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EVALUATION OF THE CMI INSTRUCTOR ROLE TRAINING PROGRAM IN THE NAVY AND AIR FORCE

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EVALUATION OF THE CMI INSTRUCTOR ROLE TRAINING PROGRAM IN THE NAVY AND AIR FORCE

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This report summarizes the background of the CMI instructor role definition and training program and the results of an evaluation of the CMI instructor role training package in selected Navy and Air Force technical training schools. The evaluation results indicate that the package met the goal of providing relevant and needed training in the Navy and Air Force CMI settings. Instructor training in theoretically-based CMI roles was seen as contributing to the more positive student attitudes toward

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CMI and their CMI instructors in some of the Navy schools selected for the study and to generally lower student elimination rates in the majority of the participating Navy schools and the Air Force school.

FOREWORD

This research was performed under work unit Z1176-PN.01 (Improving the Navy's Computer-managed Training System) as the final phase of a project aimed at defining and validating the role of the instructor within a computer-managed instruction (CMI) environment. It was conducted under the joint sponsorship of the Deputy Chief of Naval Operations (OP-01) and the Defense Advanced Research Projects Agency (DARPA).

This report describes the results of an evaluation of the CMI instructor role training package developed during this project. The training program was designed to help CMI instructors acquire the skills necessary to perform seven theoretically based instructor roles identified in the first phase of the project.

The report is intended to provide researchers with evaluation findings and training implications important in the design of CMI instructor training materials.

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SUMMARY

Problem

The lack of a valid and relevant role model for instructors in a computer-managed instruction (CMI) environment has hampered the development of instructor training programs geared specifically to the problems and challenges encountered in this setting.

Purpose

This effort was conducted to evaluate the CMI instructor role training package in selected Navy and Air Force technical training schools.

Approach

Data for the evaluation of the training package were collected from CMI instructors in the Basic Electronics and Electricity (BE/E) school at the Naval Training Center, San Diego; the Avionics "A" (AVA) and BE/E schools at the Naval Air Technical Training Center, Millington; and the Precision Measuring Equipment (PME) school at the Lowry Technical Training Center, Lowry Air Force Base. Experimental and control groups, consisting of ten instructors each, were selected at each of these schools.

Navy and Air Force instructors in the experimental groups first participated in a 20-hour training program comprised of the 12-module CMI instructor role training package and 6 group discussions. Air Force instructors in the experimental group also received an additional 10-hour student motivational skill training package. Following the training sessions, instructors in the experimental groups returned to their CMI learning centers and data were collected on a number of measures during a 3- to 5-month evaluation period.

Results and Conclusions

According to the quantitative and qualitative findings, the training package meets the goal of providing relevant and needed training in the Navy and Air Force CMI settings. Instructor training in theoretically-based CMI roles also contributed to more positive attitudes of students toward CMI and their CMI instructors and to generally lower student elimination rates in some of the Navy schools selected for the study despite the fact that other student performance measures reflected no impact from the training of instructors.

Recommendations

The Navy CMI schools should continue to use the training materials as part of their in-service instructor training. Future changes in the CMI system should be accompanied by appropriate changes in the instructor training in accordance with the CMI instructor role model.

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INTRODUCTION

Problem

Instructors being trained for service in a computer-managed instruction (CMI) environment frequently must learn from materials designed for instructors working in conventional classroom settings. While these materials are often tailored to introduce the CMI instructors to the use of the computer as a management tool, there has been no systematic attempt to define the problems and challenges unique to the instructional roles in this setting. The lack of a coherent role model for the instructor in a CMI environment has hampered efforts to prepare future instructors for their work.

Purpose

The general goals of this research project were to define and validate the role of the CMI instructor. Specifically, the effort described herein was conducted to evaluate the CMI instructor role training program at selected Navy and Air Force technical training schools.

Background

Definition of Theoretical CMI Instructor Roles

Theoretical CMI instructor roles were defined by reviewing (1) relevant instructional and learning theories, (2) documentation of the instructional functions performed by existing CMI systems, and (3) descriptions of the roles CMI instructors currently perform, as detailed by various experts in the area. With respect to the relevant instructional and learning theories, it was found that those theories based on operant learning principles and principles derived from a cognitive theoretical framework were the most applicable to the definition of the theoretical CMI instructor roles. The following CMI systems were analyzed to identify the instructional functions that existing CMI systems are performing: the classroom information system (CIS), the Navy CMI system, the Air Force advanced instructional system (AIS), the program for learning in accordance with needs (PLAN), the TRACER system, the instruction support system (ISS), and the programmed logic for automatic teaching operation (PLATO) CMI system. To describe the roles CMI instructors are performing, recent studies of both manual self-paced (MSP) environments and CMI environments were reviewed.

