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Cost and Effectiveness of Home Study Using Asynchronous Computer Conferencing for Reserve Component Training

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November 1991

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The purpose of this research was to determine the effectivenss and costs of home study using asynchronous computer conferencing (ACC) for the Reserve Component (RC). A portion of the Engineer Officer Advanced Course was taught to RC officers using paper, video, and computer-based training materials; students and instructional staff communicated with each other using computer conferencing. A control group consisted of RC officers taking the same course in residence at the U.S. Army Engineer School. The findings were as follows: (1) ACC training costs less than resident training, (2) ACC and resident test and performance measures did not differ, (3) ACC students perceived a greater learning benefit than resident students, and (4) completion rates were higher for resident than for ACC students. These results indicate that ACC may be a cost-effective alternative to resident training for the RC.

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Training Simulation

FOREWORD

Limited time and wide geographical dispersion of both units and individuals in the National Guard and Army Reserve--the Reserve Component (RC)--make it difficult and costly for soldiers to travel to branch schools for training. Therefore, the RC is exploring alternatives that will use technology to bring training and educational opportunities to the soldiers' homes. One of these alternatives establishes remotely conducted classes in which individuals are linked with each other and their instructors using asynchronous computer conferencing (ACC).

This report summarizes the findings on the effectiveness and costs of using asynchronous computer conferencing for RC distributed training. The report was developed by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) Boise Element within the charter of the Training Technology Field Activity, Gowen Field, whose mission is to improve Reserve Component training effectiveness and efficiency through the testing and application of technology. The research task supporting this mission, Application of Technology to Meet Reserve Component Needs, is organized under the Training for Combat Effectiveness program area. The National Guard Bureau, Forces Command, and Training and Doctrine Command Headquarters (TRADOC HQ) sponsored this project under the Memorandum of Understanding signed 12 June 1985 that established the office. Project results have been briefed to TRADOC HQ, Forces Command, Office of the Chief, Army Reserve, and the National Guard Bureau.

Edgar M. Johnson

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Technical Director

COST AND EFFECTIVENESS OF HOME STUDY USING ASYNCHRONOUS COMPUTER CONFERENCING FOR RESERVE COMPONENT TRAINING

EXECUTIVE SUMMARY

Requirement:

This report evaluates the costs and effectiveness of using asynchronous computer conferencing (ACC) techniques to provide high-quality remotely delivered training to the U.S. Army Reserve Component (RC).

Procedure:

The evaluation used a portion of the Engineer Officer Advanced Course (EOAC) as a test bed. Course materials that taught the same content presented in the resident course were developed for remote, asynchronous presentation. Media used were paper and computer-based instruction, video tapes, and computer conferencing. The efficacy of remote training was compared with that of the resident program for throughput, performance, and cost.

Findings:

Comparisons of home study by ACC and resident training showed that (1) ACC training costs less, (2) there were no differences in test scores, (3) ACC students perceived they learned more from the course, and (4) more resident students completed the course.

Utilization of Findings:

Based on these data, it appears that ACC courses can be a cost-effective alternative to resident training. These findings support the efficacy of distributed training for the RC and contribute to the development of Total Force distributed-training strategies and decisions concerning the implementation of new training technologies.

COST AND EFFECTIVENESS OF HOME STUDY USING ASYNCHRONOUS COMPUTER CONFERENCING FOR RESERVE COMPONENT TRAINING

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COST AND EFFECTIVENESS OF HOME STUDY USING ASYNCHRONOUS COMPUTER CONFERENCING FOR RESERVE COMPONENT TRAINING

Background

Geographical dispersion, limited resources and civilian job and family demands make travel to distant locations for training and education difficult for members of the Reserve Components (RC). The Army RC, composed of the United States Army Reserve (USAR) and the Army National Guard (ARNG), consists of approximately 7000 units scattered across the nation and overseas at more than 4000 armories and reserve centers. The typical RC training year includes only 39 days traditionally distributed over 12 weekends and one 15-day annual training session during which units must accomplish both individual and collective training requirements. Thus, when individuals must attend training or educational courses away from home, they are absent from their units, detracting from unit collective training and the organization's ability to attain wartime readiness levels.

