruction
3. Educational Advisor
4. Manpower/personnel official
5. Development official

AGENCY (for Washington area interviews only)
21. DA Staff
22. DN Staff
23. HQ USMC Staff
24. DAF Staff
25. TRADOC Staff

LOCATION (field interviews)
1. Fort Monmouth
2. San Diego
3. Twenty-nine Palms
4. Lowry AFB
5. Memphis NAS
6. Aberdeen PG
7. USNA
8. Fort Devens
9. ALMC
10. QM School
11. AFSC
12. ICAF
13. DODCI
14. Engineer School
15. Keesler AFB
16. Chanute AFB
17. USMA
18. Hanscom Fld
19. Def Sys Mgt Sch
20. Trans Sch

- - - - - - - - -

26. Msl & Muns Sch

YEARS EXPERIENCE WITH COMPUTERS (in training or otherwise)
1. 1 year
2. 2 years
3. 3 years
4. 4 years
5. 5 years
6. 6 years
7. 7 years
8. 8 years
9. 9 years
10. 10 years or more



DEPARTMENT OF DEFENSE
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WASHINGTON, D.C. 20319

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The remainder of the questions will deal directly with the human side of this issue. You will note questions that ask you about the student of the future and the impact of the computer on that student. In much of the research conducted to date, the instructor has tended to be the forgotten man. Thus, you can appreciate that your opinion about the role of the trainer in the 1980s is the focal point of this data gathering process. To promote a better understanding of the instructor's attitudes, please be as objective as possible in responding. The sum of these answers could well influence the thinking of top defense officials as they make decisions about training systems for the future.

This project is jointly sponsored by the U.S. Army and the Industrial College of the Armed Forces. This survey has been officially approved by the Department of the Army under the provisions of AR 600-46 and by the Department of the Air Force under provisions of AFR 178-9.

INSTRUCTIONS

--Your responses will not be discussed with members of your organization nor will any responses be individually identifiable. Each questionnaire is to be given a control number but that is for statistical control only. Your replies will remain anonymous and all data will be analyzed by groups or in total.

--Each question contains a list of responses. Circle the one(s) that <u>best</u> describes how <u>you</u> feel or think.

--If you think the questions does not apply to you or you have no idea of how to answer it, skip it.

--Half of each page has been left blank for your comments. In case you desire to comment, please use this space to clarify your responses with specific illustrations of what you mean or why you feel the way you do. In the event more space is needed, simply fold the page in half vertically and continue writing on the back of the page.

--Depending upon the different circumstances surrounding the issuance of the survey packet, you should return the completed questionnaire in one of the following three ways:

1. Put it the box specified (marked CAI Survey) when they are distributed
2. Put it in the box provided by your supervisor at the place indicated.
3. Mail it to: COL Gene T. Sherron
   ICAF
   Fort McNair
   Washington, D.C. 20319

--If you have any questions or wish to discuss the study, please contact COL Gene Sherron on site or call his office number--AUTOVON 223-8235 or (202)693-8235.

DEFINITIONS

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These phrases include such applications as interactive dialogues, simulations, drill and practice, and computations.

When acronyms like CTS are used in relationship to a particular service, they take on specific meanings. In those instances they will be precisely defined and accurately used in the report.

QUESTIONS

1. Based on your experience, which U.S. military service has made the most progress toward incorporating computer technology into its instructional system?

   1. Army
   2. Navy
   3. Marine Corps
   4. Air Force
   5. Coast Guard

2. Looking to the 1980s, which service do you feel will be the leader in the use of computers to assist in the instructional process?

   1. Army
   2. Navy
   3. Marine Corps
   4. Air Force
   5. Coast Guard

3. In comparison to all of the training in which your service is currently engaged, indicate to what extent you think it is using computers to assist in the instructional process?

   1. 0 to 5%
   2. 6 to 10%
   3. 11 to 20%
   4. 21 to 30%
   5. 31 to 50%
   6. Greater than 50%

4. Projecting to the 1980s, how much of the instruction will have some degree of computer support or involvement?

   1. 0 to 5%
   2. 6 to 10%
   3. 11 to 20%
   4. 21 to 35%
   5. 36 to 50%
   6. 51 to 66%
   7. 67 to 90%
   8. Greater than 90%

COMMENTS

QUESTIONS

COMMENTS

5. Again thinking toward the 1980s, where will initial specialty training take place? (The awarding of an MOS, AFSC, NEC, or sub-specialty code.)

   1. At any one of the many places where they are now being trained.
   2. Training will be centralized so that just a few large bases will do all of this type of training.
   3. The first duty station will also be the site of training which could range from on-the-job training to computerized training.
   4. Other _____

   _____

6. In the 1980s, what <u>three</u> instructional processes should be emphasized?

   1. Self-paced, individualized instruction
   2. Conventional classroom instruction
   3. Computerized instruction
   4. On-the-job training
   5. Self-directed (do-it-yourself) learning
   6. Unit or organizational training of the individual
   7. Other _____
   8. Other _____
   9. Other _____

7. Identify <u>two</u> driving forces that could cause a significant shift to the use of computers in the instructional process?

   1. Student acceptance
   2. Instructor motivated
   3. School staff influenced
   4. Training command direction
   5. Departmental (e.g., DA) directive
   6. Demonstrated cost effectiveness
   7. Direction of DOD
   8. Capacity to raise achievement scores
   9. Improved performance on the job
   10. Other _____
   11. Other _____

QUESTIONS

COMMENTS

8. To what extent do you agree or disagree with this statement?
As far as the military is concerned, we are beyond the question of the feasibility of using computers in training. Our goal now is to find the best ways of implementing computerized instruction.

   1. Strongly agree
   2. Agree
   3. Not sure
   4. Disagree
   5. Strongly disagree

9. As we move toward the 1980s, what will be two significant barriers or obstacles to the use of computer technology?

   1. Cost
   2. Attitude of the instructors
   3. Attitude of the staff
   4. Attitude of the students
   5. Hardware technology lacking
   6. Organizational climate
   7. Lack of good authoring languages
   8. Someone in authority to make a decision now
   9. Other_____

10. Projecting your thoughts into the 1980s, what will be the dominant mode of military instruction? (Definitions follow the responses)

   1. Conventional methods of instruction--classrooms, blackboards, books, etc.
   2. Computer managed instruction
   3. Tutorial computer assisted instruction
   4. Computer based simulations
   5. Computational computer assisted instruction
   6. A computerized training system which includes CMI, CAI, & other media
   7. The methods of today but with improved uses of TV, films, etc.

Computer managed instruction is the use of the computer as a classroom management tool. In this mode, the computer is used to grade tests, prescribe remedial work, direct lessons to be studied, designate media to be used, schedule equipment and media, and monitor student progress.

Tutorial computer assisted instruction is a technique where lesson material is presented to the student in an interactive dialogue, and responses to items are analyzed to assess how much has been learned from each phase of the presentation so that the program can modify the course or level of presentation.

Computer assisted simulation is an attempt to model a real life situation represented by a given set of parameters and circumstances stored in a computer. Conversation between the student and the computer results in the student obtaining an input-output process comparable to the information available in a real or idealized situation.

Computational computer assisted instruction is the use of the arithmetic power and speed of the computer to solve mathematical and logic type proglems which the student programs or formats for processing, usually via a remote terminal.

QUESTIONS	COMMENTS
11. Do you think that the use of the computer in the instructional process is bound to become less prevalent by the 1980s? 1. Strongly agree 2. Agree 3. Not sure 4. Disagree 5. Strongly disagree	
12. To what degree do you agree or disagree with this statement? The conventional 8 hour military training day, 5 days a week, using the normal lock step approach, will still be the dominant training technique in the 1980s. 1. Strongly agree 2. Agree 3. Not sure 4. Disagree 5. Strongly disagree	

QUESTIONS

COMMENTS

13. As a general concept, do you think the following statement would apply to your service?
Military instruction in the 1980s will be a fully computer directed instructional system where the computer becomes a surrogate instructor. It would direct the student's path throughout a course of instruction that could include scheduled group discussions, team training, tutorial computer assisted instruction or a closed circuit TV presentation. All systems would be designed to meet the individual student's experiences, abilities, and job requirements.

1. Strongly agree
2. Agree
3. Not sure
4. Disagree
5. Strongly disagree

14. How do you react to this statement?
Military training today is still very labor intensive. The augmentation of instructors by machines, such as computers, offers the most likely alterative to increase productivity in training for the future.

1. Strongly agree
2. Agree
3. Not sure
4. Disagree
5. Strongly disagree

15. How do you feel about this?
The youth of the 1980s could be motivated to enlist because of modern training methods, such as computer based instruction.

1. Strongly agree
2. Agree
3. Not sure
4. Disagree
5. Strongly disagree

QUESTIONS

COMMENTS

16. What are the top three benefits or advantages of the use of computers in the instructional process?

1. It saves money.
2. It saves time.
3. It produces quality instruction.
4. It is favored by students.
5. It has the flexibility to handle varying training loads.
6. It reduces the dropout (washout) rate.
7. It offers greater uniformity in the quality of training.
8. It is easier to be assured that educational objectives are met.
9. Its students perform better on the job.
10. Its ability to adapt to individual differences.
11. Other_____

17. What is your thought on this? The availability of some form of computerized instruction for career development throughout a service person's tour would have an influence on a decision to make the military a career.

1. Strongly agree
2. Agree
3. Not sure
4. Disagree
5. Strongly disagree

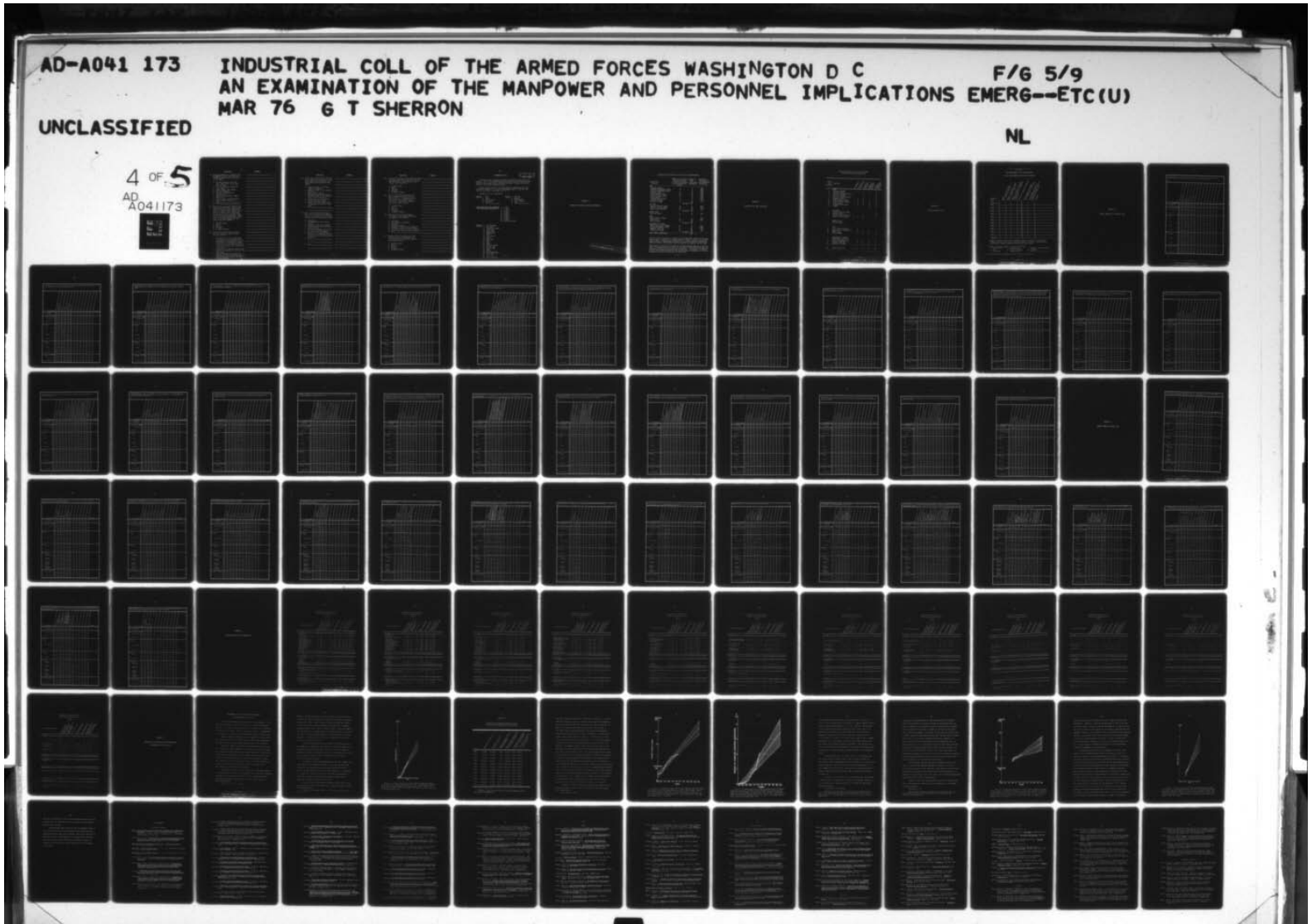
18. It is said that using computers in the instructional process substitutes some "capital" for "labor." Therefore, instructor spaces should be reduced by the future application of computers to training.

1. Strongly agree
2. Agree
3. Not sure
4. Disagree
5. Strongly disagree

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QUESTIONS

COMMENTS

19. What two categories of students could be most efficiently and effectively trained by computerized instruction in the 1980s?

    1. Enlisted personnel learning entry level skills (e.g., MOS, AFSC, or NEC)
    2. Enlisted personnel beyond the entry level
    3. Cadets (USMA, USNA, USAFA)
    4. Officer candidates
    5. Officers at the basic or advanced level
    6. Staff officer students (C&GSC, AFSC, etc.)
    7. Senior service college students (war colleges, ICAF, etc.)
    8. Other_____
    9. Other_____

20. Recent official surveys indicate that: Compared to the draftee, today's typical enlistee has a lower educational level, is several years younger, often enlists to learn a skill, and tends to sign up for a unit of choice which allows visits home on weekends. Therefore, training by computerized instruction will be more appropriate than using conventional methods.

    1. Strongly agree
    2. Agree
    3. Not sure
    4. Disagree
    5. Strongly disagree

21. With computerized training systems, how will instructors adapt to carry out their duties?

    1. Instructors will use a team effort or production line approach for the development of instructional material
    2. Instructors will prepare the educational part of the material and technicians will convert the material for the computer.
    3. Instructors will develop instructional material and prepare it for entry into the system
    4. Author-programmer instructors will prepare the instructional material and tutor-proctor instructors will deal with the students.

QUESTIONS

COMMENTS

22. Select one or more ways in which you think instructors, working with computer based training systems, will be selected for assignment in the 1980s?

1. Because of their prior knowledge of computers.
2. Because of their prior teaching experience.
3. Because they volunteer.
4. Because they possess a special MOS, AFSC, NEC, or sub-specialty code or skill identifier.
5. Because of their personality and aptitude test scores.
6. Without too much regard to any of the above, but more on availability.
7. Other_____

_____

23. What is your estimate of the <u>two</u> activities that will occupy most of the time of instructors in any future computer based instructional systems?

1. Programming
2. Developing and writing lesson material
3. Counseling individual students
4. Analyzing forms and doing administrative tasks
5. Instructing students on material not covered by the computer
6. Analysis of the educational objectives and translating them into tasks to achieve effectiveness of learning
7. Other_____

_____

8. Other_____

_____

QUESTIONS

COMMENTS

24. Instructors trained in using computer based training methods should be given a unique MOS, AFSC, NEC, or sub-specialty code or similar skill identifier.

1. Strongly agree
2. Agree
3. Not sure
4. Disagree
5. Strongly disagree

25. Just as proficiency and other skill pay is awarded to certain skills in the military, it is appropriate that this type of pay be authorized to instructors qualified in computerized instructional methods.

1. Strongly agree
2. Agree
3. Not sure
4. Disagree
5. Strongly disagree

26. What <u>two</u> factors will motivate an instructor in the computerized training systems of the future?

1. Extra pay
2. Satisfaction of teaching
3. Prestige
4. Freedom of action
5. Enjoyment of working with computers
6. Efficiency reports, fitness reports,
7. Pleasure of developing course material
8. Other _____

27. Computer based instruction will free instructors to do a great deal more individual work with students than was ever possible before.

1. Strongly agree
2. Agree
3. Not sure
4. Disagree
5. Strongly disagree

BIOGRAPHICAL DATA

Control Number

Different groups of people entertain differing opinions about this subject. So, it is intended that the data collected from this survey be analyzed on the whole and by different groupings. Please indicate your status in the various categories below.

There is no intention to use this method to identify you and your individual response. If you are uncomfortable about filling out this section, feel free to omit some or all of it.

Thank you for your cooperation.

SERVICE
1. Army
2. Navy
3. Marine Corps
4. Air Force
5. Other_____

STATUS
1. Enlisted
2. Warrant
3. Commissioned
4. Civil Service
5. Other_____

YEARS EXPERIENCE WITH COMPUTERS (in training or otherwise)
1. 1 year
2. 2 years
3. 3 years
4. 4 years
5. 5 years
6. 6 years
7. 7 years
8. 8 years
9. 9 years
10. 10 or more years

LOCATION
1. Fort Monmouth
2. San Diego
3. Twenty-nine Palms
4. Lowry AFB
5. Memphis NAS
6. Aberdeen PG
7. USNA
8. Fort Devens
9. ALMC
10. QM School
11. AFSC
12. ICAF
13. DODCI
14. Engineer School
15. Keesler AFB
16. Chanute AFB
17. USMA
18. Other_____
19. Def Sys Mgt Sch
20. Trans Sch

- - - - - - - - -

26. Msl & Muns Sch

[12]

APPENDIX C

SUMMARY OF INSTRUCTOR SURVEY RESPONDENTS

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SUMMARY OF INSTRUCTOR SURVEY RESPONDENTS

Service and Location	Number of Instructors Actively Involved in Using the Computer in the Instructional Process		Number of those Instructors Responding	Percentage Responding in the Respective Populations
ARMY				
Engineer School	2		2	100%
Logistics Management Center	8		8	100%
Missile & Munitions School	4		4	100%
Ordnance School	5		5	100%
Quartermaster School	23		23	100%
Security Agency School	53		53	100%
Signal School	9		9	100%
Transportation School	4		4	100%
Army War College	5		5	100%
Military Academy	a		41	----
		Sub-total	154	
AIR FORCE				
Chanute Training Center	8		8	100%
Keesler Training Center	10		10	100%
Lowry Training Center	24		24	100%
		Sub-total	42	
MARINE CORPS				
Com-Elec School	24		24	100%
NAVY				
S-3A Training Program	5		5	100%
Memphis NAS	74		74	100%
Naval Academy	b		43	----
		Sub-total	122	
DEPARTMENT OF DEFENSE				
Armed Forces Staff College	12		12	100%
Systems Management School	9		9	100%
Computer Institute	27		26	96%
Industrial College	20		20	100%
		Sub-total	67	
TOTAL SAMPLE POPULATION			409	

[a]Several hundred instructors at the Military Academy make some use of the computer support. Therefore, in seeking primarily "expert" opinion, the Academic Computer Advisory Committeemen identified only those instructors who were actively involved in the physical interface between the computer and the cadet.