This three-pronged analysis resulted in the theoretical CMI instructor role model (McCombs & Dobrovolny, 1980), which detailed the two primary roles that CMI instructors theoretically or ideally perform: learning manager and learning facilitator. The learning manager role includes the roles of (1) planner of classroom operation and (2) plan implementer/monitor of student performance and progress. The learning facilitator role includes the roles of (1) evaluator of individual student performance and provider of motivational performance feedback, (2) diagnostician of individual student learning problems, (3) remediator of student learning problems by prescription or administration of selected strategies and resources, (4) counselor and advisor of students for personal career problems, and (5) tutor/modeler of new information, skills, and personal responsibility.

In addition to these seven theoretically-based roles, four additional roles--course author and evaluator, CMI equipment maintainer, course supervisor, and miscellaneous behavior--were identified on the basis of the three information sources listed above and

information obtained from interviews with and observation of Navy and Air Force CMI instructors. Although these roles were not considered ideal theoretically, they might account for deviations of the actual CMI instructor behaviors from the theoretical role model.

Following the definition of these 11 roles, two sources were used to compile a list of specific behaviors for each of the role categories. First, the behaviors logically or theoretically related to each role category were defined (McCombs & Dobrovolny, 1980). Next, these behaviors were refined by examining the behavior categories detailed for the Air Force CMI system (Lintz, Tate, Pflasterer, Nix, Klem, & Click, 1979; Summers, Pelletier, & Spangenberg, 1977) and for the role of learning coordinator in experience-based career education (Christensen & Johnson, 1977).

After CMI instructor behaviors were delineated for each role, an index of "ideal time spent" per role category and per behavior was derived. This index represents the relative contribution of each role or behavior to student learning (on the basis of relevant learning theories, experience with CMI, and expert judgment) transformed to reflect the relative proportion of ideal time that should be spent in each role or behavior. The ideal time[1] spent per role category in a training day was defined as follows:

1. Planner--10 to 25 percent.
2. Implementer/monitor—25 to 40 percent.
3. Evaluator/provider--25 to 40 percent.
4. Diagnostician--25 to 40 percent.
5. Remediator--25 to 40 percent.
6. Counselor/advisor--40 to 60 percent.
7. Tutor/modeler--40 to 60 percent.

In deriving these ideal times, an attempt was made to account for approximately 100 percent of a CMI instructor's time across or within roles. In so doing, however, consideration was given to independent (e.g., planner) versus overlapping (e.g., diagnostician, evaluator) roles. By using this approach, the derived ideal time spent could be directly compared with the actual time spent, as reported by the instructors. The following section describes the results of comparing ideal and actual values and discusses possible factors contributing to deviations of ideal versus actual values.

Comparison of Theoretical and Actual Instructor Roles

The theoretically-based CMI-instructor roles were defined to provide an ideal model against which actual military CMI instructor behaviors could be evaluated. It was assumed that, if there were very few differences between the ideal, theoretical role model and the actual situation in various military CMI schools, the background and training of the military CMI instructors must be adequate. On the other hand, if there were significant differences between the two, a more appropriate training program might be developed to modify instructor behaviors toward those of the theoretical role model.

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[1]For a list of the ideal time spent per behavior in each role category, see McCombs and Dobrovolny, 1980.

Data on the actual behavior of military CMI instructors were collected by administering a CMI instructor roles and behaviors questionnaire (McCombs & Dobrovolny, 1980), observing Navy and Air Force CMI operations, and interviewing instructors and managerial personnel in each of the following military schools: the Propulsion Engineering (PE) and Basic Electronics and Electricity (BE/E) schools at the Naval Training Center (NTC), Great Lakes; the Avionics Fundamentals (AFUN), Avionics "A" (AVA), BE/E, and Aviation Mechanics/Jet "A" (AD/JA) schools at the Naval Air Station (NAS), Millington; and the Precision Measuring Equipment (PME) and Inventory Management (IM) schools at the Lowry Technical Training Center (LTTC), Lowry Air Force Base.