In addition to hardships for soldiers and units, training in residence at active component branch schools is expensive. In a plan to reduce this cost, the U.S. Army Training and Doctrine Command (TRADOC) has proposed a 50% cut in resident training time by the year 2007 (TRADOC PAM 350-4, 1989). Similar reductions may be forthcoming for Reserve Forces (RF) Schools and National Guard state academies.

The purpose of this report is to summarize an investigation into an alternate means for meeting the training/educational needs of the RC called Asynchronous Computer Conferencing (ACC). In general, ACC is a means of communicating from different locations at different times (i.e., asynchronously) using a computer network. An "electronic classroom" is established by connecting students with one another and the instructional staff. A student or instructor can participate in classroom activities from any location using existing telephone lines and a computer equipped with a modem. Computer conferencing is similar to electronic mail, allowing students to work together in groups, ask questions of instructors, tutor classmates or just share thoughts and experiences. It can also enable the instructional staff to direct small group instruction, ask and answer questions, test, provide timely feedback and give remedial instruction.

The goals of the present research were to (a) develop and test a new training option using ACC that would not require soldiers to leave their homes and units, but would maintain the quality of training found at the branch school and (b) determine the cost and effectiveness of developing and operating the ACC alternative.

The ACC concept for conducting RC military education was evaluated using the Engineer Officer Advanced Course (EOAC) as a test case. An officer advanced course was chosen because noncompletion of OAC has been identified historically as the primary reason why RC captains fail to be selected for promotion. In FY 89, for example, only 59% of those eligible had completed their advanced course resulting in an overall promotion-to-major selection rate of only 50.5% (official Army Reserve Personnel Center data). The dropout problem can be attributed to several factors including the cost of sending RC soldiers to resident schools, the limited time available to attend resident training because of civilian and military reserve responsibilities and quality/motivational inconsistencies found in current non-resident training.

EOAC was selected, in particular, because approximately 72% of the Army's engineer assets are RC; the content of the EOAC is a mix of technical, tactical and problem solving tasks; and because EOAC consists largely of small group instruction (SGI), presenting a major challenge to those executing non-resident training.

Method

Participants

Fourteen RC captains and lieutenants began the computer mediated home-study course. Six were members of the USAR and eight were ARNG. All but one were male. The instructional staff consisted of a civilian full-time course manager/administrator responsible for the overall operation of the course and supervision of supporting staff; he was also a member of the USAR. The supporting staff consisted of four part-time instructors, all members of the USAR; their responsibilities included monitoring student progress, directing group discussions and conducting remedial instruction.

For comparison purposes, course performance data were collected from 339 RC officers taking EOAC in residence at USAES during FY 87, 88 and 89. Demographic information was also collected from 49 RC students in residence during FY 89.

Course Description

Module 6 of the seven module (each two weeks long) United States Army Engineer School resident EOAC course, consisting of 66 program of instruction (POI) hours, was taught. The POI was identical for the resident and ACC courses. The nine topics covered were: Airfield Damage Repair (2 hrs.), Military Petroleum Pipelines (4 hrs.), Asphalt Production (3 hrs.), Flexible Pavement Structures (5 hrs.), Roads and Airfields (7 hrs.), Military Bridges (24 hrs.), Rear Operations (2 hrs.), a video presentation of a talk by an allied officer (1 hrs.), and a writing requirement (2 hrs.). In a course culminating practical exercise called a "Capstone" (16 hrs.), students worked in teams of five or six and were required to integrate technical information learned throughout the module into plans for carrying out construction directives issued by a notional higher headquarters. The Capstone scenario placed the teams as staff groups in a simulated combat environment in which they were to develop plans appropriate to this scenario and resource constraints; each team then briefed its plan to an actual field grade officer posing as the commander using computer conferencing.

The resident course was presented in a traditional military classroom setting with students living in residence for the duration of the course, attending classes each day, five days a week. In addition, students were expected to study during weekends and evenings. Typical media included lectures, computer-aided instruction and small group instruction with practical exercises. Testing consisted of a final exam and a graded Capstone exercise.

The materials used in the resident course were converted into a form suitable for ACC (Hahn, Harbour, Wells, Schurman, and Daveline, 1990). The media selected for ACC were determined by both the availability of the equipment at the students' homes and the suitability for meeting the learning objectives. Figure 1 compares the methods and media used in the resident course with the ACC-based course. Table 1 shows the percentage of course hours devoted to particular media/tasks.