[b]The majority of the 540 instructors at the Naval Academy make use of the computer. A program maintains a record of the amount of time each instructor and midshipmen assigned to his course use the computer. The director of computer services used the information from the program and his knowledge as to faculty experience to identify instructors for the survey.

APPENDIX D

TABULATION OF STAFF INTERVIEWS

TABULATION OF STAFF INTERVIEWS BY LOCATION AND POSITION

TOTALS by LOCATION	LOCATION	Commandant	Director of Instruction	Educational Adviser	Manpower/ Personnel Officer	Computer Development Officer
	ARMY					
2	Army War College		1			1
3	Engineer School			1	2	
6	Logistics Management Sch	1		1		4
1	Military Academy					1
3	Missile & Munitions Sch			1		2
4	Ordnance School		1	1	1	1
5	Quartermaster School		1	2		2
4	Security Agency School		1	1	1	1
4	Signal School		1	1	1	1
6	Transportation School		1	1	2	2
2	TRADOC				1	1
	AIR FORCE					
3	Chanute Training Center			2		1
3	Hanscom Field					3
3	Keesler Training Center	1		1		1
6	Lowry Training Center		1	1	1	3
	MARINE CORPS					
2	Com-Elec School		1	1		
	NAVY					
1	S-3A Training Program		1			
2	Basic Elec & Electron Sch		1			1
8	Memphis NAS		3	3	2	
7	Naval Academy		1	1	3	2
	DEPARTMENT OF DEFENSE					
5	Armed Forces Staff Col		1	2		2
5	Systems Management Sch		2	1	1	1
3	Computer Institute		1	1	1	
4	Industrial College			1	1	2
92	TOTAL by Position	2	18	23	17	32

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APPENDIX E

FOLLOW-ON SURVEY FORM

_____
location

THE DEVELOPMENT OF THE INSTRUCTIONAL

USE OF THE COMPUTER IN MILITARY TRAINING

Academic Year or Fiscal Year	Number of courses that use computer support*	Number of students trained with computer support*	Number of hours the student received computer supported training*	Mode(s) of computer support**	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Comments
1974							
1973							
1972							
1971							
1970							
1969							
1968							
1967							
1966							
1965							
1964							
1963***							

* Computer support is used in its broadest context. Consider it to include: computer assisted instruction, computer managed instruction, computer based instruction, computer supported instruction, and so forth.

** Modes of computer support are coded as follows:

1 - Tutorial CAI	4 - Computational	7 - Computer science education
2 - CMI	5 - Drill & practice	8 - Dialogue
3 - Simulation	6 - Administrative	9 - other _____

*** If prior data is available, please add as an attachment.

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APPENDIX F

SUMMARY SHEETS FOR INSTRUCTOR DATA

INSTRUCTOR QUESTION 1. Based on your experience, which U. S. military service has made the most progress toward incorporating computer technology into its instructional system?

		No response	Army	Navy	Marine Corps	Air Force								
response number		0	1.	2.	3.	4.								NOTES
TOTAL OBSERVATIONS All Services	#	104	86	105	11	103								
	%	25%	21%	26%	3%	25%								
OTHER SERVICES vs ARMY Other Services	#	60	13	94	11	58								
	%	25%	5%	40%	5%	25%								
Army Only	#	44	73	11	0	45								
	%	25%	43%	6%	0%	26%								
BY SERVICE Army	#	44	73	11	0	45								
	%	25%	43%	6%	0%	26%								
Navy	#	32	2	61	2	17								
	%	28%	2%	53%	2%	15%								
Marines	#	8	0	27	8	6								
	%	16%	0%	55%	16%	13%								
Air Force	#	14	10	3	1	32								
	%	23%	17%	5%	2%	53%								
BY STATUS Enlisted	#	22	28	62	4	23								
	%	16%	20%	45%	3%	16%								
Officers	#	52	29	20	2	51								
	%	34%	19%	13%	1%	33%								
Civilians	#	28	26	19	3	27								
	%	27%	25%	19%	3%	26%								
BY COMPUTER EXPERIENCE 1 Year	#	24	12	45	3	25								
	%	22%	11%	41%	3%	23%								
10 Years Plus	#	16	16	10	0	21								
	%	25%	25%	16%	0%	34%								

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INSTRUCTOR QUESTION 2. Looking to the 1980s, which service do you feel will be the leader in the use of computers to assist in the instructional process?

		No response	Army	Navy	Marine Corps	Air Force								
response number		0	1.	2.	3.	4.								NOTES
TOTAL OBSERVATIONS All Services	#	111	72	92	12	122								
	%	27%	18%	22%	3%	30%								
OTHER SERVICES vs ARMY Other Services	#	61	11	86	11	67								
	%	26%	5%	36%	5%	28%								
Army Only	#	50	61	6	1	55								
	%	29%	35%	3%	1%	32%								
BY SERVICE Army	#	50	61	6	1	55								
	%	29%	35%	3%	1%	32%								
Navy	#	33	4	60	1	16								
	%	29%	3%	53%	1%	14%								
Marines	#	10	2	21	9	7								
	%	21%	4%	43%	18%	14%								
Air Force	#	12	4	3	1	40								
	%	20%	7%	5%	2%	66%								
BY STATUS Enlisted	#	26	21	59	6	27								
	%	19%	15%	43%	4%	19%								
Officers	#	51	26	18	3	56								
	%	33%	17%	12%	2%	36%								
Civilians	#	30	23	12	2	36								
	%	29%	22%	12%	2%	35%								
BY COMPUTER EXPERIENCE 1 Year	#	22	12	37	6	32								
	%	20%	11%	34%	6%	29%								
10 Years Plus	#	13	19	8	0	23								
	%	21%	30%	13%	0%	36%								

INSTRUCTOR QUESTION 3. In comparison to all of the training in which your service is currently engaged, indicate to what extent you think it is using computers to assist in the instructional process?

		No response	0 to 5%	6 to 10%	11 to 20%	21 to 30%	31 to 50%	Greater than 50%							NOTES
response number		0	1.	2.	3.	4.	5.	6.							
TOTAL OBSERVATIONS All Services	#	23	135	118	71	32	18	12							
	%	6%	33%	29%	17%	8%	4%	3%							
OTHER SERVICES vs ARMY Other Services	#	14	72	70	44	16	10	10							
	%	6%	30%	30%	19%	7%	4%	4%							
Army Only	#	9	63	48	27	16	8	2							
	%	5%	36%	28%	16%	9%	5%	1%							
BY SERVICE Army	#	9	63	48	27	16	8	2							
	%	5%	36%	28%	16%	9%	5%	1%							
Navy	#	7	23	40	26	9	2	7							
	%	6%	20%	35%	23%	8%	2%	6%							
Marines	#	0	23	14	6	1	2	3							
	%	0%	47%	29%	12%	2%	4%	6%							
Air Force	#	6	24	10	9	6	5	0							
	%	10%	40%	17%	15%	10%	8%	0%							
BY STATUS Enlisted	#	4	37	32	36	12	8	10							
	%	3%	26%	23%	26%	9%	6%	7%							
Officers	#	13	54	54	20	9	2	2							
	%	9%	35%	35%	13%	6%	1%	1%							
Civilians	#	6	39	26	15	10	7	0							
	%	6%	38%	25%	14%	10%	7%	0%							
BY COMPUTER EXPERIENCE 1 Year	#	3	35	31	19	10	6	5							
	%	3%	32%	28%	17%	9%	6%	5%							
10 Years Plus	#	4	25	22	8	3	0	1							
	%	6%	40%	35%	13%	5%	0%	1%							

INSTRUCTOR QUESTION 4. Projecting to the 1980s, how much of the instruction will have some degree of computer support or involvement?

		No response	0 to 5%	6 to 10%	11 to 20%	21 to 35%	36 to 50%	51 to 66%	67 to 90%	Greater than 90%				NOTES
response number		0	1.	2.	3.	4.	5.	6.	7.	8.				
TOTAL OBSERVATIONS	#	27	5	39	67	70	75	51	54	21				
All Services	%	7%	1%	10%	16%	17%	18%	13%	13%	5%				
OTHER SERVICES vs ARMY	#	17	1	16	34	30	49	33	41	15				
Other Services	%	7%	1%	7%	14%	13%	21%	14%	17%	6%				
Army Only	#	10	4	23	33	40	26	18	13	6				
	%	6%	2%	13%	19%	23%	15%	10%	8%	4%				
BY SERVICE	#	10	4	23	33	40	26	18	13	6				
Army	%	6%	2%	13%	19%	23%	15%	10%	7%	3%				
Navy	#	9	0	4	14	16	26	17	18	10				
	%	8%	0%	3%	12%	14%	23%	15%	16%	9%				
Marines	#	3	0	4	6	3	9	6	16	2				
	%	6%	0%	8%	12%	6%	19%	12%	33%	4%				
Air Force	#	4	1	6	7	11	13	8	7	3				
	%	7%	2%	10%	12%	18%	21%	13%	12%	5%				
BY STATUS	#	11	0	7	9	13	27	23	36	13				
Enlisted	%	8%	0%	5%	7%	9%	19%	17%	26%	9%				
Officers	#	12	4	21	36	36	20	11	11	3				
	%	8%	3%	14%	23%	23%	13%	7%	7%	2%				
Civilians	#	4	1	10	20	20	22	16	5	5				
	%	4%	1%	9%	19%	19%	21%	15%	5%	5%				
BY COMPUTER EXPERIENCE	#	10	0	6	12	19	20	17	17	8				
1 Year	%	9%	0%	6%	11%	17%	18%	16%	16%	7%				
10 Years Plus	#	2	1	10	18	11	7	9	3	2				
	%	3%	2%	16%	29%	17%	11%	14%	5%	3%				

INSTRUCTOR QUESTION 5. Again thinking toward the 1980s, where will initial specialty training take place? (The awarding of an MOS, AFSC, NEC or sub-specialty code)

		No response	At any one of the many places where they are now being trained.	Training will be centralized so that just a few large bases will do all of this type of training.	The first duty station will also be the site of training which could range from on-the-job training to computerized training.	Other								
response number		0	1.	2.	3.	4.								NOTES
TOTAL OBSERVATIONS	#	39	101	206	54	9								
All Services	%	10%	25%	50%	13%	2%								
OTHER SERVICES vs ARMY	#	24	52	121	32	7								
Other Services	%	10%	22%	51%	14%	3%								
Army Only	#	15	49	85	22	2								
	%	9%	28%	49%	13%	1%								
BY SERVICE	#	15	49	85	22	2								
Army	%	9%	28%	49%	13%	1%								
Navy	#	16	23	54	19	2								
	%	14%	20%	47%	17%	2%								
Marines	#	4	11	31	3	0								
	%	8%	23%	63%	6%	0%								
Air Force	#	1	14	31	9	5								
	%	2%	23%	52%	15%	8%								
BY STATUS	#	7	24	87	19	2								
Enlisted	%	5%	17%	63%	14%	1%								
Officers	#	16	46	67	20	5								
	%	10%	30%	44%	13%	3%								
Civilians	#	16	28	45	12	2								
	%	15%	27%	44%	12%	2%								
BY COMPUTER EXPERIENCE	#	9	19	69	11	1								
1 Year	%	8%	18%	63%	10%	1%								
10 Years Plus	#	4	18	28	11	2								
	%	6%	29%	44%	18%	3%								

INSTRUCTOR QUESTION 6. In the 1980s, what <u>three</u> instructional processes should be emphasized?

		No response	Self-paced, individual instruction	Conventional classroom instruction	Computerized instruction	On-the-job training	Self-directed (do-it-yourself) learning	Unit or organizational of the individual	Other					
response number		0	1.	2.	3.	4.	5.	6.	7.					NOTES
TOTAL OBSERVATIONS All Services	#	134	277	177	247	222	56	104	17					
	%	11%	23%	14%	20%	18%	5%	8%	1%					
OTHER SERVICES vs ARMY Other Services	#	63	166	107	141	134	27	59	11					
	%	9%	23%	15%	20%	19%	4%	8%	2%					
Army Only	#	65	111	70	106	88	29	45	5					
	%	13%	21%	13%	20%	17%	6%	9%	1%					
BY SERVICE Army	#	65	111	70	106	88	29	45	5					
	%	13%	21%	13%	20%	17%	6%	9%	1%					
Navy	#	36	71	51	63	63	19	32	8					
	%	10%	22%	15%	18%	18%	6%	9%	2%					
Marines	#	8	43	19	31	28	28	12	0					
	%	5%	25%	11%	18%	17%	17%	7%	0%					
Air Force	#	15	46	27	41	36	36	9	3					
	%	7%	22%	13%	19%	17%	17%	4%	1%					
BY STATUS Enlisted	#	48	110	46	86	75	11	38	3					
	%	12%	25%	11%	21%	18%	3%	9%	1%					
Officers	#	52	81	80	84	87	26	47	5					
	%	11%	18%	17%	18%	19%	6%	10%	1%					
Civilians	#	28	76	47	68	50	18	17	0					
	%	9%	26%	15%	22%	16%	6%	6%	0%					
BY COMPUTER EXPERIENCE 1 Year	#	42	82	49	58	56	12	27	1					
	%	13%	25%	15%	18%	17%	4%	8%	0%					
10 Years Plus	#	15	40	31	42	36	8	14	3					
	%	8%	21%	16%	23%	19%	4%	7%	2%					

INSTRUCTOR QUESTION 7. Identify two driving forces that could cause a significant shift to the use of computers in the instructional process?

		No response	Student acceptance	Instructor motivated	School staff influenced	Training command direction	Departmental (e.g.,DA) directive	Demonstrated cost effectiveness	Direction of DOD	Capacity to raise achievement scores	Improved performance on the job	Other		NOTES
response number		0	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.		
TOTAL OBSERVATIONS All Services	#	40	94	84	48	61	44	167	64	43	145	30		
	%	5%	11%	10%	6%	7%	5%	21%	8%	5%	18%	4%		
OTHER SERVICES vs ARMY Other Services	#	25	62	32	19	33	18	96	41	28	85	17		
	%	5%	14%	7%	4%	7%	4%	21%	9%	6%	19%	4%		
Army Only	#	15	32	34	29	28	26	71	23	15	60	13		
	%	4%	9%	10%	8%	8%	8%	21%	7%	4%	17%	4%		
BY SERVICE Army	#	15	32	34	29	28	26	71	23	15	60	13		
	%	4%	9%	10%	8%	8%	8%	21%	7%	4%	17%	4%		
Navy	#	16	33	24	13	20	10	37	20	14	31	9		
	%	7%	15%	11%	6%	9%	4%	15%	9%	6%	14%	4%		
Marines	#	3	12	11	4	3	3	22	5	9	25	1		
	%	3%	12%	11%	4%	3%	3%	22%	5%	9%	27%	1%		
Air Force	#	3	15	9	1	8	3	32	14	4	28	2		
	%	3%	12%	8%	1%	7%	3%	26%	12%	3%	23%	2%		
BY STATUS Enlisted	#	16	38	27	19	25	13	52	15	19	48	6		
	%	6%	15%	10%	7%	9%	5%	21%	5%	7%	17%	2%		
Officers	#	10	29	33	19	19	17	66	30	14	56	16		
	%	3%	9%	11%	6%	6%	6%	21%	10%	5%	18%	5%		
Civilians	#	13	26	19	8	16	11	44	17	8	37	9		
	%	6%	13%	9%	4%	8%	5%	21%	8%	4%	18%	4%		
BY COMPUTER EXPERIENCE 1 Year	#	2	29	22	10	17	20	46	15	12	44	4		
	%	1%	13%	10%	5%	8%	9%	23%	7%	5%	20%	2%		
10 Years Plus	#	3	11	13	9	5	7	32	12	8	25	6		
	%	2%	8%	10%	7%	4%	5%	25%	9%	6%	19%	5%		

INSTRUCTOR QUESTION 8. To what extent do you agree or disagree with this statement? As far as the military is concerned, we are beyond the question of the feasibility of using computers in training. Our goal now is to find the best ways of implementing computerized instruction.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							NOTES
response number		0	1.	2.	3.	4.	5.							
TOTAL OBSERVATIONS All Services	#	8	131	165	49	38	18							
	%	2%	32%	40%	12%	9%	5%							
OTHER SERVICES vs ARMY Other Services	#	4	80	97	27	20	8							
	%	2%	34%	41%	11%	9%	3%							
Army Only	#	4	51	68	22	18	10							
	%	2%	30%	39%	13%	10%	6%							
BY SERVICE Army	#	4	51	68	22	18	10							
	%	2%	30%	39%	13%	10%	6%							
Navy	#	2	40	39	16	12	5							
	%	2%	35%	34%	14%	11%	4%							
Marines	#	1	17	23	4	3	1							
	%	2%	35%	47%	8%	6%	2%							
Air Force	#	1	19	28	5	5	2							
	%	2%	32%	47%	8%	8%	3%							
BY STATUS Enlisted	#	5	43	49	21	14	7							
	%	4%	31%	35%	15%	10%	5%							
Officers	#	1	41	70	20	15	7							
	%	1%	27%	45%	13%	10%	4%							
Civilians	#	2	41	43	6	8	3							
	%	2%	40%	42%	6%	7%	3%							
BY COMPUTER EXPERIENCE 1 Year	#	3	28	47	17	11	3							
	%	3%	26%	43%	15%	10%	3%							
10 Years Plus	#	0	25	25	9	4	0							
	%	0%	40%	40%	14%	6%	0%							

INSTRUCTOR QUESTION 9. As we move toward the 1980s, what will be two significant barriers or obstacles to the use of computer technology?

		No response	Cost	Attitude of the instructors	Attitude of the staff	Attitude of the students	Hardware technology lacking	Organizational climate	Lack of good authoring languages	Someone in authority to make a decision now	Other			NOTES
response number		0	1.	2.	3.	4.	5.	6.	7.	8.	9.			
TOTAL OBSERVATIONS All Services	#	49	201	123	69	65	32	82	32	109	56			
	%	6%	25%	15%	8%	8%	4%	10%	4%	13%	7%			
OTHER SERVICES vs ARMY														
Other Services	#	21	102	74	39	42	14	51	19	65	35			
	%	5%	22%	16%	8%	9%	3%	11%	4%	14%	8%			
Army Only	#	18	99	49	30	23	18	31	13	44	21			
	%	5%	37%	14%	9%	7%	5%	9%	4%	14%	6%			
BY SERVICE														
Army	#	18	99	49	30	23	18	31	13	44	21			
	%	5%	31%	14%	9%	7%	5%	9%	4%	14%	6%			
Navy	#	18	46	45	16	25	8	26	6	28	10			
	%	8%	20%	20%	7%	11%	4%	11%	3%	12%	4%			
Marines	#	4	26	16	6	7	4	10	4	14	7			
	%	4%	28%	16%	6%	7%	4%	10%	4%	14%	7%			
Air Force	#	6	26	9	15	10	2	13	6	20	13			
	%	5%	24%	8%	13%	9%	2%	12%	5%	19%	11%			
BY STATUS														
Enlisted	#	18	80	53	16	28	15	17	7	33	11			
	%	6%	29%	19%	6%	10%	5%	6%	3%	12%	4%			
Officers	#	18	69	41	28	27	10	40	15	38	22			
	%	6%	23%	13%	9%	9%	3%	13%	5%	12%	7%			
Civilians	#	12	46	24	21	9	6	23	10	35	20			
	%	6%	22%	12%	10%	4%	3%	11%	5%	17%	10%			
BY COMPUTER EXPERIENCE														
1 Year	#	13	62	42	15	19	13	17	9	22	6			
	%	6%	28%	19%	7%	9%	6%	8%	4%	10%	3%			
10 Years Plus	#	5	33	15	14	6	2	14	7	17	13			
	%	4%	26%	12%	11%	5%	2%	11%	6%	13%	10%			

INSTRUCTOR QUESTION 10. Projecting your thoughts into the 1980s, what will be the dominant mode of military instruction?