The questionnaire was based on the 11 CMI instructor roles discussed earlier. For this measure, instructors were asked to indicate the percentage of time they spent performing (1) each of the roles (except for the miscellaneous behavior role, which was considered too general for a time estimate) and (2) each of the specific behaviors within all 11 roles. Instructors made their responses using a 7-point scale, where 1 = I don't do this at all and 7 = I spend more than 75 percent of my time doing this.

In addition to numerous supervisory and management personnel, who were interviewed informally, CMI instructors at the following schools were involved in the data collection:

1. PE school, NTC Great Lakes--22 instructors.
2. BE/E school, NTC Great Lakes--41 instructors.
3. AFUN school, NAS Millington--21 instructors.
4. AVA school, NAS Millington--28 instructors.
5. BE/E school, NAS Millington--19 instructors.
6. PME school, Lowry Air Force Base--46 instructors.
7. IM school, Lowry Air Force Base--20 instructors.

At the AD/JA school, NAS Millington, five instructors and three supervisory/management personnel participated in informal discussions.

The major findings in the comparison of actual Navy and Air Force CMI instructor roles and behaviors with the theoretical CMI instructor role model are summarized below:

1. CMI instructors generally reported spending the majority of their time in the seven roles identified as theoretically ideal; however, a number of discrepancies exist in (a) the rank ordering of ideal- versus actual-time spent in the seven roles and (b) the types of ideal versus actual behaviors performed most frequently within each role.

The major discrepancies found between ideal and actual CMI instructor roles and behaviors were essentially differences in the kinds of activities performed within the ideal roles. The actual behaviors reflected more emphasis on CMI management, administrative, and clerical tasks than did the ideal behaviors, which emphasized facilitating student learning.

2. Several factors were seen as responsible for the deviations between ideal and actual CMI instructor roles and behaviors.

a. CMI instructors' perceptions of the amount of control they had over various CMI procedures (e.g., planning motivational systems or using incentives to increase

student motivation, flexibility in adjusting instruction methods or procedures to meet individual student needs, planning and implementing various group experiences) did not always match actual possibilities.

b. Deficiencies in existing instructor training for CMI (e.g., little or no training in those specific skills and behaviors required for the performance of learning facilitator roles, little or no practice in behaviors related to the types of students/instructor interactions required in learning centers, no orientation to the nature of their new roles in a CMI environment) contribute to the instructors' feelings of frustration in handling problems associated with declining student skills.

c. Inadequacies in the performance of the Navy CMI system that were occurring during the study (e.g., frequent downtimes, long terminal response times), as well as some problems with outdated terminal hardware and system reliability, were seen as contributing to instructors' mistrust of the system. As a result of these system inadequacies, many Navy instructors performed numerous clerical and administrative tasks not considered part of the theoretical CMI instructor role model. These clerical and administrative tasks were also a source of instructors' unhappiness with their job.

3. Significant deviations between the ideal and actual CMI instructor roles and behaviors indicated that an effective CMI instructor role-training program was needed.

Refining of Role Concept and Training Approach

On the basis of the data collected in the comparison of ideal and actual CMI instructor roles and behaviors, training program guidelines were developed. These guidelines specified that an effective role training program for these instructors would have to include not only skill training in those behaviors needed to perform the theoretical CMI instructor roles, but also (1) training in positive attitude formation, (2) techniques for changing instructors' perceptions of the CMI system and their roles in that system, and (3) strategies for performing CMI instructor roles as efficiently and effectively as possible in a less-than-perfect environment.

Three general strategies for promoting positive instructor attitudes were identified.

1. The training must focus on explaining to instructors what they can expect in a CMI learning center. The objective of this portion of the training would be to contrast the responsibilities of students and instructors in lock-step instruction and CMI and to clarify the implications of these responsibilities for instructors and students.

2. CMI instructors must be shown how to take control of their environment. Accordingly, instructors should be introduced to the concept that people can control their moods, attitudes, and feelings by what they say to themselves.

3. Instructors should be taught how to take control of their environment by personalizing their specific CMI learning centers. That is, instructors should be shown how to plan and implement special classroom activities or group experiences, to structure various student experiences including time to tell "sea or war stories," and to diagnose and remediate student problems effectively.

Two main strategies were identified for helping instructors change their perceptions of their CMI system and their roles in that system.

1. Instructors should be provided with the opportunity to analyze their own personal values, beliefs, and attitudes about the entire area of education and training and should understand the importance of setting goals, communicating effectively, and managing stress.