Table 1

Media/Task Percentages

Media/Task	%
Computer-Based Instruction	19%
Team Synchronous	4%
Team Asynchronous	20%
Video	2%
Print	41%
Quiz/Exam/Review	14%

RESIDENT COURSE	ACC COURSE
Live Lecture	Paper-based readings Storyboards Author CAI Lessons Videotape of Lecture
Live Exam Review	Asynchronous Discussion Exam Review
Live Proctored Exam	Computer Proctored Exam
Lead-through Prac Exercises	Author CAI Lessons Spreadsheet exercises Paper-based exercises
Small Group Practical Exercises	Individual Problem Solving Synchronous Group Problem Solving Asynchronous Group Problem Solving
Homework	Homework
Videotape	Video Transcript of Videotape
Readings	Readings
Plato CAI	Plato CAI
Live Role Play	Videotaped Role Play
Writing Assignments	Writing Assignment
Live Capstone	Capstone via Asynchronous Meetings

Figure 1. Methods used in resident course with corresponding methods appropriate for the Asynchronous Computer Conferencing course.

Equipment, Communications and Software

Each student was provided a personal computer with a 20 megabyte hard disk, keyboard, color monitor and printer. Software and courseware loaded on each computer consisted of (a) the specially developed course management system and communications package; (b) computer-assisted instruction and tests; (c) a word processing package; and (d) a spreadsheet package.

A communications system for ACC was provided through Army Forum, a division of the Office of the Director of the Army Staff. The host computer was located at Wayne State University and used Confer II [Copyright (c) 1986 by Advertel Communication Systems, Inc.] software.

Specialized software was designed to create an interface between Confer II and the student. It was designed to mimic the functions performed at the resident school and to help create the concept of the electronic classroom. Major functions the students would perform were assigned to "rooms", as shown in Figure 2. This schoolhouse metaphor served to aid the ACC student in understanding the ACC learning environment. Key rooms included (a) a room for administrative matters such as announcements and class standings (the office); (b) rooms for private communications (mail room, instructor help room, team leader help room); (c) rooms for group communication (break room, class room, team rooms); (d) a room to access lessons on their hard disks (the classroom); and (e) rooms to do homework and other written assignments (the writing center). In addition, a task list was displayed which guided the student through the learning activities and showed personal progress. Timed quiz and exam questions were presented, scored and reported electronically. Test security was maintained by denying students any opportunity to either print tests or to recall a test to the computer screen once time expired for the test.

<table>
<tr><td>Writing Room</td><td rowspan="2">Classroom
Break Room
Team Rooms</td><td>Learning Center</td></tr>
<tr><td>Mail Room</td><td>Office</td></tr>
<tr><td>Team Leader Help Room</td><td>Task List</td><td>Instructor Help Room</td></tr>
</table>

Figure 2. The software interface using the schoolhouse metaphor.

Procedure

Computer Assembly and Training. Students were mailed all computer equipment and course materials with written instructions on assembling/operating their computers and software. Also provided was a toll free "hot line" telephone number for resolving hardware/software problems. In addition, the students received precourse training materials to familiarize them with the operation of the computer and software.

Part-time instructional staff were provided the same type of equipment and software as the students. Additionally, they attended a five day training course on instructional responsibilities, teaching/motivational techniques and operation of hardware/software. Instructional staff and researchers met in person for this training which combined lecture and hands-on practice with the computer.

Course Progression. Students signed a contract agreeing to spend eight hours per week on course materials and to log-on to their computers twice each week. As shown in Figure 3, the course was executed in three phases, beginning in September, 1988 and ending in April, 1989. For the first phase, students completed assignments and tests at their own pace using materials designed for individual instruction. They communicated with the instructional staff, but did not participate in group exercises with other students. Grade points for all assignments and tests were awarded individually. In the second phase, self-pacing was eliminated and all students were given a fixed schedule of assignments and tests. The students were also organized into two teams and, in addition to individual assignments, completed group tasks for which all members of the team received the same grade. In the third phase, each team completed the Capstone practical exercise and presented their solution in a formal briefing held synchronously on their computers to a field grade officer from the support staff who role-played their engineer brigade/group commander.