		No response	Conventional methods of instruction--classrooms, blackboards, books, etc.	Computer managed instruction	Tutorial computer assisted instruction	Computer based simulations	Computational computer assisted instruction	A computerized training system which includes CMI, CAI, and other media	The methods of today but with improved uses of TV, films, etc.					
response number		0	1.	2.	3.	4.	5.	6.	7.					NOTES
TOTAL OBSERVATIONS All Services	#	18	70	57	34	19	9	121	81					
	%	4%	17%	14%	8%	5%	2%	30%	20%					
OTHER SERVICES vs ARMY Other Services	#	4	33	35	22	11	4	85	42					
	%	2%	14%	15%	9%	4%	2%	36%	18%					
Army Only	#	14	37	22	12	8	5	36	39					
	%	8%	21%	13%	7%	5%	3%	21%	22%					
BY SERVICE Army	#	14	37	22	12	8	5	36	39					
	%	8%	21%	13%	7%	5%	3%	21%	22%					
Navy	#	1	19	21	6	5	1	40	21					
	%	1%	17%	19%	5%	4%	1%	35%	18%					
Marines	#	1	4	7	6	2	1	19	9					
	%	2%	8%	14%	12%	4%	2%	39%	19%					
Air Force	#	1	7	7	9	4	2	22	8					
	%	2%	12%	12%	15%	7%	3%	36%	13%					
BY STATUS Enlisted	#	7	14	28	10	6	3	51	20					
	%	5%	10%	20%	7%	4%	2%	37%	15%					
Officers	#	4	40	12	13	7	3	35	40					
	%	3%	26%	8%	8%	4%	2%	23%	26%					
Civilians	#	6	16	14	11	5	3	30	18					
	%	5%	15%	14%	11%	5%	3%	30%	17%					
BY COMPUTER EXPERIENCE 1 Year	#	7	12	23	7	6	3	33	18					
	%	6%	11%	21%	6%	6%	3%	30%	17%					
10 Years Plus	#	2	15	3	4	2	2	21	14					
	%	3%	24%	5%	7%	3%	3%	33%	22%					

INSTRUCTOR QUESTION 11. Do you think that the use of the computer in the instructional process is bound to become less prevalent by the 1980s?

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							
response number		0	1.	2.	3.	4.	5.							NOTES
TOTAL OBSERVATIONS All Services	#	9	5	12	34	201	148							
	%	2%	1%	3%	9%	49%	36%							
OTHER SERVICES vs ARMY Other Services	#	7	3	6	17	110	93							
	%	3%	1%	3%	9%	46%	38%							
Army Only	#	2	2	6	17	91	55							
	%	1%	1%	3%	10%	53%	32%							
BY SERVICE Army	#	2	2	6	17	91	55							
	%	1%	1%	3%	10%	52%	32%							
Navy	#	3	3	2	10	50	46							
	%	3%	3%	1%	9%	44%	40%							
Marines	#	3	0	3	6	22	15							
	%	6%	0%	6%	12%	45%	31%							
Air Force	#	1	0	0	1	33	25							
	%	2%	0%	0%	2%	55%	41%							
BY STATUS Enlisted	#	5	3	5	20	77	29							
	%	4%	2%	4%	14%	55%	21%							
Officers	#	2	0	5	8	81	58							
	%	1%	0%	3%	5%	53%	38%							
Civilians	#	2	1	2	6	40	52							
	%	2%	1%	2%	6%	39%	50%							
BY COMPUTER EXPERIENCE 1 Year	#	4	2	5	12	62	24							
	%	4%	1%	5%	11%	57%	22%							
10 Years Plus	#	0	1	1	4	30	27							
	%	0%	2%	2%	6%	47%	43%							

INSTRUCTOR QUESTION 12. To what degree do you agree or disagree with this statement? The conventional 8 hour military training day, 5 days a week, using the normal lock-step approach, will still be the dominant training technique in the 1980s.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							
response number		0	1.	2.	3.	4.	5.							NOTES
TOTAL OBSERVATIONS	#	6	19	92	63	141	88							
All Services	%	1%	5%	23%	15%	34%	22%							
OTHER SERVICES vs ARMY	#	3	7	40	34	92	60							
Other Services	%	1%	3%	17%	14%	39%	26%							
Army Only	#	3	12	52	29	49	28							
	%	2%	7%	30%	17%	28%	16%							
BY SERVICE	#	3	12	52	29	49	28							
Army	%	2%	7%	30%	17%	28%	16%							
Navy	#	1	2	21	17	47	26							
	%	1%	2%	18%	15%	41%	23%							
Marines	#	1	2	6	7	18	15							
	%	2%	4%	12%	14%	37%	31%							
Air Force	#	1	2	9	9	23	16							
	%	2%	3%	15%	15%	38%	27%							
BY STATUS	#	2	4	17	20	63	33							
Enlisted	%	2%	3%	12%	14%	45%	24%							
Officers	#	2	9	48	28	44	23							
	%	1%	6%	31%	18%	29%	15%							
Civilians	#	2	6	26	12	30	27							
	%	2%	6%	25%	12%	29%	26%							
BY COMPUTER EXPERIENCE	#	1	8	19	20	44	17							
1 Year	%	1%	7%	17%	18%	41%	16%							
10 Years Plus	#	0	3	11	11	23	16							
	%	0%	3%	18%	18%	36%	25%							

INSTRUCTOR QUESTION 13. As a general concept, do you think the following statement would apply to your service? Military instruction in the 1980s will be a fully computer directed instructional system where the computer becomes a surrogate instructor. It would direct the student's path throughout a course of instruction that could include scheduled group discussions, team training, tutorial computer assisted instruction or a closed circuit TV presentation. All systems would be designed to meet the individual student's experiences, abilities, and job requirements.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							
response number		0	1.	2.	3.	4.	5.							NOTES
TOTAL OBSERVATIONS All Services	#	8	32	82	79	143	65							
	%	2%	8%	20%	19%	35%	16%							
OTHER SERVICES vs ARMY Other Services	#	6	14	57	47	81	31							
	%	3%	6%	24%	20%	34%	13%							
Army Only	#	2	18	25	32	62	34							
	%	1%	10%	14%	19%	36%	20%							
BY SERVICE Army	#	2	18	25	32	62	34							
	%	1%	10%	14%	19%	36%	20%							
Navy	#	3	7	26	26	38	14							
	%	3%	6%	23%	23%	33%	12%							
Marines	#	0	4	18	9	15	3							
	%	0%	8%	37%	18%	31%	6%							
Air Force	#	2	3	13	11	21	10							
	%	3%	5%	22%	18%	35%	17%							
BY STATUS Enlisted	#	2	15	43	33	32	14							
	%	1%	11%	31%	24%	23%	10%							
Officers	#	1	4	19	24	76	30							
	%	1%	3%	12%	16%	49%	19%							
Civilians	#	5	12	19	20	28	19							
	%	5%	12%	18%	20%	27%	18%							
BY COMPUTER EXPERIENCE 1 Year	#	2	12	31	25	28	11							
	%	2%	11%	28%	23%	26%	10%							
10 Years Plus	#	0	4	7	16	25	11							
	%	0%	6%	11%	25%	40%	18%							

INSTRUCTOR QUESTION 14. How do you react to this statement? Military training today is still very labor intensive. The augmentation of instructors by machines, such as computers, offers the most likely alterative to increase productivity in training for the future.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							NOTES
response number		0	1.	2.	3.	4.	5.							
TOTAL OBSERVATIONS All Services	#	10	73	199	57	49	21							
	%	2%	18%	49%	14%	12%	5%							
OTHER SERVICES vs ARMY Other Services	#	7	34	115	34	33	13							
	%	3%	14%	49%	14%	14%	6%							
Army Only	#	3	39	84	23	16	8							
	%	2%	23%	48%	13%	9%	5%							
BY SERVICE Army	#	3	39	84	23	16	8							
	%	2%	23%	48%	13%	9%	5%							
Navy	#	3	14	56	14	17	10							
	%	3%	12%	49%	12%	15%	9%							
Marines	#	2	6	25	8	7	1							
	%	4%	12%	50%	17%	15%	2%							
Air Force	#	2	13	28	8	8	1							
	%	3%	22%	47%	13%	13%	2%							
BY STATUS Enlisted	#	5	23	65	20	17	9							
	%	4%	17%	47%	14%	12%	6%							
Officers	#	1	31	76	21	18	7							
	%	1%	20%	49%	14%	12%	4%							
Civilians	#	3	16	52	15	13	4							
	%	3%	15%	50%	15%	13%	4%							
BY COMPUTER EXPERIENCE 1 Year	#	4	17	49	21	13	5							
	%	4%	16%	45%	19%	12%	4%							
10 Years Plus	#	0	12	31	9	9	2							
	%	0%	19%	50%	14%	14%	3%							

INSTRUCTOR QUESTION 15. How do you feel about this? The youth of the 1980s could be motivated to enlist because of modern training methods, such as computer based instruction.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							
response number		0	1.	2.	3.	4.	5.							NOTES
TOTAL OBSERVATIONS All Services	#	9	33	115	76	124	52							
	%	2%	8%	28%	19%	30%	13%							
OTHER SERVICES vs ARMY	#	5	17	65	46	72	31							
Other Services	%	2%	7%	28%	19%	31%	13%							
Army Only	#	4	16	50	30	52	21							
	%	3%	9%	29%	17%	30%	12%							
BY SERVICE Army	#	4	16	50	30	52	21							
	%	3%	9%	29%	17%	30%	12%							
Navy	#	1	8	28	25	37	15							
	%	1%	7%	25%	22%	32%	13%							
Marines	#	0	4	20	6	13	6							
	%	0%	8%	41%	12%	27%	12%							
Air Force	#	3	5	16	13	17	6							
	%	4%	8%	27%	23%	28%	10%							
BY STATUS Enlisted	#	1	13	48	24	35	18							
	%	1%	9%	35%	17%	25%	13%							
Officers	#	3	5	36	33	58	19							
	%	2%	3%	24%	21%	38%	12%							
Civilians	#	5	13	29	18	27	11							
	%	5%	13%	28%	17%	26%	11%							
BY COMPUTER EXPERIENCE 1 Year	#	2	4	37	22	32	12							
	%	2%	4%	34%	20%	29%	11%							
10 Years Plus	#	0	5	17	12	24	5							
	%	0%	8%	27%	19%	38%	8%							

INSTRUCTOR QUESTION 16. What are the top three benefits or advantages of the use of computers in the instructional process?

		No response	It saves money	It saves time	It produces quality instruction	It is favored by students	It has the flexibility to handle varying training loads	It reduces the dropout (washout) rate	It offers greater uniformity in the quality of training	It is easier to be assured that educational objectives are met	Its students perform better on the job	Its ability to adapt to individual differences	Other	
response number		0	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	NOTES
TOTAL OBSERVATIONS	#	170	68	187	75	23	167	29	208	115	14	137		
All Services	%	13%	6%	16%	6%	2%	13%	2%	19%	10%	1%	12%	1%	
THER SERVICES vs ARMY	#	108	43	106	38	13	94	19	112	70	5	100	1	
Other Services	%	15%	6%	15%	5%	2%	13%	3%	16%	10%	1%	14%	0%	
Army Only	#	63	25	81	37	10	73	10	96	45	9	60	3	
	%	12%	5%	16%	7%	2%	14%	2%	19%	9%	2%	11%	1%	
SERVICE	#	63	25	81	37	10	73	10	96	45	9	60	3	
Army	%	12%	5%	16%	7%	2%	14%	2%	19%	9%	2%	11%	1%	
Navy	#	66	26	61	13	5	49	6	41	31	1	32	1	
	%	19%	8%	17%	4%	2%	15%	2%	12%	9%	1%	10%	1%	
Marines	#	19	5	24	12	3	12	9	16	31	6	15	0	
	%	13%	3%	16%	8%	2%	8%	6%	11%	19%	4%	10%	0%	
Air Force	#	12	10	21	13	4	27	4	35	18	1	27	0	
	%	7%	6%	12%	8%	2%	16%	2%	20%	10%	1%	16%	0%	
STATUS	#	71	29	76	22	6	40	15	67	35	4	37	3	
Enlisted	%	18%	7%	19%	5%	1%	10%	4%	17%	8%	1%	9%	1%	
Officers	#	63	26	71	28	5	69	5	90	37	7	49	1	
	%	14%	6%	16%	6%	1%	15%	1%	20%	8%	2%	10%	1%	
Civilians	#	29	13	38	22	12	41	8	44	38	4	47	0	
	%	10%	4%	13%	7%	4%	14%	3%	15%	13%	1%	16%	0%	
COMPUTER EXPERIENCE	#	53	22	55	16	2	40	10	55	34	2	33	0	
1 Year	%	16%	7%	17%	5%	1%	12%	3%	17%	11%	1%	10%	0%	
10 Years Plus	#	15	11	22	12	3	33	3	29	21	3	32	2	
	%	7%	6%	12%	6%	2%	18%	2%	16%	11%	2%	17%	1%	

INSTRUCTOR QUESTION 17. What is your thought on this? The availability of some form of computerized instruction for career development throughout a service person's tour would have an influence on a decision to make the military a career.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							NOTES
response number		0	1.	2.	3.	4.	5.							
TOTAL OBSERVATIONS All Services	#	13	25	114	103	124	30							
	%	3%	6%	28%	25%	30%	8%							
OTHER SERVICES vs ARMY Other Services	#	9	16	67	59	69	16							
	%	4%	7%	28%	25%	29%	7%							
Army Only	#	4	9	47	44	55	14							
	%	2%	5%	27%	26%	32%	8%							
BY SERVICE Army	#	4	9	47	44	55	14							
	%	2%	5%	27%	26%	32%	8%							
Navy	#	5	5	30	27	41	6							
	%	4%	4%	27%	24%	36%	5%							
Marines	#	1	6	20	12	8	2							
	%	2%	12%	41%	25%	16%	4%							
Air Force	#	2	5	15	16	16	6							
	%	3%	8%	25%	27%	27%	10%							
BY STATUS Enlisted	#	2	10	46	37	33	11							
	%	1%	7%	33%	27%	24%	8%							
Officers	#	5	3	32	36	63	15							
	%	3%	2%	21%	23%	41%	10%							
Civilians	#	6	11	32	27	24	3							
	%	6%	11%	31%	26%	23%	3%							
BY COMPUTER EXPERIENCE 1 Year	#	3	5	44	23	27	7							
	%	3%	5%	40%	21%	25%	6%							
10 Years Plus	#	1	4	12	16	27	3							
	%	2%	6%	19%	25%	43%	5%							

INSTRUCTOR QUESTION 18. Is is said that using computers in the instructional process substitutes some "capital" for "labor." Therefore, instructor spaces should be reduced by the future application of computers to training.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							NOTES
response number		0	1.	2.	3.	4.	5.							
TOTAL OBSERVATIONS All Services	#	14	17	122	80	122	54							
	%	3%	4%	30%	20%	30%	13%							
OTHER SERVICES vs ARMY Other Services	#	9	9	69	49	66	34							
	%	4%	4%	29%	21%	28%	14%							
Army Only	#	5	8	53	31	56	20							
	%	3%	5%	37%	18%	32%	11%							
BY SERVICE Army	#	5	8	53	31	56	20							
	%	3%	5%	31%	18%	32%	11%							
Navy	#	5	1	29	30	29	20							
	%	5%	1%	25%	26%	25%	18%							
Marines	#	0	4	21	4	13	7							
	%	0	8%	43%	8%	27%	14%							
Air Force	#	2	4	15	13	19	7							
	%	3%	6%	25%	22%	32%	12%							
BY STATUS Enlisted	#	4	6	44	27	35	23							
	%	3%	4%	32%	19%	25%	17%							
Officers	#	5	4	52	26	51	16							
	%	3%	3%	34%	17%	33%	10%							
Civilians	#	5	7	24	21	33	13							
	%	5%	7%	23%	20%	32%	13%							
BY COMPUTER EXPERIENCE 1 Year	#	5	4	35	25	28	12							
	%	5%	4%	32%	23%	25%	11%							
10 Years Plus	#	0	3	20	9	27	4							
	%	0%	5%	32%	14%	43%	6%							

INSTRUCTOR QUESTION 19. What two categories of students could be most efficiently and effectively trained by computerized instruction in the 1980s?

		No response	Enlisted personnel learning entry level skills (e.g., MOS, AFSC, or NEC)	Enlisted personnel beyond the entry level	Cadets (USMA, USNA, USAFA)	Officer candidates	Officers at the basic or advanced level	Staff officer students (C&GSC, AFSC, etc.)	Senior service college students (war colleges, ICAF, etc.)	Other				NOTES
response number		0	1.	2.	3.	4.	5.	6.	7.	8.				
TOTAL OBSERVATIONS	#	101	251	140	81	46	123	30	27	19				
All Services	%	12%	31%	17%	10%	6%	15%	4%	3%	2%				
OTHER SERVICES vs ARMY	#	71	150	81	47	30	52	10	15	16				
Other Services	%	15%	33%	17%	10%	6%	11%	2%	3%	3%				
Army Only	#	30	101	59	34	16	71	20	12	3				
	%	9%	28%	17%	10%	5%	21%	6%	3%	1%				
BY SERVICE	#													
Army		30	101	59	34	16	71	20	12	3				
	%	9%	28%	17%	10%	5%	21%	6%	3%	1%				
Navy	#	36	70	41	25	17	20	4	11	5				
	%	16%	30%	18%	11%	7%	9%	2%	5%	2%				
Marines	#	11	37	19	5	6	13	2	4	1				
	%	11%	39%	19%	5%	6%	13%	2%	4%	1%				
Air Force	#	19	36	20	15	5	16	3	1	5				
	%	16%	29%	17%	13%	4%	13%	3%	1%	4%				
BY STATUS	#													
Enlisted		32	107	49	17	16	39	6	7	5				
	%	12%	37%	18%	6%	6%	14%	2%	3%	2%				
Officers	#	36	75	55	41	18	50	17	9	7				
	%	12%	24%	18%	13%	6%	16%	6%	3%	2%				
Civilians	#	30	60	30	21	11	31	6	11	5				
	%	15%	30%	15%	10%	5%	15%	3%	5%	2%				
BY COMPUTER EXPERIENCE	#	27	79	39	21	11	29	4	4	4				
1 Year	%	12%	36%	18%	10%	5%	13%	2%	2%	2%				
10 Years Plus	#	13	29	25	10	9	23	5	6	4				
	%	10%	24%	20%	8%	7%	19%	4%	5%	3%				

INSTRUCTOR QUESTION 20. Recent official surveys indicate that: Compared to the draftee, today's typical enlistee has a lower educational level, is several years younger, often enlists to learn a skill, and tends to sign up for a unit of choice which allows visits home on weekends. Therefore, training by computerized instruction will be more appropriate than using conventional methods.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							NOTES
response number		0	1.	2.	3.	4.	5.							
TOTAL OBSERVATIONS All Services	#	21	32	107	114	95	40							
	%	5%	8%	26%	28%	23%	10%							
OTHER SERVICES vs ARMY Other Services	#	10	14	72	68	49	23							
	%	4%	6%	30%	29%	21%	10%							
Army Only	#	11	18	35	46	46	17							
	%	6%	10%	20%	27%	27%	10%							
BY SERVICE Army	#	11	18	35	46	46	17							
	%	6%	10%	20%	27%	27%	10%							
Navy	#	6	6	34	31	25	12							
	%	5%	5%	30%	27%	22%	11%							
Marines	#	1	7	18	12	7	4							
	%	2%	14%	37%	25%	14%	8%							
Air Force	#	1	1	16	20	15	7							
	%	2%	2%	27%	33%	25%	11%							
BY STATUS Enlisted	#	5	13	47	35	22	17							
	%	4%	9%	34%	25%	16%	12%							
Officers	#	9	7	29	42	49	18							
	%	6%	4%	19%	27%	32%	12%							
Civilians	#	7	11	28	32	22	3							
	%	7%	11%	27%	31%	21%	3%							
BY COMPUTER EXPERIENCE 1 Year	#	6	6	29	39	21	8							
	%	5%	5%	27%	36%	19%	8%							
10 Years Plus	#	1	6	16	23	16	1							
	%	2%	10%	25%	36%	25%	2%							

INSTRUCTOR QUESTION 21. With computerized training systems, how will instructors adapt to carry out their duties?