2. To help CMI instructors recognize the flexibility available in their CMI environment, the CMI instructor role training package was to be implemented in a CMI mode. This training format would allow instructors to go through their training in a CMI learning center using self-instructional materials and generally playing the role of a CMI student. Furthermore, this training environment should be structured to demonstrate techniques for maximizing the features of the specific CMI system with which instructors would work in their learning centers.

Several strategies were developed for training CMI instructors to perform their roles as efficiently and effectively as possible in a less-than-perfect environment. These strategies included (1) incorporating role-playing exercises into the training, (2) providing follow-up sessions in which instructors could share "case histories" of CMI experiences and successful/unsuccessful techniques used, (3) providing practice exercises at critical points in the training program, (4) integrating actual observations or on-the-job training experiences, and (5) providing specific guidelines for using the computer to assist CMI instructors in each of their CMI instructor roles. This latter information was tailored to the specific capabilities of the Air Force and the Navy CMI systems.

Description of CMI Instructor Role Training Package

The foregoing strategies were incorporated wherever appropriate in each of the training modules. Additionally, the CMI instructor role training package is currently implemented as a 20-hour training course with 12 self-instructional printed modules and 6 group discussions. The 12 printed modules are designed to be consumable in that instructors can use them as reference guides in the learning center. The modules contain numerous exercises designed to help the instructor develop alternative motivational, diagnostic, and remedial plans; identify sources of additional information and assistance; and generate checklists or helpful reminders. These excercises are also used as the basis for the six group sessions. In the group sessions, the instructors get together to share their ideas, suggestions, and hypotheses about effective and efficient techniques for managing and facilitating student learning.

Each module in the training package also contains a rationale statement, a set of key words, and a list of objectives. The rationale statement explains the purpose of the materials being presented in the module. The key words are main ideas of the module; the objectives state what the instructor will learn or be able to do after completing the module materials. Finally, each module contains periodic embedded questions to help instructors determine how well they have learned the new information.

Titles of the 12 training modules are listed below. Appendix A presents detailed descriptions of the contents of each module.

1. The Role of the Instructor in CMI.
2. Preparing to be a CMI Instructor.
3. Understanding the Technical Training Student.
4. The Instructor as a Learning Manager--Planning the Environment.

5. The Instructor as a Learning Manager--Planning Instructional Events.
6. The Instructor as an Implementor of CMI Plans.
7. The Instructor as an Evaluator.
8. The Instructor as a Diagnostician.
9. The Instructor as a Remediator.
10. The Instructor as a Counselor and Career Advisor.
11. The Instructor as a Modeler.
12. Coordinating CMI Instructor Roles--Putting it all Together.

APPROACH

Rationale

Evaluation Measures

The goal of the evaluation of the CMI instructor role training package was to assess its impact on instructor effectiveness in the CMI environment. It was assumed that instructor effectiveness was composed of several measurable components:

1. A cognitive component comprising instructor knowledge of the concepts and skills presented in the CMI role training program.

2. An affective component comprising instructional attitudes toward the CMI instructor role, CMI as an instructional method, and the value of the role training program.

3. A behavior component comprising direct and indirect measures of instructor performance of CMI instructor roles.

The cognitive and affective components, directly measurable through criterion tests and questionnaires, were considered important, but not the most critical, components of instructor effectiveness. That is, aspects of the behavior component, although not as easily measurable, were judged to be the most valuable indices of the impact of the training package.

Several measures of instructor performance of the CMI instructor roles are possible. First, actual behaviors of CMI instructors before and after the training program could be directly and frequently observed in the learning centers using a small group of trained observers and an observational measurement system similar to that described by Komaki and Collins (1980). Not only were manpower and time requirements of such an approach beyond the scope of this effort, but the concern that the presence of outside observers might affect the behavior of the instructors reduced the feasibility of direct evaluative observation.

A second class of measures related to instructor performance of their CMI roles is student performance and attitudes toward CMI. Travers (1981) pointed out, however, that when students are considered responsible for their own learning--as is the case in the self-directed learning environment of CMI--the main criterion for assessing teacher effectiveness should not be student performance. Since student performance in CMI is influenced by many factors other than instructor performance, the evaluation of the CMI instructor role training package emphasized the three components outlined above, rather than student performance.