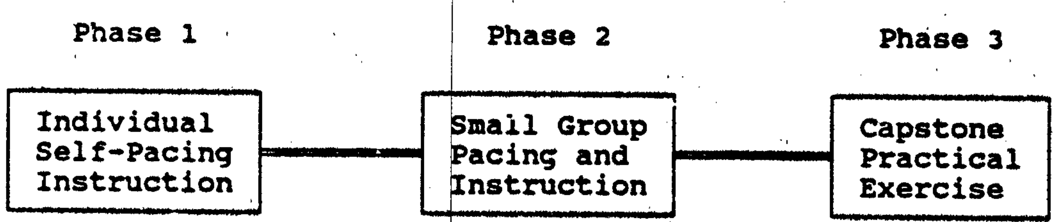

Figure 3. The three phases of the Asynchronous Computer Conferencing course.

Data Analysis

Four types of data were collected: (a) test and homework scores; (b) student perceptions of how much they thought they had learned; (c) course completion rates; and (d) costs of development/conversion and execution. Because there were several dependent measures, comparisons of the resident to the ACC course were made using multivariate analysis procedures for a two-group design (Harris, 1975).

Test, homework and practical exercise scores. Tests and homework assignments were the same as those used for the USAES resident Module 6. Multiple-choice tests were administered after each topic and immediately scored by the computer. Students were not allowed to take additional tests until they passed the preceding test. Homework was graded by the instructor and returned with comments, usually within 24 hours of receipt. It should be noted that in the USAES resident course, a comprehensive module exam is administered at the end of the two week block, whereas for the ACC students, separate tests were administered after each topic.

Student perceptions. Both the resident and ACC groups were administered surveys before and after the course to determine student self-assessment of knowledge on the course topics (e.g., how much they thought they learned). Students rated their perceived amount of knowledge on engineer technical and tactical skills on a five point scale. A measure of the perceived amount learned was derived by computing the difference between ratings before and after the course for each student.

Completion rate. The percentage of students who completed the resident and the ACC courses was the completion measure. Any ACC student who failed to complete the course in its entirety was administered a survey to determine the reason(s) for noncompletion.

Cost. The costs in time and dollars to develop/convert course materials and run one iteration of the 66 POI hour module were computed. These estimates were based on assumptions that (a) the data gathered from the 66 POI hours converted and tested in this research will generalize to other EOAC modules; (b) previously developed software, communications packages, and instructor training courses (Harbour, Daveline, Wells, Schurman, Hahn, 1990) will be used; and (c) the guidelines for course development/conversion summarized later in Table 3 reflect an accurate level of effort.

The conversion estimates are based on a TRADOC publication entitled "Estimated Time Values for Training Developments (1984)" produced by the TRADOC Management Engineering Activity (TRAMEA). Estimated Time Values (ETVs) are expressed as staff hours and listed in categories and sub-categories within the TRAMEA document. Modified category names have been used in this report to better describe the processes actually undertaken in the present research. The development/conversion staff hours reflect an estimate based on a matchup of actual time spent by the ACC staff with the ETV guidelines. An extrapolation from the ETVs to actual dollar costs was made based on estimates of contract and in-house hourly rates for developing/converting a resident course to ACC. The contract rate was based on the actual time and cost spent in developing/converting the ACC course. An in-house rate was derived from pay, allowances, benefits and base operations costs as detailed in Appendix B.

The costs to execute the 66 POI hours were estimated for each of the categories listed in the left column of Table 4. The start-up and recurring costs for each course iteration of 50 students were computed separately. It is assumed that start-up costs would be repeated every five iterations. In addition, estimates were made of projected costs if the training were executed completely by in-house personnel versus totally under contract, based again on the hourly rates previously discussed.

In addition, cost projections for conducting and executing the entire EOAC (seven modules) using ACC were computed. This projection was based on the actual cost of the single Module 6 adjusted for the cost of more portable equipment (i.e., lap-top computers).

Costs of training EOAC students in residence at USAES were obtained from a report (ATRM-159) produced by the Office of the Deputy Chief of Staff for Resource Management (DCSRM), Headquarters, TRADOC. These costs are detailed at Appendix D.

Results

Test, Homework and Practical Exercise Scores

As shown at the top of Table 2, there were no reliable differences between the test, homework or practical exercise scores of students in residence versus ACC. (Demographically, the resident group did not differ significantly from the ACC group).