		No response	Instructors will use a team effort or production line approach for the development of instructional material.	Instructors will prepare the education-al part of the material and technicians will convert the material for the computer	Instructors will develop instructional material and prepare it for entry into the system.	Author-programmer instructors will prepare the instructional material and tutor-proctor instructors deal with the students.								
response number		0	1.	2.	3.	4.								NOTES
TOTAL OBSERVATIONS	#	31	45	104	81	148								
All Services	%	8%	11%	25%	20%	36%								
OTHER SERVICES vs ARMY	#	15	25	49	56	91								
Other Services	%	6%	11%	21%	24%	38%								
Army Only	#	16	20	55	25	57								
	%	9%	12%	32%	14%	33%								
BY SERVICE	#	16	20	55	25	57								
Army	%	9%	11%	32%	14%	33%								
Navy	#	9	15	22	22	46								
	%	8%	13%	19%	19%	41%								
Marines	#	2	4	4	20	19								
	%	4%	8%	8%	41%	39%								
Air Force	#	1	4	19	13	23								
	%	2%	6%	32%	22%	38%								
BY STATUS	#	12	19	32	23	53								
Enlisted	%	9%	14%	23%	16%	38%								
Officers	#	11	18	39	27	59								
	%	7%	12%	25%	18%	38%								
Civilians	#	7	7	31	25	33								
	%	7%	7%	30%	24%	32%								
BY COMPUTER EXPERIENCE	#	12	16	26	19	36								
1 Year	%	11%	15%	24%	17%	33%								
10 Years Plus	#	0	7	13	12	31								
	%	0%	11%	21%	19%	49%								

INSTRUCTOR QUESTION 22. Select one or more ways in which you think instructors, working with computer based training systems, will be selected for assignment in the 1980s?

response number		1. Because of their prior knowledge of computers.	2. Because of their prior teaching experience.	3. Because they volunteer.	4. Because they posses a special MOS, AFSC, NEC, or sub-specialty code or skill identifier.	5. Because of their personality and aptitude test scores.	6. Without too much regard to any of the above, but more on availability.	7. Other							NOTES
TOTAL OBSERVATIONS All Services	#	110	178	67	151	44	112	19							
	%	16%	27%	10%	22%	6%	16%	3%							
OTHER SERVICES vs ARMY Other Services	#	57	94	37	31	30	61	7							
	%	18%	30%	12%	10%	9%	19%	2%							
Army Only	#	53	84	30	77	14	51	12							
	%	17%	26%	9%	24%	4%	16%	4%							
BY SERVICE Army	#	53	84	30	77	14	51	12							
	%	17%	26%	9%	24%	4%	16%	4%							
Navy	#	31	46	22	34	17	34	1							
	%	17%	25%	12%	18%	9%	18%	1%							
Marines	#	12	22	4	16	4	12	1							
	%	17%	31%	6%	23%	6%	17%	1%							
Air Force	#	12	20	10	23	6	11	5							
	%	14%	23%	11%	26%	7%	13%	6%							
BY STATUS Enlisted	#	32	54	22	55	19	41	3							
	%	14%	24%	10%	24%	8%	18%	1%							
Officers	#	52	71	27	60	12	47	6							
	%	19%	26%	10%	22%	4%	17%	2%							
Civilians	#	23	47	15	32	12	21	9							
	%	14%	30%	9%	20%	8%	13%	6%							
BY COMPUTER EXPERIENCE 1 Year	#	28	36	14	39	11	27	4							
	%	18%	23%	9%	25%	7%	17%	3%							
10 Years Plus	#	11	30	13	25	13	16	5							
	%	10%	26%	12%	22%	12%	14%	4%							

INSTRUCTOR QUESTION 23. What is your estimate of the two activities that will occupy most of the time of instructors in any future computer based instructional systems?

		Programming.	Developing and writing lesson material.	Counseling individual students.	Analyzing forms and doing administrative tasks.	Instructing students on material not covered by the computer.	Analysis of the educational objectives and translating them into tasks to achieve effectiveness of learning.	Other						NOTES
response number		1.	2.	3.	4.	5.	6.	7.						
TOTAL OBSERVATIONS All Services	#	48	204	156	67	136	136	25						
	%	6%	26%	20%	9%	18%	18%	3%						
OTHER SERVICES vs ARMY Other Services	#	22	112	102	39	85	73	11						
	%	5%	25%	22%	9%	19%	16%	2%						
Army Only	#	26	92	54	28	51	63	14						
	%	8%	28%	16%	9%	16%	19%	4%						
BY SERVICE Army	#	26	92	54	28	51	63	14						
	%	8%	28%	16%	9%	16%	19%	4%						
Navy	#	15	45	56	24	38	30	4						
	%	7%	21%	27%	11%	18%	14%	2%						
Marines	#	3	26	23	3	17	20	1						
	%	3%	28%	25%	3%	18%	22%	1%						
Air Force	#	4	38	19	10	23	17	5						
	%	3%	33%	16%	9%	20%	15%	4%						
BY STATUS Enlisted	#	16	59	76	27	40	37	6						
	%	6%	23%	30%	10%	15%	14%	2%						
Officers	#	17	85	40	23	59	59	11						
	%	6%	28%	14%	8%	20%	20%	4%						
Civilians	#	13	53	34	16	31	38	7						
	%	7%	27%	18%	8%	16%	20%	4%						
BY COMPUTER EXPERIENCE 1 Year	#	15	49	46	23	33	33	4						
	%	7%	25%	23%	11%	16%	16%	2%						
10 Years Plus	#	4	32	19	4	26	26	4						
	%	3%	28%	17%	3%	23%	23%	3%						

INSTRUCTOR QUESTION 24. Instructors trained in using computer based training methods should be given a unique MOS, AFSC, NEC, or sub-specialty code or similar skill identifier.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							NOTES
response number		0	1.	2.	3.	4.	5.							
TOTAL OBSERVATIONS All Services	#	16	116	181	35	46	15							
	%	4%	28%	44%	9%	11%	4%							
OTHER SERVICES vs ARMY Other Services	#	12	59	105	19	33	8							
	%	5%	25%	45%	8%	14%	3%							
Army Only	#	4	57	76	16	13	7							
	%	2%	33%	44%	9%	8%	4%							
BY SERVICE Army	#	4	57	76	16	13	7							
	%	2%	33%	44%	9%	8%	4%							
Navy	#	4	32	47	13	15	3							
	%	4%	28%	41%	11%	13%	3%							
Marines	#	1	13	24	5	3	3							
	%	2%	27%	49%	10%	6%	6%							
Air Force	#	4	13	28	1	13	1							
	%	7%	21%	47%	2%	21%	2%							
BY STATUS Enlisted	#	3	49	60	10	11	6							
	%	2%	35%	43%	7%	8%	5%							
Officers	#	2	33	76	14	22	7							
	%	1%	22%	49%	9%	14%	5%							
Civilians	#	10	31	39	9	13	1							
	%	10%	30%	38%	9%	12%	1%							
BY COMPUTER EXPERIENCE 1 Year	#	4	32	50	8	6	9							
	%	4%	29%	46%	7%	6%	8%							
10 Years Plus	#	1	15	31	8	8	0							
	%	1%	24%	49%	13%	13%	0%							

INSTRUCTOR QUESTION 25. Just as proficiency and other skill pay is awarded to certain skills in the military, it is appropriate that this type of pay be authorized to instructors qualified in computerized instructional methods.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							NOTES
response number		0	1.	2.	3.	4.	5.							
TOTAL OBSERVATIONS All Services	#	16	82	109	43	110	49							
	%	4%	20%	27%	10%	27%	12%							
OTHER SERVICES vs ARMY Other Services	#	9	48	54	25	70	30							
	%	4%	20%	23%	10%	30%	13%							
Army Only	#	7	34	55	18	40	19							
	%	4%	20%	32%	10%	23%	11%							
BY SERVICE Army	#	7	34	55	18	40	19							
	%	4%	20%	32%	10%	23%	11%							
Navy	#	4	18	23	14	36	19							
	%	3%	16%	20%	12%	32%	17%							
Marines	#	0	20	13	5	9	2							
	%	0%	41%	27%	10%	18%	4%							
Air Force	#	2	10	14	5	23	6							
	%	3%	17%	23%	8%	39%	10%							
BY STATUS Enlisted	#	3	45	39	12	29	11							
	%	2%	32%	28%	9%	21%	8%							
Officers	#	5	13	37	16	55	28							
	%	3%	9%	24%	10%	36%	18%							
Civilians	#	8	22	28	13	24	8							
	%	8%	21%	27%	13%	23%	8%							
BY COMPUTER EXPERIENCE 1 Year	#	4	30	34	9	21	11							
	%	4%	28%	31%	8%	19%	10%							
10 Years Plus	#	1	12	14	9	20	7							
	%	2%	19%	22%	14%	32%	11%							

INSTRUCTOR QUESTION 26. What two factors will motivate an instructor in the computerized training systems of the future?

		No response	Extra pay	Satisfaction of teaching	Prestige	Freedom of action	Enjoyment of working with computers	Efficiency reports, fitness reports	Pleasure of developing course material	Other				
response number		0	1.	2.	3.	4.	5.	6.	7.	8.				NOTES
TOTAL OBSERVATIONS	#	77	100	209	52	86	153	27	72	41				
All Services	%	9%	12%	26%	6%	11%	19%	3%	9%	5%				
OTHER SERVICES vs ARMY	#	37	60	125	33	54	81	15	42	25				
Other Services	%	8%	13%	27%	7%	11%	17%	3%	9%	5%				
Army Only	#	40	40	84	19	32	71	13	30	17				
	%	12%	12%	24%	5%	9%	20%	4%	9%	5%				
BY SERVICE														
Army	#	40	40	84	19	32	71	13	30	17				
	%	12%	12%	24%	5%	9%	20%	4%	9%	5%				
Navy	#	17	32	57	16	25	50	6	17	11				
	%	7%	14%	24%	7%	11%	22%	3%	7%	5%				
Marines	#	0	19	27	6	11	10	2	10	7				
	%	0%	21%	28%	7%	12%	11%	2%	11%	8%				
Air Force	#	8	7	34	9	14	20	5	15	9				
	%	7%	6%	28%	7%	12%	17%	4%	12%	7%				
BY STATUS														
Enlisted	#	30	61	65	19	30	34	9	21	3				
	%	11%	22%	24%	7%	11%	13%	3%	8%	1%				
Officers	#	23	21	86	11	30	76	14	27	5				
	%	8%	7%	29%	4%	10%	26%	5%	9%	2%				
Civilians	#	21	16	58	22	24	37	4	21	0				
	%	10%	8%	29%	11%	12%	18%	2%	10%	0%				
BY COMPUTER EXPERIENCE														
1 Year	#	23	44	40	14	22	37	11	18	9				
	%	11%	21%	18%	6%	10%	17%	5%	8%	4%				
10 Years Plus	#	7	13	37	11	13	27	4	10	4				
	%	6%	10%	30%	9%	10%	21%	3%	8%	3%				

INSTRUCTOR QUESTION 27. Computer based instruction will free instructors to do a great deal more individual work with students than was ever possible before.

		No response	Strongly agree	Agree	Not sure	Disagree	Strongly disagree							
response number		0	1.	2.	3.	4.	5.							NOTES
TOTAL OBSERVATIONS	#	13	116	136	47	58	39							
All Services	%	4%	28%	33%	11%	14%	10%							
OTHER SERVICES vs ARMY	#	8	71	73	31	31	22							
Other Services	%	4%	30%	31%	13%	13%	9%							
Army Only	#	4	45	63	16	27	18							
	%	2%	26%	37%	9%	16%	10%							
BY SERVICE	#	4	45	63	16	27	18							
Army	%	2%	26%	36%	9%	16%	11%							
Navy	#	4	33	30	18	20	9							
	%	3%	29%	26%	16%	18%	8%							
Marines	#	0	19	18	3	3	6							
	%	0%	39%	37%	6%	6%	12%							
Air Force	#	2	17	22	8	6	5							
	%	3%	29%	37%	13%	10%	8%							
BY STATUS	#	4	52	43	12	13	15							
Enlisted	%	3%	37%	31%	9%	9%	11%							
Officers	#	4	25	57	24	30	14							
	%	3%	16%	37%	16%	19%	9%							
Civilians	#	4	33	32	10	14	10							
	%	4%	32%	31%	10%	13%	10%							
BY COMPUTER EXPERIENCE	#	3	34	28	16	15	13							
1 Year	%	3%	31%	26%	15%	13%	12%							
10 Years Plus	#	2	17	25	6	9	4							
	%	3%	27%	40%	10%	14%	6%							

APPENDIX G

SUMMARY SHEETS FOR STAFF DATA

STAFF QUESTION 1. Based on your experience, which U. S. military service has made the most progress toward incorporating computer technology into its instructional system?

		No response	Army	Navy	Marine Corps	Air Force							NOTES
response number		0	1.	2.	3.	4.							
TOTAL OBSERVATIONS	#	11	17	25	3	36							
All Services	%	12%	19%	27%	3%	39%							
OTHER SERVICES vs ARMY	#	3	4	19	3	18							
Other Services	%	6%	9%	41%	6%	38%							
Army Only	#	8	13	6	0	18							
	%	18%	29%	13%	0%	40%							
BY SERVICE	#												
Army	#	8	13	6	0	18							
	%	18%	29%	13%	0%	40%							
Navy & Marines	#	3	2	13	2	5							
	%	12%	8%	52%	8%	20%							
Air Force	#	0	0	5	0	12							
	%	0%	0%	29%	0%	71%							
BY STATUS	#												
Officers	#	8	7	13	1	15							
	%	18%	16%	30%	2%	34%							
Civilians	#	3	9	9	2	21							
	%	7%	20%	20%	4%	49%							
BY POSITION	#												
Director of Instruction	#	1	2	6	1	8							
	%	6%	11%	33%	6%	44%							
Educational Adviser	#	0	1	6	2	14							
	%	0%	4%	26%	9%	61%							
Manpower or Personnel Officer	#	3	1	6	0	7							
	%	18%	6%	36%	0%	41%							
Computer Development Officer	#	7	12	6	0	7							
	%	22%	37%	19%	0%	22%							
BY COMPUTER EXPERIENCE	#												
Up to 2 Years	#	2	5	7	0	6							
	%	10%	25%	35%	0%	30%							
10 Years Plus	#	3	6	5	1	16							
	%	10%	19%	16%	3%	52%							

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STAFF QUESTION 2. Looking to the 1980s, which service do you feel will be the leader in the use of computers to assist in the instructional process?

		No response	Army	Navy	Marine Corps	Air Force								
response number		0	1.	2.	3.	4.								NOTES
TOTAL OBSERVATIONS	#	7	25	15	0	45								
All Services	%	8%	27%	16%	0%	49%								
OTHER SERVICES vs ARMY	#	3	3	13	0	28								
Other Services	%	5%	6%	28%	0%	60%								
Army Only	#	4	22	2	0	17								
	%	9%	49%	4%	0%	38%								
BY SERVICE	#													
Army	#	4	22	2	0	17								
	%	9%	49%	4%	0%	38%								
Navy & Marines	#	3	2	12	0	8								
	%	12%	8%	48%	0%	32%								
Air Force	#	0	0	1	0	16								
	%	0%	0%	6%	0%	94%								
BY STATUS	#													
Officers	#	4	14	9	0	17								
	%	9%	32%	20%	0%	39%								
Civilians	#	3	11	4	0	26								
	%	7%	25%	9%	0%	59%								
BY POSITION	#													
Director of Instruction	#	0	3	5	0	10								
	%	0%	16%	28%	0%	56%								
Educational Adviser	#	0	5	3	0	15								
	%	0%	22%	13%	0%	65%								
Manpower or Personnel Officer	#	1	4	3	0	9								
	%	6%	23%	18%	0%	53%								
Computer Development Officer	#	6	12	4	0	10								
	%	19%	38%	12%	0%	31%								
BY COMPUTER EXPERIENCE	#													
Up to 2 Years	#	0	6	4	0	10								
	%	0%	30%	20%	0%	50%								
10 Years Plus	#	3	4	3	0	21								
	%	10%	13%	9%	0%	68%								

STAFF QUESTION 3. In comparison to all of the training in which your service is currently engaged, indicate to what extent you think it is using computers to assist in the instructional process?

		No response	0 to 5%	6 to 10%	11 to 20%	21 to 30%	31 to 50%	Greater than 50%					
response number		0	1.	2.	3.	4.	5.	6.					NOTES
TOTAL OBSERVATIONS	#	3	50	27	7	3	1	1					
All Services	%	3%	55%	29%	8%	3%	1%	1%					
OTHER SERVICES vs ARMY	#	3	22	13	5	2	1	1					
Other Services	%	6%	47%	28%	11%	4%	2%	2%					
Army Only	#	0	28	14	2	1	0	0					
	%	0%	62%	31%	5%	2%	0%	0%					
BY SERVICE	#	0	28	14	2	1	0	0					
Army	%	0%	62%	31%	5%	2%	0%	0%					
Navy & Marines	#	3	14	3	2	2	0	1					
	%	12%	56%	12%	8%	8%	0%	4%					
Air Force	#	0	6	7	3	0	1	0					
	%	0%	35%	41%	18%	0%	6%	0%					
BY STATUS	#	2	20	14	5	2	0	1					
Officers	%	4%	46%	32%	12%	4%	0%	2%					
Civilians	#	1	26	13	2	1	1	0					
	%	2%	59%	30%	5%	2%	2%	0%					
BY POSITION	#	1	10	4	3	0	0	0					
Director of Instruction	%	5%	56%	22%	17%	0%	0%	0%					
Educational Adviser	#	0	16	3	2	1	0	1					
	%	0%	70%	13%	9%	4%	0%	4%					
Manpower or Personnel Officer	#	1	9	5	0	1	1	0					
	%	6%	53%	29%	0%	6%	6%	0%					
Computer Development Officer	#	1	14	14	2	1	0	0					
	%	3%	44%	44%	6%	3%	0%	0%					
BY COMPUTER EXPERIENCE	#	0	14	4	0	1	1	0					
Up to 2 Years	%	0%	70%	20%	0%	5%	5%	0%					
10 Years Plus	#	1	17	10	2	1	0	0					
	%	3%	57%	32%	7%	3%	0%	0%					

STAFF QUESTION 4. Projecting your thoughts to the 1980s, how much of the instruction do you feel will have some degree of computer support or involvement?