Student Perceptions

The ACC students showed significantly greater gains in terms of how much they reported they learned during the course [Wilks Lambda = 0.49, $F(15,28) = 1.96$, $p<0.05$] as detailed in Appendix A. Another perception, shared by all the students, was that eight hours per week was a reasonable amount of time to spend on an ACC course, but those eight hours must include the administrative time required for upload, download, etc.

Completion Rate

Historically, the completion rate for resident EOAC students is 95% or better. However, only 64% of the students in the experimental ACC class finished the entire course. The reasons most frequently cited for ACC noncompletion included conflicts due to family and job commitments and delays due to changes in the experimental course schedule.

Cost: One EOAC Module of 66 POI Hours

Course conversion. A projection of the total ETVs needed to convert the 66 POI hours of Module 6, as it was configured at the time of the research, is 4250 staff hours as shown in Table 2 and detailed in Appendix B. If the conversion were accomplished completely by in-house staff, the cost would be $152,400 (based on the rates shown in Appendix C). If the conversion were done under contract, the cost is estimated at $266,700. In a further comparison, the estimated cost for full development of the same 66 POI hours of resident training (ETV equal to 5881 staff hours) is $187,700 at the in-house rate.

Table 2

Estimated Time Values for Asynchronous Computer Conferencing Conversion of 66 Program of Instruction Hours

Category	Staff Hours	% Effort
Course Requirements Analysis	435	10%
Course Design	163	4%
Course Development	2589	61%
CBI / Slide Conversion[a]	812	19%
Video Tape Production	251	6%
TOTAL	4250	

[a]Includes the hours to prepare and supervise a contract for CBI development plus the hours spent to actually perform the low level CBI conversion required by the ACC Project.

Execution. In Table 3 are listed both the estimated start-up and recurring costs of executing a 66 hour ACC course for 50 students.

Table 3

Asynchronous Computer Conferencing Execution Costs ($K) Within-Government/Contractor

Category	Start-up In-House/Contract	Recurring In-House/Contract
Production	---	16.8/16.8
Equipment	93.5/93.5	---
Training	23.8/46.7	0.3/0.6
S[illegible]	---	8.0/8.0
Operations and Support	---	96.1/189.0
Totals	117.3/140.2	121.2/214.4

Amortized total costs. Figure 3 shows how costs would be amortized over 10 Module 6 iterations. ACC (in-house) becomes less costly than resident after two iterations. ACC (contract) requires about seven iterations to match the cost of the resident option, but then steadily increases savings over residence thereafter.

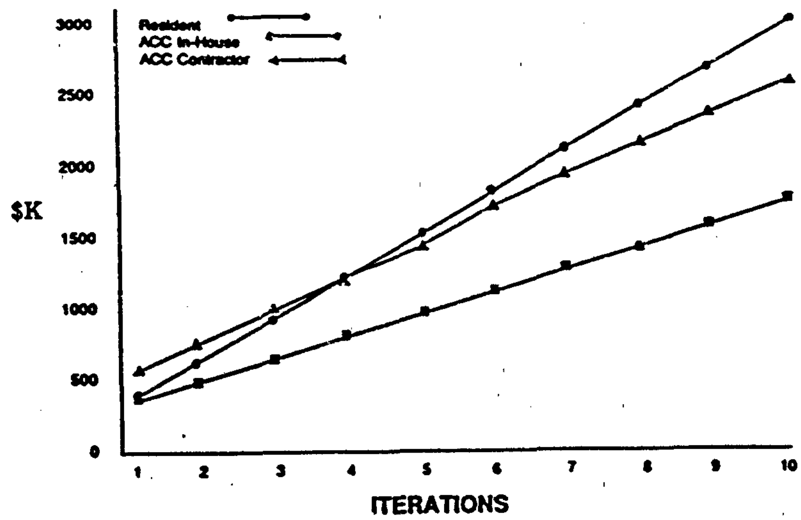

Figure 4. Cumulative costs of course conversion and execution for Asynchronous Computer Conferencing and resident training.

Cost: Projections for an Entire EOAC-RC of Seven Modules

As indicated earlier, an assumption has been made that Module 6 approximates the other six resident EOAC-RC modules in terms of duration and type of material covered. At the Engineer School, two weeks are devoted to each module. Each ACC module will require about five months to complete extending an entire seven module course to a minimum of 35 months if modules were delivered back-to-back. Interviews and surveys of ACC experimental course students indicate that back-to-back modules would adversely affect course retention. Therefore, for the purposes of this model, a course duration of 3 1/2 years (42 months) has been assumed which provides for breaks between modules. The projection is based on two iterations of this 3 1/2 year course for seven years.