		No response	0 to 5%	6 to 10%	11 to 20%	21 to 35%	36 to 50%	51 to 66%	67 to 90%	Greater than 90%			
response number		0	1.	2.	3.	4.	5.	6.	7.	8.			NOTES
TOTAL OBSERVATIONS	#	2	2	10	16	20	16	13	9	4			
All Services	%	2%	2%	11%	17%	23%	17%	14%	10%	4%			
OTHER SERVICES vs ARMY	#	2	0	0	5	10	11	9	7	3			
Other Services	%	4%	0%	0%	11%	21%	24%	19%	15%	6%			
Army Only	#	0	2	10	11	10	5	4	2	1			
	%	0%	5%	22%	25%	22%	11%	9%	5%	2%			
BY SERVICE	#												
Army	#	0	2	10	11	10	5	4	2	1			
	%	0%	5%	22%	24%	22%	10%	9%	5%	2%			
Navy & Marines	#	2	0	0	2	4	6	5	4	2			
	%	8%	0%	0%	8%	16%	24%	20%	16%	8%			
Air Force	#	0	0	0	3	3	3	4	3	1			
	%	0%	0%	0%	18%	18%	18%	23%	17%	6%			
BY STATUS	#												
Officers	#	2	1	4	9	7	7	9	2	3			
	%	4%	2%	10%	21%	16%	16%	21%	4%	6%			
Civilians	#	0	1	6	7	13	7	2	7	1			
	%	0%	2%	14%	16%	29%	16%	5%	16%	2%			
BY POSITION	#												
Director of Instruction	#	0	0	1	3	6	1	5	1	1			
	%	0%	0%	6%	16%	33%	6%	27%	6%	6%			
Educational Adviser	#	0	1	3	6	2	6	0	4	1			
	%	0%	4%	13%	26%	9%	26%	0%	18%	4%			
Manpower or Personnel Officer	#	1	1	1	5	3	2	4	0	0			
	%	6%	6%	6%	29%	18%	12%	23%	0%	0%			
Computer Development Officer	#	1	0	4	2	9	6	4	4	2			
	%	3%	0%	13%	6%	28%	18%	13%	13%	6%			
BY COMPUTER EXPERIENCE	#												
Up to 2 Years	#	0	1	3	6	1	1	5	3	0			
	%	0%	5%	15%	30%	5%	5%	25%	15%	0%			
10 Years Plus	#	0	1	3	6	10	7	2	1	1			
	%	0%	3%	10%	19%	32%	23%	7%	3%	3%			

STAFF QUESTION 6. Five to ten years from now, at what level do you think the bulk of computerized training will be taking place?

		No response	Entry level training	Mid-career level training	Senior level training								
response number		0	1.	2.	3.								NOTES
TOTAL OBSERVATIONS	#	2	59	22	3								
All Services	%	3%	67%	26%	4%								
OTHER SERVICES vs ARMY	#	2	34	9	0								
Other Services	%	4%	76%	20%	0%								
	#	0	25	13	3								
Army Only	%	0%	61%	32%	7%								
BY SERVICE	#	0	25	13	3								
Army	%	0%	61%	32%	7%								
	#	2	14	8	0								
Navy & Marines	%	8%	59%	33%	0%								
	#	0	17	0	0								
Air Force	%	0%	100%	0%	0%								
BY STATUS	#	1	28	11	0								
Officers	%	2%	71%	27%	0%								
	#	1	29	9	3								
Civilians	%	2%	69%	22%	7%								
BY POSITION	#	0	9	6	2								
Director of Instruction	%	0%	53%	35%	12%								
	#	0	16	5	1								
Educational Adviser	%	0%	73%	23%	4%								
	#	1	9	6	0								
Manpower or Personnel Officer	%	6%	56%	38%	0%								
	#	1	24	5	0								
Computer Development Officer	%	3%	80%	17%	0%								
BY COMPUTER EXPERIENCE	#	0	12	7	0								
Up to 2 Years	%	0%	63%	37%	0%								
	#	0	20	7	1								
10 Years Plus	%	0%	71%	25%	4%								

STAFF QUESTION 7. What types of training do you feel will be most susceptible to computer assisted or supported instruction?

		No response	Technical skill training	Sciences vs. humanities	Field skills	Tactical decisionmaking skills							
response number		0	1.	2.	3.	4.							NOTES
TOTAL OBSERVATIONS All Services	#	3	76	15	12	40							
	%	2%	53%	10%	8%	27%							
OTHER SERVICES vs ARMY Other Services	#	2	39	5	9	10							
	%	3%	60%	8%	14%	15%							
Army Only	#	1	37	10	3	30							
	%	1%	46%	12%	4%	37%							
BY SERVICE Army	#	1	37	10	3	30							
	%	1%	46%	12%	4%	37%							
Navy & Marines	#	2	19	5	6	6							
	%	5%	50%	13%	16%	16%							
Air Force	#	0	20	0	0	4							
	%	0%	83%	0%	0%	17%							
BY STATUS Officers	#	3	36	7	6	15							
	%	4%	55%	10%	9%	22%							
Civilians	#	0	37	11	5	23							
	%	0%	49%	14%	7%	30%							
BY POSITION Director of Instruction	#	0	14	1	3	4							
	%	0%	63%	5%	14%	18%							
Educational Adviser	#	0	21	6	3	12							
	%	0%	50%	14%	7%	29%							
Manpower or Personnel Officer	#	1	12	3	2	6							
	%	4%	50%	13%	8%	25%							
Computer Development Officer	#	2	27	5	2	15							
	%	4%	53%	10%	4%	29%							
BY COMPUTER EXPERIENCE Up to 2 Years	#	0	16	1	2	7							
	%	0%	61%	4%	8%	27%							
10 Years Plus	#	1	15	3	8	10							
	%	3%	40%	8%	22%	27%							

STAFF QUESTION 9. With the increased presence of computers on posts, bases, and stations, to what degree will they also be used to train individuals? For example:

		No response	Use Administrative computer systems (e.g., Base Level B-3500s)	Use Operational or field tactical data systems (e.g. Army's TACFIRE, TOS, CSS, etc	Use neither system	Use both administrative & operational systems	Limited use of other post systems						
response number		0	1.	2.	3.	4.	5.						NOTES
TOTAL OBSERVATIONS	#	15	13	3	25	23	13						
All Services	%	17%	14%	3%	27%	25%	14%						
OTHER SERVICES vs ARMY	#	7	9	2	12	11	6						
Other Services	%	15%	19%	4%	26%	23%	13%						
Army Only	#	8	4	1	13	12	7						
	%	18%	9%	2%	29%	27%	15%						
BY SERVICE	#												
Army	%	8	4	1	13	12	7						
	#	18%	9%	2%	29%	27%	15%						
Navy & Marines	%	4	5	1	5	10	0						
	#	16%	20%	4%	20%	40%	0%						
Air Force	%	3	3	0	4	1	6						
	#	18%	18%	0%	23%	6%	35%						
BY STATUS	#	8	3	1	16	10	6						
Officers	%	19%	6%	2%	37%	23%	13%						
Civilians	#	7	9	2	8	11	7						
	%	16%	20%	6%	18%	24%	16%						
BY POSITION	#	2	2	8	5	1	0						
Director of Instruction	%	11%	11%	44%	28%	6%	0%						
Educational Adviser	#	4	3	1	4	8	3						
	%	17%	13%	5%	17%	35%	13%						
Manpower or Personnel Officer	#	5	3	1	4	3	1						
	%	29%	18%	6%	23%	18%	6%						
Computer Development Officer	#	4	5	1	9	7	6						
	%	12%	16%	3%	28%	22%	19%						
BY COMPUTER EXPERIENCE	#	6	3	5	3	3	0						
Up to 2 Years	%	30%	15%	25%	15%	15%	0%						
10 Years Plus	#	5	3	2	11	4	6						
	%	16%	10%	6%	36%	13%	19%						

STAFF QUESTION 10. In the 1980s, will self-paced individualized instruction be the norm?

		No response	Yes	No									NOTES
response number		0	1.	2.									
TOTAL OBSERVATIONS	#	5	55	32									
All Services	%	5%	60%	35%									
OTHER SERVICES vs ARMY	#	4	32	11									
Other Services	%	9%	68%	23%									
Army Only	#	1	23	21									
	%	2%	51%	47%									
BY SERVICE	#	1	23	21									
Army	%	2%	51%	47%									
Navy & Marines	#	3	16	6									
	%	12%	64%	24%									
Air Force	#	1	14	2									
	%	6%	82%	12%									
BY STATUS	#	5	21	18									
Officers	%	11%	48%	41%									
Civilians	#	0	30	14									
	%	0%	68%	32%									
BY POSITION	#	2	11	5									
Director of Instruction	%	11%	61%	28%									
Educational Adviser	#	0	17	6									
	%	0%	74%	26%									
Manpower or Personnel Officer	#	1	6	10									
	%	6%	35%	59%									
Computer Development Officer	#	2	20	10									
	%	6%	63%	31%									
BY COMPUTER EXPERIENCE	#	0	12	8									
Up to 2 Years	%	0%	60%	40%									
10 Years Plus	#	1	20	10									
	%	3%	65%	32%									

STAFF QUESTION 11. a. Will the presence or absence of modern instructional methods like computer based training have an impact on recruiting efforts by your service?

		No response	Yes	No									NOTES
response number		0	1.	2.									
TOTAL OBSERVATIONS	#	9	59	24									
All Services	%	10%	64%	26%									
OTHER SERVICES vs ARMY	#	5	33	9									
Other Services	%	11%	70%	19%									
Army Only	#	4	26	15									
	%	9%	58%	33%									
BY SERVICE	#	4	26	15									
Army	%	9%	58%	33%									
Navy & Marines	#	5	12	8									
	%	20%	48%	32%									
Air Force	#	0	16	1									
	%	0%	94%	6%									
BY STATUS	#	6	25	13									
Officers	%	13%	56%	29%									
Civilians	#	2	31	11									
	%	5%	70%	25%									
BY POSITION	#	1	11	6									
Director of Instruction	%	6%	61	33									
Educational Adviser	#	1	14	8									
	%	4%	61%	35%									
Manpower or Personnel Officer	#	4	10	3									
	%	23%	59%	18%									
Computer Development Officer	#	3	23	6									
	%	9%	72%	19%									
BY COMPUTER EXPERIENCE	#	4	8	8									
Up to 2 Years	%	20%	40%	40%									
10 Years Plus	#	1	24	6									
	%	3%	78%	19%									

STAFF QUESTION 11. b. If so, where do you see the greatest impact?

		No response	Initial enlistments	Reenlistments	Applicants for officer training	Both enlistments & reenlistments							
response number		0	1.	2.	3.	4.							NOTES
TOTAL OBSERVATIONS	#	33	36	10	6	7							
All Services	%	36%	39%	11%	6%	8%							
OTHER SERVICES vs ARMY	#	15	20	6	3	3							
Other Services	%	32%	43%	13%	6%	6%							
Army Only	#	18	16	4	3	4							
	%	40%	35%	9%	7%	9%							
BY SERVICE	#	18	16	4	3	4							
Army	%	40%	35%	9%	7%	9%							
Navy & Marines	#	13	6	3	2	1							
	%	52%	24%	12%	8%	4%							
Air Force	#	2	10	2	1	2							
	%	12%	59%	12%	6%	11%							
BY STATUS	#	18	14	4	4	4							
Officers	%	41%	32%	9%	9%	9%							
Civilians	#	14	19	6	2	3							
	%	32%	43%	14%	4%	7%							
BY POSITION	#	7	7	2	0	2							
Director of Instruction	%	39%	39%	11%	0%	11%							
Educational Adviser	#	10	7	3	2	1							
	%	44%	30%	13%	9%	4%							
Manpower or Personnel Officer	#	7	6	1	2	1							
	%	41%	35%	6%	12%	6%							
Computer Development Officer	#	8	15	4	2	3							
	%	25%	47%	13%	6%	9%							
BY COMPUTER EXPERIENCE	#	12	4	1	2	1							
Up to 2 Years	%	60%	20%	5%	10%	5%							
10 Years Plus	#	8	15	6	2	0							
	%	26%	48%	19%	7%	0%							

STAFF QUESTION 13. On what basis do you think instructors will be identified and selected for computer based instructional assignments in the future?

		No response	Special skill identifiers	Past experience in teaching	Training or experience with computers	Aptitude, appearance, and personality							
response number		0	1.	2.	3.	4.							NOTES
TOTAL OBSERVATIONS	#	5	49	31	43	41							
All Services	%	3%	30%	18%	25%	24%							
OTHER SERVICES vs ARMY	#												
Other Services	#	1	27	14	24	19							
	%	1%	33%	16%	28%	22%							
Army Only	#	3	22	17	19	22							
	%	4%	27%	20%	22%	27%							
BY SERVICE	#												
Army	#	3	22	17	19	22							
	%	4%	27%	20%	22%	27%							
Navy & Marines	#	1	10	13	13	9							
	%	2%	22%	28%	28%	20%							
Air Force	#	0	13	4	11	8							
	%	0%	36%	11%	31%	22%							
BY STATUS	#												
Officers	#	3	24	13	18	19							
	%	4%	31%	17%	23%	25%							
Civilians	#	1	22	17	24	20							
	%	1%	26%	20%	29%	24%							
BY POSITION	#												
Director of Instruction	#	0	10	6	10	11							
	%	0%	27%	16%	27%	30%							
Educational Adviser	#	1	9	9	11	7							
	%	3%	24%	24%	30%	19%							
Manpower or Personnel Officer	#	1	12	6	10	6							
	%	3%	34%	17%	29%	17%							
Computer Development Officer	#	2	17	10	12	15							
	%	4%	30%	18%	21%	27%							
BY COMPUTER EXPERIENCE	#												
Up to 2 Years	#	0	9	4	8	9							
	%	0%	30%	13%	27%	30%							
10 Years Plus	#	1	16	12	17	16							
	%	2%	26%	19%	27%	26%							

STAFF QUESTION 14. a. A computerized training system represents a significant investment on the part of any organization. What do you feel are the positive attributes of computer based training that will offset those costs? For example:

		No response	Reduced training time	Fewer instructors required	Higher student achievement	Generates instructor motivation	Better performance after training	Student preference	Reduced attrition rate	Flexibility to handle varying training loads	Greater uniformity in the quality of training	Others	
response number		0	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	NOTES
TOTAL OBSERVATIONS	#	26	66	41	45	9	41	21	36	45	46	18	
All Services	%	7%	18%	10%	11%	2%	10%	5%	9%	11%	12%	5%	
OTHER SERVICES vs ARMY													
Other Services	#	15	32	27	20	5	20	9	22	24	27	7	
	%	7%	15	13	10	2	10	4	11	12	13	3	
Army Only	#	20	34	14	25	4	21	12	14	22	19	12	
	%	10%	17%	7%	13%	2%	11%	6%	7%	11%	10%	6%	
BY SERVICE													
Army	#	20	34	14	25	4	21	12	14	22	19	12	
	%	10%	17%	7%	13%	2%	11%	6%	7%	11%	10%	6%	
Navy & Marines	#	12	13	14	10	2	7	5	11	12	14	4	
	%	12%	12%	13%	10%	2%	7%	5%	11%	11%	13%	4%	
Air Force	#	2	15	12	7	2	11	4	10	11	11	2	
	%	2%	17%	14%	8%	2%	13%	5%	11%	13%	13%	2%	
BY STATUS													
Officers	#	15%	29%	24%	23%	5%	22%	11%	17%	18%	20%	7%	
	%	8%	14%	13%	12%	3%	12%	6%	9%	9%	10%	4%	
Civilians	#	10	34	15	21	4	19	10	18	26	24	11	
	%	5%	17%	8%	11%	2%	10%	5%	9%	14%	13%	6%	
BY POSITION													
Director of Instruction	#	7	11	8	12	3	10	5	10	9	10	0	
	%	8%	13%	9%	13%	4%	12%	6%	12%	11%	12%	0%	
Educational Adviser	#	6	17	8	10	2	12	3	9	14	13	0	
	%	6%	16%	9%	11%	2%	13%	3%	10%	15%	14%	0%	
Manpower or Personnel Officer	#	6	11	10	7	1	4	4	4	6	8	0	
	%	10%	17%	16%	11%	2%	7%	7%	7%	10%	13%	0%	
Computer Development Officer	#	7	25	14	15	3	13	9	12	16	14	0	
	%	5%	20%	11%	12%	2%	10%	7%	9%	13%	11%	0%	
BY COMPUTER EXPERIENCE	#	6	14	9	7	1	4	4	5	11	10	0	
Up to 2 Years	%	8%	20%	13%	10%	1%	6%	6%	7%	15%	14%	0%	
10 Years Plus	#	9	22	14	15	4	18	6	8	20	16	8	
	%	6%	16%	10%	11%	3%	13%	4%	6%	14%	11%	6%	

STAFF QUESTION 14. b. Of those selected in 14a, which one (or ones) do you feel could tip the scales from conventional instruction to a form of computerized instruction?

		No response	Reduced training time	Fewer instructors required	Higher student achievement	Generates instructor motivation	Better performance after training	Student preference	Reduced attrition rate	Flexibility to handle varying training loads	Greater uniformity in the quality of training	Others	
response number		0	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	NOTES
TOTAL OBSERVATIONS	#	8	53	24	13	1	17	3	5	12	7		
All Services	%	6%	37%	17%	9%	1%	12%	2%	3%	8%	5%		
OTHER SERVICES vs ARMY													
Other Services	#	4	24	16	4	1	9	1	2	6	5		
	%	6%	33%	22%	6%	1%	13%	1%	3%	8%	7%		
Army Only	#	4	29	8	4	0	8	2	3	6	2		
	%	6%	44%	12%	6%	0%	12%	3%	5%	9%	3%		
BY SERVICE													
Army	#	4	29	8	4	0	8	2	3	6	2		
	%	6%	44%	12%	6%	0%	12%	3%	5%	9%	3%		
Navy & Marines	#	4	11	9	2	0	3	1	2	3	2		
	%	11%	30	24%	5%	0%	8%	3%	5%	8%	5%		
Air Force	#	0	10	6	0	1	3	0	0	3	2		
	%	0%	40%	24%	0%	4%	12%	0%	0%	12%	8%		
BY STATUS													
Officers	#	5	22	13	5	0	10	3	2	4	2		
	%	8%	33%	20%	8%	0%	15%	5%	3%	6%	3%		
Civilians	#	2	28	9	8	1	7	0	3	7	4		
	%	3%	41%	13%	12%	1%	10%	0%	4%	10%	6%		
BY POSITION													
Director of Instruction	#	1	7	3	3	0	6	0	1	2	5		
	%	4%	25%	11%	11%	0%	21%	0%	4%	7%	18%		
Educational Adviser	#	2	12	6	2	0	6	0	3	3	2		
	%	6%	33%	17%	6%	0%	17%	0%	8%	8%	6%		
Manpower or Personnel Officer	#	2	11	6	2	0	2	1	0	1	0		
	%	8%	44%	24%	8%	0%	8%	4%	0%	4%	0%		
Computer Development Officer	#	3	21	9	5	1	3	2	1	6	0		
	%	6%	41%	18%	10%	2%	6%	4%	2%	12%	0%		
BY COMPUTER EXPERIENCE													
Up to 2 Years	#	3	11	4	3	0	1	1	2	5	2		
	%	9%	34%	13%	9%	0%	3%	3%	6%	16%	6%		
10 Years Plus	#	3	18	11	5	0	8	2	0	4	2		
	%	4%	21%	13%	6%	0%	9%	2%	0%	5%	2%		

STAFF QUESTION 15. Do you see computerized training systems changing manpower structure or management practices in the future?

		No response	Changes in specialty codes or identifiers	Different grade requirements	Changed performance standards	Total authorizations	Changes in staffing criteria						NOTES
response number		0	1.	2.	3.	4.	5.						
TOTAL OBSERVATIONS	#	29	42	32	25	40	60						
All Services	%	13%	18%	14%	11%	18%	26%						
OTHER SERVICES vs ARMY	#	19	18	15	12	26	36						
Other Services	%	14%	14%	12%	10%	21%	29%						
Army Only	#	10	24	17	13	14	24						
	%	9%	24%	17%	12%	14%	24%						
BY SERVICE	#	10	24	17	13	14	24						
Army	%	9%	24%	17%	12%	14%	24%						
Navy & Marines	#	11	8	6	5	10	19						
	%	19%	14%	10%	8%	17%	32%						
Air Force	#	5	8	7	4	14	15						
	%	9%	15%	13%	8%	26%	29%						
BY STATUS	#	14	15	18	9	22	30						
Officers	%	13%	14%	17%	8%	20%	28%						
Civilians	#	12	26	12	15	17	27						
	%	10%	24	11	14	16	25						
BY POSITION	#	8	5	6	5	9	15						
Director of Instruction	%	17%	10%	13%	10%	19%	31%						
Educational Adviser	#	8	13	5	6	10	15						
	%	14%	23%	9%	11%	18%	25%						
Manpower or Personnel Officer	#	6	7	9	5	6	11						
	%	14%	16%	20%	11%	14%	25%						
Computer Development Officer	#	6	16	12	9	14	18						
	%	8%	21%	16%	12%	19%	24%						
BY COMPUTER EXPERIENCE	#	10	6	5	2	5	13						
Up to 2 Years	%	24%	15%	12%	5%	12%	32%						
10 Years Plus	#	6	17	11	12	16	21						
	%	7%	20%	13%	14%	19%	26%						

STAFF QUESTION 16. With more and more computers being used in the instructional process, do you see the trend toward centralization or toward decentralization of training?

		TOWARD CENTRALIZATION					TOWARD DECENTRALIZATION						NOTES
		School level	Training command	Department level	DoD level	No change	School level	Training command	Department level	DoD level			
response number		1.	2.	3.	4.	0	1.	2.	3.	4.			
TOTAL OBSERVATIONS	#	38	36	21	25	17	16	9	8	10			
All Services	%	21%	20%	12%	14%	9%	9%	5%	4%	6%			
OTHER SERVICES vs ARMY	#	19	21	12	14	10	8	5	5	6			
Other Services	%	19%	21%	12%	14%	10%	8%	5%	5%	6%			
Army Only	#	19	15	9	11	7	8	4	3	4			
	%	23%	19%	11%	14%	9%	10%	5%	4%	5%			
BY SERVICE	#	19	15	9	11	7	8	4	3	4			
Army	%	23%	19%	11%	14%	9%	10%	5%	4%	5%			
Navy & Marines	#	11	17	6	7	3	7	3	2	3			
	%	19%	29%	10%	12%	5%	12%	5%	3%	5%			
Air Force	#	8	8	6	8	7	1	2	3	3			
	%	17%	17%	13%	17%	15%	3%	4%	7%	7%			
BY STATUS	#	20	17	10	14	8	9	4	4	6			
Officers	%	22%	19%	12%	15%	8%	10%	4%	4%	6%			
Civilians	#	18	19	11	11	9	7	5	4	4			
	%	21%	22%	13%	13%	10%	8%	5%	4%	4%			
BY POSITION	#	10	12	4	6	5	6	2	1	2			
Director of Instruction	%	21%	26%	9%	12%	10%	12%	4%	2%	4%			
Educational Adviser	#	7	8	6	6	5	3	3	3	2			
	%	16%	19%	14%	14%	11%	7%	7%	7%	5%			
Manpower or Personnel Officer	#	10	9	6	6	3	4	3	2	3			
	%	22%	20%	14%	14%	6%	8%	6%	4%	6%			
Computer Development Officer	#	11	7	5	7	4	3	2	2	3			
	%	25%	16%	11%	16%	8%	7%	5%	5%	7%			
BY COMPUTER EXPERIENCE	#	14	16	11	8	8	6	4	4	4			
Up to 2 Years	%	19%	21%	15%	11%	11%	8%	5%	5%	5%			
10 Years Plus	#	24	20	10	17	9	10	5	4	6			
	%	24%	19%	9%	16%	8%	9%	5%	4%	6%			

STAFF QUESTION 18. Because of the shrinking Defense dollar and the need for improved productivity in the military training establishment, do you think that the Office of the Secretary of Defense will be exerting additional efforts to:

		No response	Reduce duplication of training?	Increased productivity in training?	Exchange instructional materials between schools and or services?	Consolidate training activities?	Contract training?						
response number		0	1.	2.	3.	4.	5.						NOTES
TOTAL OBSERVATIONS	#	11	76	71	67	72	29						
All Services	%	3%	23%	22%	21%	22%	9%						
THER SERVICES vs ARMY	#	5	38	33	37	39	14						
Other Services	%	3%	23%	20%	22%	24%	8%						
Army Only	#	6	38	38	30	33	15						
	%	4%	24%	24%	18%	21%	9%						
Y SERVICE	#												
Army		6	38	38	30	33	15						
	%	4%	24%	24%	18%	21%	9%						
Navy & Marines	#	5	17	12	16	17	5						
	%	7%	24%	16%	22%	24%	7%						
Air Force	#	0	17	17	17	17	7						
	%	0%	23%	23%	23%	23%	8%						
Y STATUS	#												
Officers		5	37	35	32	33	14						
	%	3%	24%	22%	21%	21%	9%						
Civilians	#	6	35	34	31	35	13						
	%	4%	23%	22%	20%	23%	8%						
Y POSITION	#												
Director of Instruction		1	14	14	13	14	4						
	%	2%	23%	23%	22%	23%	7%						
Educational Adviser	#	3	20	18	18	18	9						
	%	3%	24%	21%	21%	21%	10%						
Manpower or Personnel Officer	#	3	13	10	12	12	6						
	%	5%	24%	18%	21%	21%	11%						
Computer Development Officer	#	4	27	27	23	27	10						
	%	3%	23%	23%	20%	23%	8%						
Y COMPUTER EXPERIENCE	#												
Up to 2 Years		2	17	15	15	15	6						
	%	3%	25%	21%	21%	21%	9%						
10 Years Plus	#	3	26	23	22	28	13						
	%	3%	23%	20%	19%	24%	11%						

STAFF QUESTION 19. Do you feel that Congress will force the military to adopt more computerized training through budget constraints or the passage of directive legislation?

		No response	Yes	No									NOTES
response number		0	1.	2.									
TOTAL OBSERVATIONS	#	4	19	69									
All Services	%	5%	20%	75%									
OTHER SERVICES vs ARMY	#	3	11	33									
Other Services	%	6%	24%	70%									
Army Only	#	1	8	36									
	%	2%	18%	80%									
BY SERVICE													
Army	#	1	8	36									
	%	2%	18%	80%									
Navy & Marines	#	1	4	20									
	%	4%	16%	80%									
Air Force	#	2	5	10									
	%	12%	29%	59%									
BY STATUS													
Officers	#	2	10	32									
	%	4%	23%	73%									
Civilians	#	2	8	34									
	%	5%	18%	77%									
BY POSITION													
Director of Instruction	#	1	3	14									
	%	5%	17%	78%									
Educational Adviser	#	2	4	17									
	%	8%	18%	74%									
Manpower or Personnel Officer	#	1	4	12									
	%	6%	23%	71%									
Computer Development Officer	#	0	8	24									
	%	0%	25%	75%									
BY COMPUTER EXPERIENCE													
Up to 2 Years	#	1	4	15									
	%	5%	20%	75%									
10 Years Plus	#	1	7	21									
	%	3%	23%	74%									

APPENDIX H

FOLLOW-ON SURVEY DATA PRESENTATION

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE
COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year
1974

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported	Dominant Application
U. S. ARMY									
Air Defense School	18	713	73	3,4,5	53,363	8,250	206	.0249	Simulation
Armor School	2	568	39	3,5,7	19,032	1,548	39	.0252	Simulation
Aviation School	6	775	9	3,5	6,928	86,871	943	.0108	Simulation
Command & General Staff College	7	1,000	26	3,4,5,8	36,000	1,170	100	.0855	Computational
Engineer School	2	450	10	1,4,7	7,926	3,960	16	.0040	Computational
Field Artillery School	6	3,431	10	1,4,5,7	35,347	24,591	565	.0223	Simulation
Infantry School	7	4,360	19	1	81,183	16,095	511	.0317	CAI
Institute of Administration	12	2,253	753	5,7	43,907	33,863	5,511	.1627	Drill & Practice
Logistics Management Center	41	7,068	50	3,6	353,400	50,140	512	.0102	Simulation
Military Academy	70	4,200	40	3,4,5,7,8	168,000	7,800	675	.0865	Computational
Military Police School	3	550	2	1	801	30,620	1,000	.0321	CAI
Missile & Munitions School	6	187	380	3	71,060	270,950	4,560	.0168	Simulation
Ordnance School	3	911	52	1,3	9,698	262,655	95	.0004	CAI
Quartermaster School	10	4,139	22	3	89,687	552,734	3,367	.0060	Simulation
Security Agency School	2	1,576	206	1,5,7,9	440,996	14,672	11,088	.7557	CAI
Signal School	10	246	121	1,4,6,7	29,766	1,335,024	29,782	.0223	CAI
Transportation School	5	842	55	3,7	10,823	172,630	217	.0012	Simulation
War College	7	228	90	3,4,7,8	22,440	1,960	186	.0949	Computational
Army Totals	217	33,515	1,956	---	1,480,357	2,875,533	59,573	.0206	---
U. S. AIR FORCE									
Air Force Academy	97	6,889	11	2,3,4,5,7,9	72,345	18,402	1,018	.0553	Computational
Computer Directed Training System	11	4,000	218	1,5	87,200	---	---	--	CAI
Keesler AFB	5	390	138	1,3	46,600	113,520	294	.0026	CAI
Lowry AFB	13	6,115	105	3,5	140,376	94,379	7,363	.0780	Simulation
Sheppard AFB	35	3.166	3	1,3,5	9,674	640,680	9,820	.0154	Simulation
Air University	49	1,681	60	3,4,7	34,000	8,982	945	.1052	Simulation
Air Force Totals	210	22,241	5,385	---	390,190	942,531	19,440	.0206	---
U. S. NAVY & U. S. MARINE CORPS									
Naval Academy	94	3,700	16	1,3,5,7	59,200	1,088	60	.0551	CAI
Naval Air Technical Training--Memphis	2	16,007	189	2	1,053,594	376,043	11,500	.0305	CMI
Personnel Research & Development Center	2	105	9	1,3,5	315	---	---	--	CAI
War College	2	400	16	4	6,400	2,266	16	.0070	Computational
USMC Communications-Electronics School	2	696	20	1	13,920	84,700	1,578	.0186	CAI
Navy & Marine Totals	102	20,908	250	---	1,134,423	364,097	13,144	.0361	---
DEPARTMENT OF DEFENSE									
Armed Forces Staff College	10	540	17	1,3,4,5,7	9,204	1,148	199	.1733	Simulation
Computer Institute	6	1,634	12	1,3,4,5	19,608	3,190	380	.1191	Drill & Practice
Defense Systems Management School	4	120	45	2,3,7	5,400	958	90	.0939	Simulation
Industrial College of the Armed Forces	6	180	69	3,4,6,7	12,555	1,225	78	.0636	Simulation
Defense Totals	26	2,478	143	---	46,767	6,519	747	.1145	---

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THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE

COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year

1973

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Air Defense School	8	32	56	3,4	1,792	4,650	116	.0249
Armor School	2	573	51	3,5,7	22,665	1,709	51	.0298
Aviation School	6	754	9	3,5	6,235	86,870	943	.0108
Command & General Staff College	7	1,000	26	4	27,500	1,170	90	.0769
Engineer School	1	379	15	1,4,7	8,401	3,840	29	.0075
Field Artillery School	5	3,350	6	1,4,7	35,347	24,000	170	.0071
Infantry School	7	4,407	18	1	78,146	16,388	557	.0340
Institute of Administration	13	2,818	625	5,7	56,720	40,951	7,301	.1783
Logistics Management Center	37	4,736	50	3,6	236,800	46,079	375	.0081
Military Academy	70	4,200	40	3,4,5,7,8	168,000	7,600	650	.0855
Military Police School	4	580	2	1	920	31,040	1,200	.0387
Missile & Munitions School	6	119	278	3	33,082	263,700	3,336	.0134
Ordnance School	2	130	72	3	3,680	241,388	62	.0003
Quartermaster School	8	5,903	27	3	157,568	595,861	4,779	.0080
Security Agency School	2	2,200	226	1,5,7	446,336	14,672	12,500	.8521
Signal School	6	242	70	1,4,6,7	16,940	1,447,029	16,940	.0117
Transportation School	3	1,800	68	3,7	28,500	152,920	430	.0028
War College	6	228	81	3,4,7,8	19,808	1,960	148	.0755
Army Totals	193	33,451	1,718	---	1,347,209	2,981,833	49,676	.0166
U. S. AIR FORCE								
Air Force Academy	77	5,765	11	2,3,4,5,7,9	60,532	18,572	808	.0435
Computer Directed Training System	8	3,500	21	1,5	73,500	---	---	--
Keesler AFB	1	150	30	1	4,500	115,500	30	.0003
Lowry AFB	11	2,541	119	3,5	163,912	87,464	6,554	.0749
Sheppard AFB	27	1,772	4	1,5	7,250	650,000	7,250	.0111
Air University	40	1,452	54	3,4,7	24,588	5,927	732	.1236
Air Force Totals	166	15,180	239	---	334,827	875,483	15,374	.0176
U. S. NAVY								
Naval Academy	87	3,000	15	1,3,4,5	45,000	1,088	55	.0506
Naval Air Technical Training--Memphis	1	4,220	54	2	227,880	376,043	3,150	.0084
Personnel Research & Development Center	2	70	4	1,3	280	---	---	--
War College	1	400	8	4	3,200	2,266	8	.0035
Navy Totals	101	7,690	81	---	276,360	379,379	3,213	.0085
DEPARTMENT OF DEFENSE								
Armed Forces Staff College	10	540	11	1,3,4,5,7	6,034	1,266	92	.0727
Computer Institute	6	1,370	10	1,3,4,5	13,700	2,670	372	.1393
Defense Systems Management School	3	120	44	3,7	5,280	958	88	.0919
Industrial College of the Armed Forces	6	192	69	3,7	13,773	1,225	94	.0767
Defense Totals	25	2,222	134	---	38,787	6,119	646	.1049

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE

COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year

1972

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Air Defense School	6	34	48	3,4	1,632	4,550	96	.0211
Aviation School	6	760	9	3,5	6,841	88,647	943	.0106
Command & General Staff College	3	1,000	18	4	22,500	1,170	90	.0769
Engineer School	1	266	12	1,4,7	5,105	4,224	207	.0490
Field Artillery School	3	3,500	6	4,7	18,000	25,000	105	.0060
Infantry School								
Adjutant General School	12	2,529	741	5	51,892	36,721	7,313	.1992
Logistics Management Center	25	5,818	50	3	290,000	57,401	397	.0069
Military Academy	65	4,100	40	3,4,5	164,000	7,200	595	.0779
Missile & Munitions School	5	111	248	3	27,528	248,900	2,976	.0120
Ordnance School	1	223	24	3	5,352	287,576	24	.0001
Quartermaster School	4	4,990	37	3	180,760	724,610	5,001	.0069
Security Agency School	4	1,727	993	1,5,7	229,790	17,094	15,154	.8865
Signal School	2	240	8	1	1,920	1,661,597	1,920	.0012
Transportation School	3	1,830	104	3,7	39,761	278,406	805	.0029
War College	5	228	69	4,7,8	16,912	1,960	128	.0653
Women's Army Corps School	1	23	80	3	1,840	830	80	.0964
Army Totals	146	27,379	2,485	---	1,063,833	3,445,886	35,693	.0104
U. S. AIR FORCE								
Air Force Academy	77	5,182	11	2,3,4,5,7,9	54,411	18,530	808	.0436
Computer Directed Training System	4	1,500	20	1,5	32,700	---	---	--
Keesler AFB	1	55	30	1	1,650	94,000	30	.0003
Lowry AFB	8	2,934	138	3,5	231,158	93,904	8,528	.0908
Sheppard AFB	20	2,211	2	1,5	4,500	670,000	4,500	.0067
Air University	40	1,451	29	3,4,5,7	17,220	5,946	707	.1189
Air Force Totals	150	13,333	230	---	341,639	882,380	14,573	.0165
U. S. NAVY								
Naval Academy	66	2,500	12	1,3,4,5	30,000	1,088	40	.0368
Personnel Research & Development Center	1	152	35	1,5	5,624	---	---	--
War College	1	200	8	4	1,600	2,266	8	.0035
Navy Totals	68	2,852	55	---	37,224	3,354	48	.0143
DEPARTMENT OF DEFENSE								
Armed Forces Staff College	8	540	5	1,3,4,5,7	2,480	1,239	78	.0630
Computer Institute	5	1,646	9	3,4,5,7	14,814	2,840	369	.1299
Defense Systems Management School	2	120	44	3,7	5,040	958	84	.0877
Industrial College of the Armed Forces	5	180	68	3,4,6,7	12,450	1,225	82	.0669
Defense Totals	20	2,486	126	---	34,784	6,262	613	.0979