The instructional staff would consist of one full-time instructor plus one half-time assistant or some combination of part-time subject matter experts. Ideally, the full-time instructor would remain with the class from start to finish and would be based at the branch school, collocated with assistant(s) and any other administrative staff (e.g., a course coordinator/supervisor, course developers). A support element would also be required to handle logistics. Each operating course would require the part time assistance of an individual to coordinate the production of materials and the shipment of those materials and computer hardware to the students.

For this example, it is assumed that students and instructors would keep their equipment for an entire cycle and that the machines would last through two complete cycles (seven years) before replacement. It is also assumed that instructors would not require significant retraining prior to the end of a complete cycle. In addition, the example uses contract rates for conversion and in-house rates for execution.

A student class size of 50 is used as a best estimate of the number of students per ACC class that would be practicable under the implementation model used. Two hundred fifty students per year are shown for residence based on FY 89 EOAC-RC attendance figures from the Army Training Requirements and Resources System (ATRRS) data base. Total ACC and resident graduates are based on completion rates of 64% and 95%, respectively. The ACC figures shown in Table 5 assume that every student among the non-finishers is on hand from beginning to end, each thereby costing as much as a finisher. The time frame chosen for the comparison is seven years, or two iterations of the three and a half year ACC cycle.

The cost of graduating 1,662 students based on completion rate, cost per student, and number of students trained each year over a seven year period is computed for both resident and ACC training options. In addition, the costs of equipment and course conversion are added for the ACC option. As shown at the bottom of Table 4, there is a projected savings of 33% if ACC is adopted in place of resident training.

Table 4

Potential Long Term Savings ($M)

Course Savings	Resident Cost ($70.9M)[a] - ACC Cost ($47.8M)[b] = $23.1M
Percentage Savings	$23.1M/$70.9M = 33%

[a]Resident Cost is determined by: $40.5K (per student) x 250 (students per year) x 7 years costs $70.9M to provide 1,662 graduates, assuming 95% completion.

[b]ACC Cost is determined by: $17.7K (per student) x 2,597 (students over 7 years) costs $46.0M to provide 1,662 graduates, assuming 64% completion. The $46.0M plus a one time course conversion cost of $1.8M results in a total cost of $47.8M.

Discussion

ACC appears to meet the need of the RC to complete educational requirements from the home or homestation without extended absences from the unit. The "electronic classroom" could be conducted remotely from existing educational institutions such as branch schools or RF Schools/State Academies in order to maintain standardized instruction and relieve local commanders of educational responsibilities. Instruction has the potential to be of higher quality and more motivating than that found in typical correspondence courses. It would consist of computer based instruction supplemented by paper-based and audio/video materials for both initial learning and remediation. In addition, computerized testing could be conducted with the advantages of test security, automatic timing and scoring, and immediate reporting of results to students and instructors. And unlike correspondence courses, students would have ready access to their classmates and instructor for learning and motivational support.

Students taking the home study ACC course achieved test scores equivalent to their resident counterparts taught in a traditional educational setting. Moreover, the ACC soldiers experienced similar classroom experiences such as working in small groups to solve problems, tutoring their peers, organizing and leading team practical exercises, and giving briefings. They also experienced the same stresses stemming from meeting deadlines and being placed in leadership roles as did their resident counterparts, even though the asynchronous aspect of ACC allowed work to be spread out over longer periods. ACC students also reported a higher perceived level of learning during their course than did the resident control group.

ACC is less costly than sending soldiers to resident schools to meet their military educational requirements. It is estimated that for every five iterations of one module of the Engineer Officer Advanced Course, more than $500,000 could be saved depending upon whether the course development/conversion and implementation tasks are accomplished using government or contractor resources. A combined approach, similar to the one described in Table 5, is a likely possibility with a contractor used for the conversion effort and government assets used in execution.

Individual categories of ACC costs reveal that the cost of course conversion is highly significant, greater than either equipment or operations/support. Total costs for the latter two categories would rise as the numbers of students and instructors increase. Both costs should decrease with advances in technology. It is important to note that ACC does not eliminate the requirement for instructors and, therefore, their salaries. To the contrary, ready access to an instructor is key to the concept of the "electronic classroom" and provides that interactive link between the student and the institution missing from a stand-alone system.