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE

COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year
1971

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Aviation School	4	532	9	3,5	3,765	89,000	535	.0060
Command & General Staff College	3	1,000	16	4	16,000	1,170	60	.0513
Communications-Electronics School	1	542	102	1,2,5	55,284	1,026,905	102	.0001
Engineer School	1	361	10	1,4,7	4,403	4,224	17	.0038
Field Artillery School	3	3,600	5	4,7	18,000	26,000	150	.0058
Adjutant General School	11	1,923	450	5	34,566	29,168	2,269	.0778
Logistics Management Center	23	3,011	50	3	150,550	37,381	153	.0041
Military Academy	65	4,100	40	3,4,5	164,000	6,800	540	.0794
Missile & Munitions School	1	92	208	3	19,136	246,790	2,496	.0101
Ordnance School	1	197	24	3	4,728	250,000	24	.0001
Quartermaster School	1	174	16	3	2,784	818,598	64	.0001
Security Agency School	5	2,587	1,203	1,5,7	442,186	26,413	20,239	.7663
Transportation School	3	2,861	58	3,7	44,021	432,870	675	.0015
War College	4	228	54	4,7	13,152	1,960	96	.0490
Women's Army Corps School	1	23	80	3	1,840	830	80	.0964
Army Totals	127	20,966	2,318	---	974,415	2,998,109	27,499	.0091
U. S. AIR FORCE								
Air Force Academy	64	4,550	11	2,3,4,5,7,9	47,775	18,530	672	.0363
Computer Directed Training System	3	1,000	41	1,5	20,900	---	---	--
Lowry AFB	6	3,269	116	3,5	287,292	107,684	7,830	.0727
Sheppard AFB	8	2,284	1	1,5	2,000	675,000	2,000	.0029
Air University	40	1,223	32	3,4,5,7	13,042	5,858	710	.1212
Air Force Totals	121	12,326	201	---	371,009	807,072	11,212	.0139
U. S. NAVY								
Naval Academy	40	1,500	12	1,3,4,5	18,000	1,088	20	.0184
Personnel Research & Development Center	1	152	35	1,5	5,624	---	---	--
War College	1	200	8	4	1,600	2,266	8	.0035
Navy Totals	42	1,852	55	---	25,224	3,354	28	.0083
DEPARTMENT OF DEFENSE								
Armed Forces Staff College	8	540	4	1,3,4,5,7	2,222	1,168	22	.0188
Computer Institute	5	1,978	9	3,4,5,7	17,802	3,500	369	.0154
Industrial College of the Armed Forces	3	180	68	3,4,6	12,300	1,225	72	.0588
Defense Totals	16	2,698	81	---	32,324	5,893	463	.0785

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE

COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year
1970

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Aviation School	3	145	9	3,5	867	90,000	124	.0013
Command & General Staff College	1	200	8	4	8,000	1,170	25	.0213
Communications-Electronics School	1	477	72	1,2,5	34,344	835,532	72	.0001
Engineer School	1	460	10	1,4,7	6,672	4,274	17	.0038
Field Artillery School	3	3,700	5	4,7	18,000	26,500	150	.0057
Adjutant General School	10	1,781	313	5	10,719	26,778	1,732	.0647
Logistics Management Center	12	1,571	50	3	78,550	30,660	144	.0046
Military Academy	55	4,000	30	3,4,5	120,000	6,400	480	.0534
Missile & Munitions School	2	108	126	1,3	13,608	247,528	1,512	.0061
Ordnance School	1	217	24	3	5,208	250,000	24	.0001
Quartermaster School	1	248	16	3	3,968	1,059,734	80	.0001
Security Agency School	7	2,557	1,549	1,5,7	544,905	22,715	17,423	.7670
Transportation School	3	2,636	58	3,7	39,867	566,932	675	.0012
War College	2	30	42	7	1,260	1,960	84	.0429
Women's Army Corps School	1	23	80	3	1,840	830	80	.0964
Army Totals	105	18,153	2,391	---	887,809	3,171,003	22,621	.0071
U. S. AIR FORCE								
Air Force Academy	50	3,919	11	2,3,4,5,7,9	41,149	17,340	525	.0303
SAGE/BUIC	5	800	121	3	40,900	---	---	--
Lowry AFB	4	1,955	122	3,5	107,300	82,164	4,505	.0548
Sheppard AFB	6	2,920	1	1,5	1,500	680,000	1,500	.0220
Air University	40	428	16	3,5,4,7	3,172	1,808	16	.0088
Air Force Totals	105	10,022	270	---	194,021	781,312	6,546	.0084
U. S. NAVY & U. S. MARINE CORPS								
Naval Academy	20	500	8	1,3,4,5	4,000	1,088	10	.0092
Personnel Research & Development Center	1	152	35	1,5	5,624	---	---	--
War College	1	200	8	4	1,600	2,266	8	.0035
USMC Communications-Electronics School	1	80	21	1	1,680	84,600	128	.0015
Navy & Marine Totals	23	932	72	---	12,904	87,954	146	.0017
DEPARTMENT OF DEFENSE								
Computer Institute	5	2,112	9	4,4,5,7	19,008	3,190	402	.1260
Industrial College of the Armed Forces	3	180	68	3,4,5,6	12,590	1,225	78	.0637
Defense Totals	8	2,292	77	---	31,598	4,415	480	.1087

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE

COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year
1969

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use Computer Support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Command & General Staff College	1	200	4	4	800	1,170	10	.0085
Communications-Electronics School	1	170	42	1,2,5	7,140	1,625,392	42	.0001
Adjutant General School	10	1,670	136	5	17,418	26,956	2,018	.0749
Military Academy	50	3,900	30	3,4,5	117,000	6,000	420	.0700
Ordnance School	1	304	24	3	7,296	250,000	24	.0001
Quartermaster School	1	242	16	3	3,872	1,086,657	64	.0001
Security Agency School	2	2,479	152	1.5.7	333,370	14,910	10,520	.7056
War College	2	30	42	7	1,260	1,960	84	.0429
Army Totals	68	8,995	446	---	488,156	3,013,045	13,182	.0044
U. S. AIR FORCE								
Air Force Academy	44	3,287	11	2,3,4,5,7,9	34,513	16,830	462	.0275
SAGE/BUIC	5	300	100	3	30,000	---	---	--
Lowry AFB	2	350	62	3,5	11,000	38,674	365	.0094
Sheppard AFB	2	3,492	1	1,5	1,000	680,000	1,000	.0014
Air Force Totals	53	7,429	173	---	76,513	735,504	1,827	.0025
U. S. NAVY								
Naval Academy	12	300	8	1,3,4,5	2,400	1,088	5	.0046
Personnel Research & Development Center	1	152	35	1,5	5,624	---	---	--
Navy Totals	13	452	43	---	8,024	1,088	5	.0046
DEPARTMENT OF DEFENSE	3	1,608	8	3,4,5,7	12,864	2,245	283	.1261
Industrial College of the Armed Forces	1	180	62	3,4,6,	11,160	1,225	62	.0506
Defense Totals	4	1,788	70	---	24,024	3,470	345	.0994

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year 1968

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Communications-Electronics School	1	108	12	1,2,5	1,296	1,614,458	12	.0001
Adjutant General School	8	2,121	109	5	11,185	19,288	1,008	.0523
Military Academy	50	3,700	30	3,4,5,	111,000	5,500	360	.0655
Ordnance School	1	293	24	3	7,032	250,000	24	.0001
Quartermaster School	1	137	16	3	2,192	955,035	48	.0001
Security Agency School	2	750	322	1,5,7	224,100	6,098	5,300	.8691
Army Totals	63	7,069	513	---	356,805	2,850,379	6,652	.0023
U. S. AIR FORCE								
Air Force Academy	38	2,656	11	2,3,4,5,7,9	27,888	14,492	399	.0275
SAGE/BUIC	5	300	100	3	30,000	---	---	--
Lowry AFB	2	350	62	3,5	11,000	38,674	365	.0094
Air Force Totals	45	3,306	173	---	68,888	53,166	764	.0144
U. S. NAVY								
Naval Academy	8	200	8	1,3,4,5	1,600	1,088	5	.0046
Personnel Research & Development Center	1	152	35	1,5	5,625	---	---	--
Navy Totals	9	352	43	---	7,224	1,088	5	.0046
DEPARTMENT OF DEFENSE								
Computer Institute	3	1,331	3	7	3,993	2,275	146	.0642
Industrial College of the Armed Forces	1	180	55	3,4,6	9,900		55	.0449
Defense Totals	4	1,511	58	---	13,893	3,500	201	.0574

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE
COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year
1967

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Communications-Electronics School	1	34	12	1,2,5	648	835,357	12	.0001
Adjutant General School	7	1,359	107	5	5,687	10,288	510	.0496
Military Academy	35	3,400	20	3,4,5	68,000	5,000	340	.0680
Quartermaster School	1	106	16	3	1,696	805,000	32	.0001
Security Agency School	2	625	142	5,7	85,430	2,498	1,630	.6525
Army Totals	46	5,544	297	---	161,461	1,653,143	2,524	.0015
U. S. AIR FORCE								
Air Force Academy	28	2,124	11	2,3,4,5,7,9	22,302	13,302	294	.0221
SAGE/BUIC	5	400	100	3	40,000	---	---	--
Lowry AFB	2	350	62	3,5	11,000	38,674	365	.0094
Air Force Totals	35	2,874	173	---	73,302	51,976	659	.0127
U. S. NAVY								
Naval Academy	3	60	4	1,3,4,5	240	1,088	1	.0009
Navy Totals	3	60	4	---	240	1,088	1	.0009
DEPARTMENT OF DEFENSE								
Industrial College of the Armed Forces	1	180	34	3,4,6	6,120	1,225	34	.0278
Defense Totals	1	180	34	---	6,120	1,225	34	.0278

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE
COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year
1966

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Adjutant General School	6	1,057	55	5	4,801	6,160	96	.0156
Military Academy	25	3,100	20	3,4,5	62,000	4,000	310	.0775
Quartermaster School	1	160	16	3	2,560	525,000	48	.0001
Army Totals	32	4,317	91	---	69,361	531.160	454	.0008
U. S. AIR FORCE								
Air Force Academy	17	1,393	11	2,3,4,5,7,9	14,626	12,835	178	.0139
SAGE/BUIC	5	500	100	3	50,000	---	---	--
Lowry AFB	2	350	62	3,5	11,000	38,674	365	.0094
Air Force Totals	24	2,243	173	---	75,626	51,509	543	.0105
DEPARTMENT OF DEFENSE								
Industrial College of the Armed Forces	1	180	24	3	4,320	1,225	24	.0196
Defense Totals	1	180	24	---	4,320	1,225	24	.0196

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE

COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year

1965

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Adjutant General School	5	716	55	5	3,110	7,920	59	.0074
Military Academy	10	3,100	12	3,4,5	37,200	3,400	210	.0618
Ordnance School	1	113	16	3	1,808	525,000	32	.0001
Army Totals	16	3,929	83	---	42,118	536,320	301	.0006
U. S. AIR FORCE								
Air Force Academy	8	761	11	2,3,4,5,7,9	7,990	9,180	84	.0092
SAGE/BUIC	5	600	100	3	60,000	---	---	--
Lowry AFB	2	350	62	3,5	11,000	38,674	365	.0094
Air Force Totals	15	1,711	173	---	78,990	47,854	449	.0094
DEPARTMENT OF DEFENSE								
Industrial College of the Armed Forces	1	180	24	3	4,320	1,225	24	.0196
Defense Totals	1	180	24	---	4,320	1,225	24	.0196

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE
COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year
1964

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Adjutant General School	4	466	55	5	3,040	5,280	55	.0104
Military Academy	6	2,800	12	3,4,5	33,600	2,600	30	.0115
Quartermaster School	1	127	16	3	2,032	525,000	48	.0001
Army Totals	11	3,393	83	---	38,672	532,880	133	.0003
U. S. AIR FORCE								
Air Force Academy	8	761	11	2,3,4,5,7,9	7,990	9,180	84	.0092
SAGE/BUIC	5	600	100	3	60,000	---	---	--
Lowry AFB	2	350	62	3,5	11,000	38,674	365	.0094
Air Force Totals	15	1,711	173	---	47,854	449		.0094
DEPARTMENT OF DEFENSE								
Industrial College of the Armed Forces	1	180	24	3	4,320	1,225	24	.0194
Defense Totals	1	180	24	3	4,320	1,225	24	.0194

THE DEVELOPMENT OF THE INSTRUCTIONAL USE OF THE
COMPUTER IN MILITARY TRAINING AND EDUCATION

Fiscal Year
1963

MILITARY INSTITUTIONS BY SERVICE	Number of courses that use computer support	Number of students trained with computer support	Number of hours the student received computer supported training	Modes of computer support	Number of student contact hours with computer support	Total number of academic hours presented in the year	Total number of hours of computer supported training presented in the year	Percentage of instruction which is computer supported
U. S. ARMY								
Adjutant General School	4	613	55	5	3,064	7,040	57	.0081
Military Academy	4	2,000	12	3,4,5	24,000	2,600	30	.0115
Quartermaster School	1	46	16	3	736	525,000	16	.0001
Army Totals	9	2,659	83	---	27,800	534,640	103	.0002
U. S. AIR FORCE								
Air Force Academy	1	130	105	7	1,365	8,000	11	.0001
SAGE/BUIC	5	600	100	3	60,000	---	---	--
Air Force Totals	6	730	111	---	61,365	8,000	11	.0013
DEPARTMENT OF DEFENSE								
Industrial College of the Armed Forces	1	180	24	3	4,320	1,225	24	.0196
Defense Totals	1	180	24	3	4,320	1,225	24	.0196

APPENDIX I

METHODOLOGY AND ANALYSIS FOR THE PROJECTION OF COMPUTER USE IN THE 1980s

METHODOLOGY AND ANALYSIS FOR THE PROJECTION OF COMPUTER USE IN THE 1980s

The follow-on survey data were collected for two purposes: (1) to quantify the progress of the military services in instructional computer use, and (2) to provide a basis for projecting the future use of computers in education and training. The data were used in chapter 3 to demonstrate the progress of each service and DoD training and education institutions.

Chapter 4 reflects information that is suggestive of the prospects for the Army's future use of computer based training. This appendix was developed to offer a basis for predicting the direction of this growth.

The charts showing the follow-on survey data--figures 19, 20, and 23, in chapter 3--clearly demonstrate the upward path of growth of computer use in the Army.[1] Having served their primary purpose, the data collected in the follow-on survey are now used to suggest the future path of this activity. Within the limitations of such conjecture, however, several data categories were selected to provide a basis for trend extrapolation in order that Army managers might have a basis for planning future educational and training support requirements.

Since student contact hours are widely used in pedagogic research, it seems reasonable to project this category of data as the first estimation of computer based training activity for the 1980s. The Army data were extracted from appendix H and subjected to simple linear regression

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[1] See above, pp. 85, 87, and 92.

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analysis. In turn, these data were used to develop the projection seen in figure 51.[1] This plot suggests the direction of computer use based on twelve years of data. Using these current data (the heavy data points), it can be seen that the Army is near the 1.5 million level of computer supported student contact hours. A linear forecast of these data suggests that the Army's use of computer supported training will double in the next ten years. It may be questioned whether this one projection is the most reasonable. Therefore, other categories were examined on the basis of all the follow-on data collected.

Various categories of data were extracted from follow-on survey data summaries in appendix H. Since some of the trend lines shown in the figures specifically mentioned above (figs. 19, 20, and 23) suggest an exponential character, logarithms of some of the data categories were used in the subsequent analysis. Table 20 contains the data categories selected for further analysis.

A regression analysis was performed using each data category with time (years) as the independent variable. A curve fitting option that computed linear, exponential, power, and three hyperbolic functions assisted in identifying the best fit for the various data. It was found that significant correlation existed with the linear and exponential functions. The linear correlation coefficient was .93298, and the exponential correlation coefficient was .94249.

The logarithms of Army computer supported student contact hours data were used to check for goodness of fit. These logarithmic data were

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[1]For ease of reference, fig. 51 is a duplicate of fig. 29, on page 120 above.

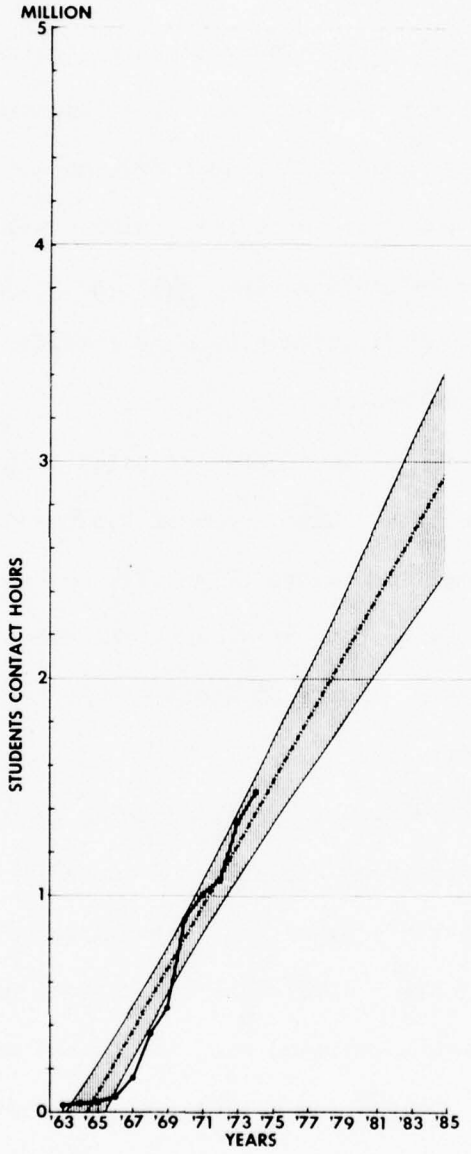


Fig. 51. A linear projection of Army computer supported student contact hours in training and education to 1985. This forecast is based on a simple regression analysis of current data (1963 to 1974). The 95 percent confidence limits are shown as the shaded area on either side of the dashed trend line.

TABLE 20

SELECTED FOLLOW-ON SURVEY DATA
USED IN THE FORECASTING ANALYSIS

Year	Student Contact Hours	Logarithm of Student Contact Hours	Computer Supported Hours of Instruction	Total Hours of Instruction (Less Computer Hours)	Percentage of Instruction That is Computer Based	Logarithm of Percentage of Instruction that is Computer Based
1963	27,800	4.44404	103	534,537	.0002	$\bar{4}$.30103
1964	38,672	4.58737	133	532,747	.0003	$\bar{4}$.47712
1965	42,118	4.62449	301	536,019	.0006	$\bar{4}$.77815
1966	69,361	4.84111	454	530,706	.0008	$\bar{4}$.90309
1967	161,461	5.20683	2,524	1,659,619	.0015	$\bar{3}$.17609
1968	356,805	5.55242	6,652	2,843,724	.0023	$\bar{3}$.36173
1969	488,156	5.68860	13,182	2,099,863	.0044	$\bar{3}$.64345
1970	887,809	5.94382	22,621	3,148,382	.0071	$\bar{3}$.85126
1971	974,415	5.98874	27,499	2,970,610	.0091	$\bar{3}$.95904
1972	1,063,833	6.02653	35,693	3,410,193	.0104	$\bar{2}$.01703
1973	1,347,209	6.12937	49,676	2,932,151	.0166	$\bar{2}$.22011
1974	1,480,357	6.17026	59,373	2,798,160	.0207	$\bar{2}$.31387

SOURCE: These data are extracted from the follow-on survey data located in appendix H

plotted on log paper to produce the chart shown in figure 52. It can be seen that the data line has been smoothed somewhat from its irregularity as seen in figure 51 (page 348). The projection shown in figure 52, the dashed line, indicates the growth in Army student contact hours to well over the 100,000,000 mark by 1985. This projection represents a 100-fold increase in the next ten years, as compared to the doubling of student contact hours suggested in figure 51. Intuitively, a 100-fold projected increase seems grossly implausible. Yet, before being judged as an incredible projection, the data should be compared with still other forecasts. For example, figure 53 shows that an extrapoliation of the percentage of total training that will be computer based is projected to be at the 3.5 percent level by 1985. This increase grows from the current 2 percent level (1974) to a possible doubling in the 1980s. As explained in chapter 3, the percentage data are probably the more conservative of those developed in the follow-on survey because they are a function of total training and computer based training.[1] Therefore, one might speculate that a doubling of computer usage in the 1980s is reasonable and consistent with the projection shown in figure 51, as opposed to the 100-fold increase suggested by the logarithmic projection shown in figure 52. This comparative methodology tends to suggest that the student contact hour data are not exponential in nature; otherwise, there would have been better consistency among the projections shown in figures 51, 52, and 53.

Although no comparable data on non-computer based student contact hours were available in the field, it is possible to draw some analogy

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[1] See above, pp. 89-90.

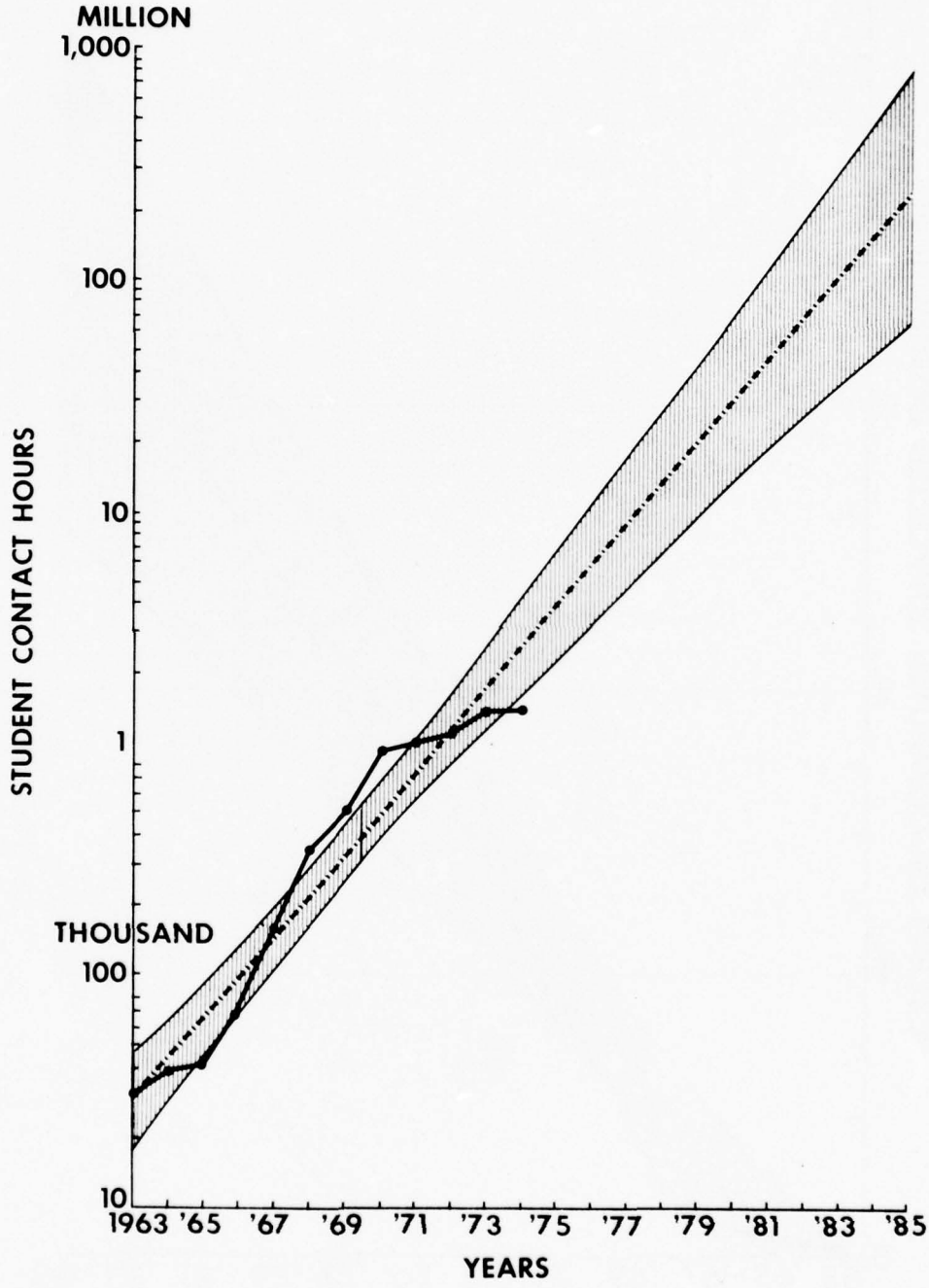


Fig. 52. A logarithmic projection of Army computer supported student contact hours in training and education to 1985. This forecast is based on a simple regression analysis of current data (1963 to 1974). The 95 percent confidence limits are shown as the shaded area on either side of the dashed trend line suggested by the current year's data, the heavy dots connected by a solid line.

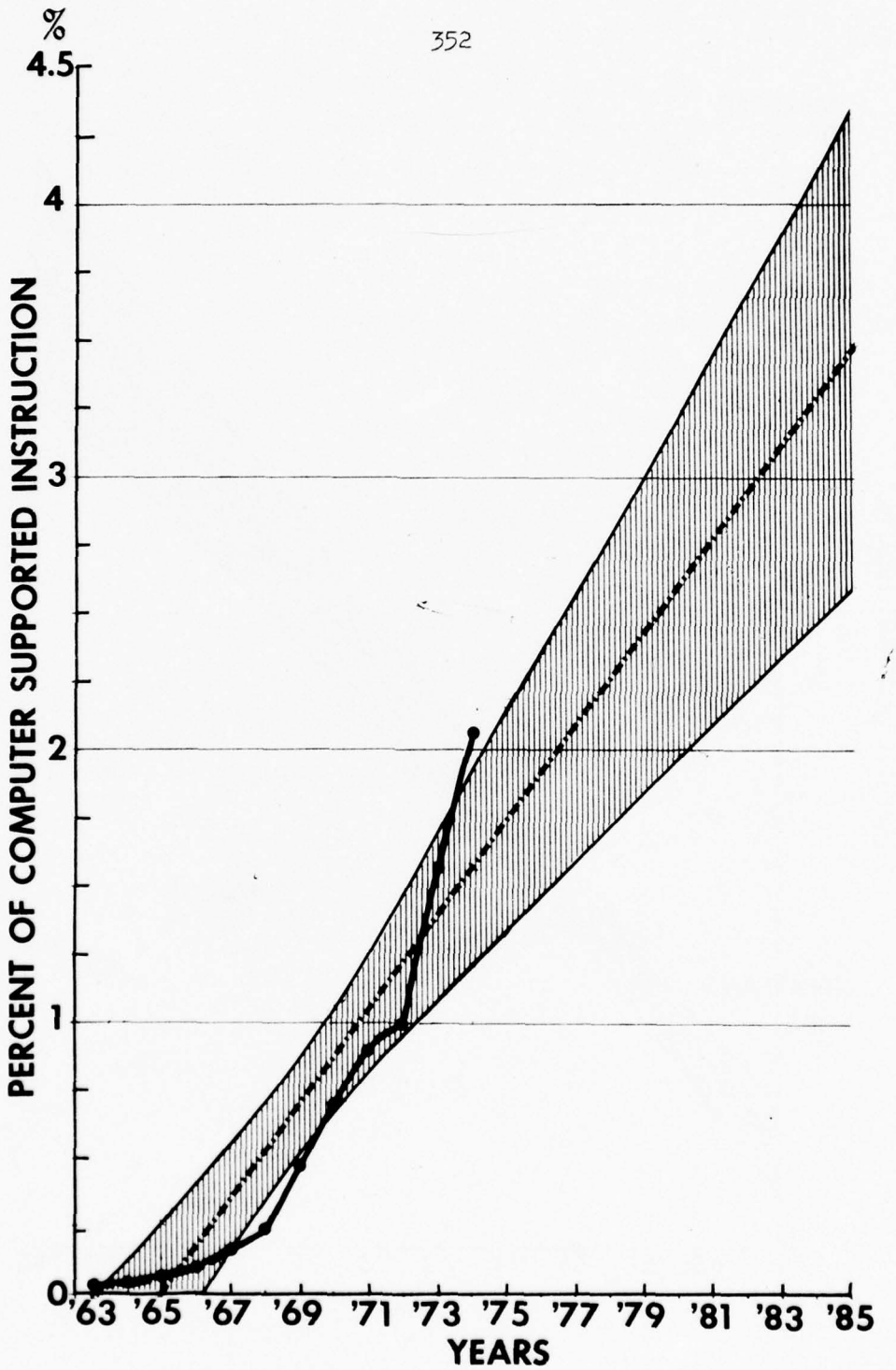


Fig. 53. A linear projection of the percentage growth in computer supported instruction for Army training and education institutions as compared to other methods of instruction. This forecast is based on a simple regression analysis of current data (1963 to 1974) and extends to 1985. The 95 percent confidence limits are shown as the shaded area on either side of the dashed trend line.

with student contact hours using total training hours. In 1974, the ratio of total training hours (non-computer) to computer supported student contact hours was approximately 2 to 1 (i.e., 2,798,160 total training hours versus 1,480,357 computer supported student contact hours). An inspection of these data (table 20) reveals that the ratio has been reducing to this point over the past twelve years, from about 20 to 1 to the current 2 to 1 ratio.[1] It does not appear from the rate of change experienced in the past several years that total student contact hours will exceed total training hours by the mid-1980s. The 1985 projection for total training hours (non-computer) is just under seven million hours, as projected by a linear regression analysis similar to those discussed above.[2]

Assuming the present 2 to 1 ratio between total training hours and computer supported student contact hours continues to 1985, the seven million total training hours projected for 1985 and the three million computer supported student contact hours provide the approximate 2 to 1 ratio suggested by the 1974 data. Once again, the linear projection in figure 51 appears to be more plausible than the exponential projection in figure 52.

In chapter 4 of this report, it is hypothesized that the progress of computer use in the Army could be viewed in three phases. Phase one is the period prior to 1969, representing the gradual and experimental

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[1] See table 20, p. 349 above.

[2] The data for total hours of instruction were projected on the basis of a simple regression analysis of current data (1963 to 1974). The projection for 1985 was suggested to be 6.89 million total hours of instruction.

growth phase of computer supported training development in the Army.[1] Accepting the premise that the data of phase one are atypical and in an effort to develop a more reasonable projection, these data were excluded from the analysis that follows. In figure 54, the data for the period 1969 to 1974 are portrayed. A regression line was used to extend the data to 1985.[2] Again the logarithmic scale was used. The data for the current years (1969 to 1974) provide a gradually sloped line, compared to the steep slope of the prior twelve years of data (includes phase one), as seen in figure 52. Yet, the regression line for the most recent six years projects the computer supported student contact hours for the Army to be above the 10,000,000-hour level in 1985. This estimate also seems to be unreasonable compared with current data (1963 to 1974) as shown in figure 51. In other words, the projection is about seven million hours higher than would be expected if it were based on other analysis.

The logarithmic scale was introduced in figures 52 and 54 in an effort to deal with the suggested exponential character of the curve developed by the student contact hour data. Even though the curve fitting analysis gave an indication that student contact hours data would fit an exponential curve slightly better than a linear one, the resulting logarithmic projections fail the test of reasonableness.

Despite the fact that the logarithmic projection of the data from 1969 to 1974 generated a trend line that is unreasonable, it was thought

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[1] See above, p. 95.

[2] This projection (and the subsequent one) is based on only six data points, and such a projection should be interpreted even more cautiously than those above.

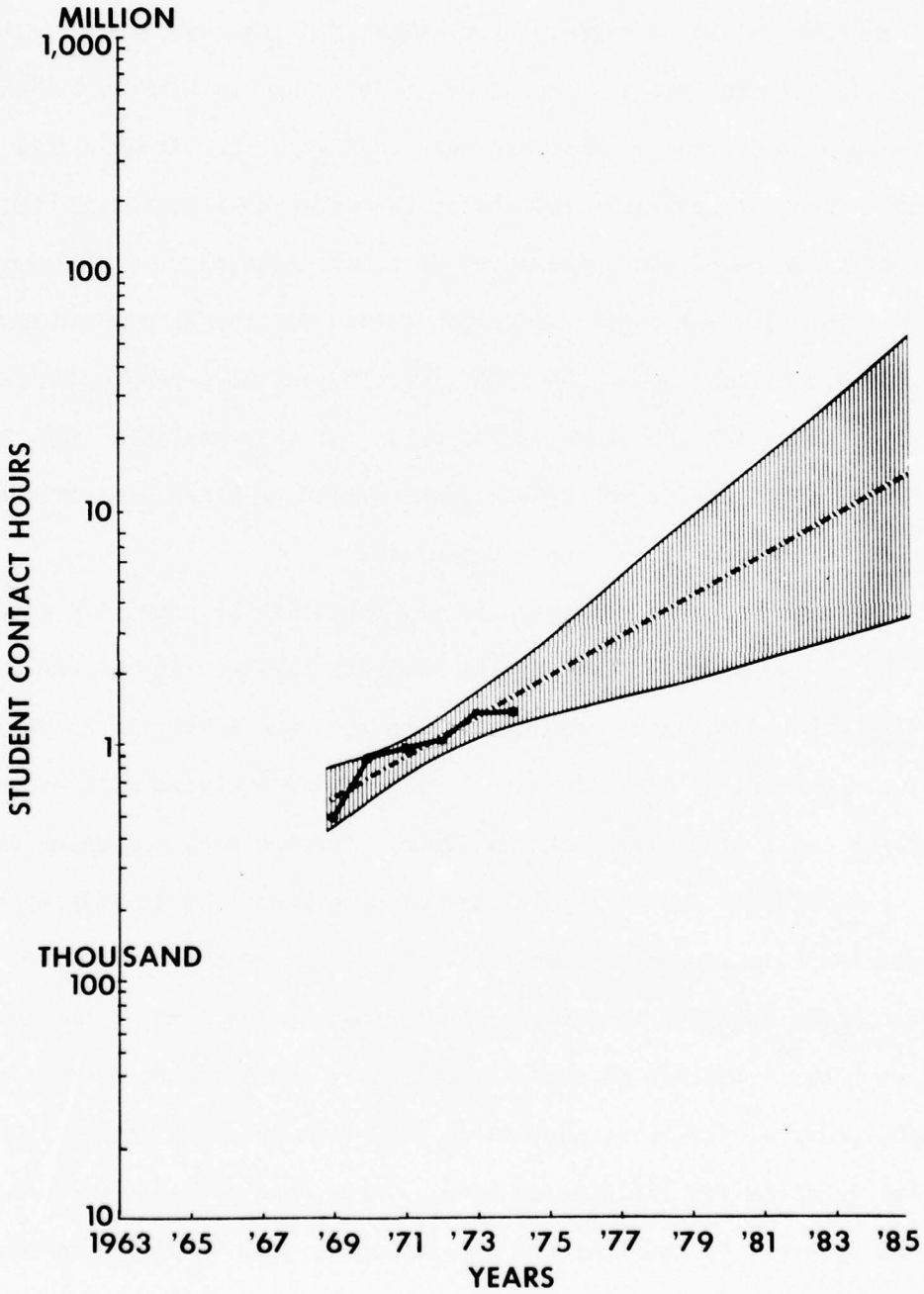


Fig. 54. A logarithmic projection of Army computer supported student contact hours in training and education to 1985. This forecast is based on a simple regression analysis of current data from 1969 to 1974. The 95 percent confidence limits are shown as the shaded area on either side of the dashed trend line suggested by the current year's data, the heavy dots connected by a solid line.

that these data should be extrapolated linearly using real values (non-logarithmic). Therefore, a forecast was made using the 1969 to 1974 data as the base period. The results are seen in figure 55. It should be noted that such a projection would generate an even steeper sloped line than that suggested in figure 51 since phase one data were removed from the regression analysis. This student contact hour projection for the Army would suggest a level of 3.5 million hours for 1985 (fig. 53) versus a projection of 2.9 million hours for 1985 made at the outset of this analysis (fig. 51). The 3.5 million figure is comparable when related to other projections thought to be reasonable, as described above.

The data from the follow-on survey (appendix H) provide a good indication of the progress made by the military services in the use of computers in education and training between 1963 and 1974. It is unlikely that simple extensions of these data by regression analysis will accurately predict the level of activity of the 1980s. Far too many exogenous factors are at work to allow the extrapolations of data discussed in this appendix to be considered as any more than conjecture or judgmental estimates. Any speculation relative to future computer use by the Army in the 1980s should be clearly labeled as such--speculative. To say that a certain level of computer activity will be pursued in 1985 requires substantiating data on the total capacity for training in 1985. These data elements are not in fact even forecast by the Army for the following year (1976). Further, a substitution effect is operative in the integration of computer based training, which may adversely affect any projection using current data. For example, there may be greater rigidity among the faculty than suggested by this research, making them more reluctant to change. Additionally,

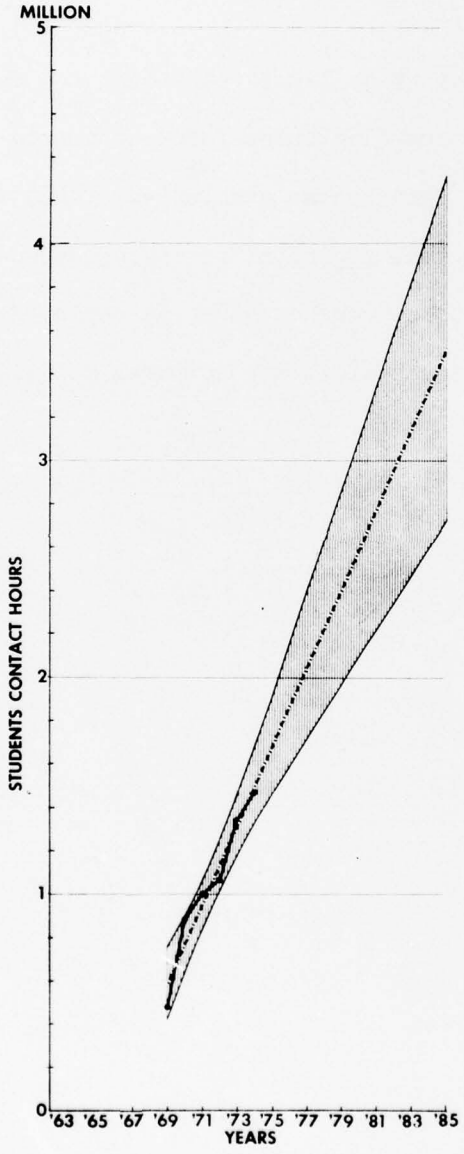


Fig. 55. A linear projection of Army computer supported student contact hours in training and education to 1985. This forecast is based on a simple regression analysis of current data from 1969 to 1974. The 95 percent confidence limits are shown as the shaded area on either side of the dashed trend line suggested by the current data, the heavy dots connected by a solid line.

here may be a saturation of instructional technology, based on the use f other media, that may draw down the total amount of instructional omputer use by the Army.

Notwithstanding these limitations, the top management levels of he military services may find these future-oriented data useful for lanning until better data become available. Thus, on the basis of the nalysis discussed in this appendix, it is suggested that the linear rojection of Army student contact hours as depicted in figure 51 epresents a good estimate of future computer activity for the Army n the 1980s.

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