Dropout is a characteristic that adversely impacts the cost-effectiveness of any course. The attrition rates for ACC and the resident EOAC-RC course were factored into the calculations comparing their relative costs. Despite higher ACC attrition, ACC was still less expensive. The dropout rate for a fully implemented ACC course will probably be much less than the experimental course because of improved efficiencies. Unfortunately, surveys of dropouts revealed that personal considerations were the most significant factors influencing a decision to quit the course and those tend to be the most difficult to overcome. ACC's longer duration increases the chances for such problems to develop. The ACC dropout rate, then, can probably be improved, but not so much that it will match the resident rate.

ACC for home study may also contribute to improving retention of RC soldiers. Geographical isolation, coupled with the perception that their time is often ill used during training, are two factors that alienate soldiers and increase their likelihood of leaving the RC (Eisley & Viner, 1989). ACC students seem to gain increased feelings of comradery, cohesion, and connectedness with their peers. ACC home study should help to counter feelings of isolation as well as to provide a sense of accomplishment even greater than that resulting from completion of resident training. A part of that sense of accomplishment may stem from what may be for many soldiers an introduction to computer technologies and an opportunity for others already familiar with computers to sharpen their skills.

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Appendix A

Pre-post Differences on Skill Ratings

Content Area	Resident Mean (SD)	Asynchronous Computer Conferencing Mean (SD)
Rear Operations	0.136 (1.13)	1.125 (0.64)
Airfield Damage Repair	0.409 (1.13)	1.375 (0.83)
Pipelines	0.452 (1.13)	1.500 (1.60)
Asphalt Production	1.250 (1.08)	1.875 (0.99)
Flexible Pavements	0.932 (1.07)	2.125 (0.99)
Bridging	0.500 (1.08)	0.625 (0.92)
Roads and Airfields	0.809 (0.99)	2.250 (1.17)

Note: Scores were obtained by subtracting pre-course ratings from post-course ratings. Ratings were based on a 1-5 scale.

Appendix B

Estimated Time Values for ACC Conversion

Category	Time (hrs)	% of Effort
Course Requirements Analysis		10%
Conduct Initial Review	111	
Assemble Draft Training Program Package	180	
Coordinate Draft Training Program Approval	42	
Provide Draft Training Program Implementation Assistance	102	
Course Design		4%
Select Instructional Setting	46	
Identify Learning Objective Relationship	20	
Group Learning Objectives	15	
Prepare Practical Exercise Test	82	
Course Development		61%
Develop Draft Course Management Plan	101	
Revise Draft Course Management Plan	19	
Develop New Lesson Plan	459	
Develop New Student Aids	576	
Develop New Instructor Guide	81	
Validation - Presents Lesson	475	
Validation - Revises Lesson	325	
Proofread Final Product	553	
CBI/Slide Conversion*	268	19%
Video Tape Production	251	6%
Total	3706	

*Hours reflect the time, based on the ETV document, required to prepare and supervise a contract to produce the low level CBI effectively used in the ACC project. The percentage shown includes the 544 hours actually taken by the project staff to develop the ACC CBI.

Appendix C

Methods for Determination of Within-Government and Contractor Hourly Rates (FY 89 Dollars)

Contractor

$$\text{Contractor Rate} = \frac{\text{Total Project Cost in Dollars}}{\text{Total Contractor Staff Hours}} = \$62.74/\text{hr}$$

Within-Government (based on the monthly pay, allowances and benefits of a captain with 8 years service and taken from standard pay tables and U.S. Army Finance and Accounting Center figures on equivalent compensation and the TRADOC DCSRMs ATRM-159 Report).

Within-Government Rate = [Base Pay + BAQ w/Dependents + BAS + Indirect Benefits (Retirement, Medical, Death and Survivor, Social Security, Federal Tax Advantage)] /Hours Worked Per Month] + 23.5% for Base Operations = $31.91/hour

Appendix D

Resident Training Cost per Graduate*

Direct Costs	
Instruction	12,550
Overhead	3,632
Student Costs	18,447
Indirect Costs	
Base Operations	5,921
Total	40,550 (7 modules)**

*14 week EOAC-RC conducted at Fort Belvoir, VA
**FY 85 data/FY 89 dollars

END

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DATE: 1-92

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