A final possible measure of instructor performance is the class of indirect measures, including student ratings, interview data, and reports of instructor performance from personnel established as contacts in each school. Students' ratings of instructor performance were assumed to be an important source of information about instructor behavior, since they are less biased by knowledge about whether their instructors had received special training than are supervisors' ratings. Because students were assured of anonymity and their attitude measures were sent directly to the investigators, it is assumed that the students evaluated their CMI instructors honestly. These indirect and anecdotal measures of instructor performance, therefore, were considered appropriate qualitative measures for this type of applied research (cf., Geis, 1980; Patton, 1980).

Data Collection Procedures

The procedures and, to some extent, the measures used in data collection differed for the Navy and Air Force schools. In the Navy schools, it was necessary to rely on designated school personnel to monitor specified procedures, to collect attitude data, and to mail it to the investigators. In addition, it was the responsibility of the Navy CMI system support personnel at the Management Information and Instructional Systems Activity (MIISA) to set up and run appropriate CMI reports of student performance data. However, because of geographical location, the investigators were able to collect the data and conduct the analysis in the Air Force school with a minimum of school personnel support. During periodic visits to the Air Force school, it was also possible to observe instructor performance and to conduct discussions and interviews with personnel involved in the study. These differences in the amount of control over data collection and analysis activities and in the kind of data collected on instructor performance of their CMI roles resulted in some differences in the quantity and quality of data collected.

Experimental Design and Procedures

The evaluation used a matched control-group design, wherein the group of instructors selected to participate in the CMI instructor training program were to be matched with a control group of instructors. In the Navy schools, the control group instructors were to be in separate learning centers on the same training shift. In the Air Force school, because there were no comparable learning centers on the same shift, it was necessary to use the first shift as the control group and the second shift as the experimental group and to control differences in student abilities between shifts statistically. In both the Navy and Air Force schools, school supervisory personnel selected the instructors for the study on the basis of manning requirements and other variables important in school operation and ensuring instructor comparability in experimental and control groups. Bias associated with the choice of particular experimental or control-group instructors in each school by school management was not considered to be a serious factor in contaminating evaluation findings.

Other procedures included as part of the experimental design were the use of (1) pre- and posttraining measures of student attitude toward instructors and CMI, (2) pre- and posttraining measures of instructor attitude toward CMI roles, (3) posttraining student performance measures for experimental and control groups, and (4) within-training knowledge measures for instructors in the experimental group. As these procedures were implemented, however, some design changes were made because such practical considerations as ease of research design implementation, cost/benefit factors, maximizing control of experimental procedures, and school acceptance of conditions imposed on the training environment by the reseach design.

In the Navy schools, there were concerns about requiring school personnel to take responsibility for administering the appropriate attitude measures to experimental and control group instructors. Therefore, it was decided that the investigators would administer posttraining questionnaires to instructors in both groups while on site for the training sessions. In the Air Force school, however, the pre- and posttraining instructor-attitude measures were administered only to experimental group instructors to avoid sensitizing the instructors in the control group (who were on a different shift than were the experimental group instructors) to the nature of the evaluation study. This procedure was considered experimentally appropriate for assessing instructor attitude changes attributable to the training program.

A second change was made in the area of evaluating student performance. In the Navy schools, a measure of student performance that is independent of ability differences was selected for evaluation purposes (i.e., the difference between learning rate and progress rate, as defined in the Measures section, p. 10). In the Air Force school, it was possible to establish a baseline time period in which average performance levels for experimental and control groups could be determined. These baseline performance levels were then available to use in comparing differences between groups following training program implementation, as well as to determine if there were shift differences in student performance that were not attributable to the CMI role training program.

Finally, because of instructor manning shortages, the IM School at Lowry AFB, one of the two Air Force schools originally scheduled to be included in the summative evaluation, was forced to withdraw, leaving the MPE school at Lowry AFB as the only Air Force testbed for both this project and another research project in the area of motivational student skill training. Thus, the summative evaluation of the instructor and student training programs was conducted concurrently in the PME course using Air Force instructors trained with a combination of the CMI instructor role training program and the student skills program to be learning managers and learning facilitators in the CMI environment of the PME course. These procedures necessarily confound evaluation results making it impossible to separate effects due to the instructor versus student skill training materials. In discussing Air Force findings, however, every effort is made to discuss the potential impact of the individual programs where appropriate.

General Procedures

There were two distinct evaluations of the CMI instructor role training package: a formative evaluation and a summative evaluation.

Formative Evaluation

The purpose of the formative evaluation was to obtain users' suggestions, critiques, and comments on the materials and module tests and to provide the users with an avenue for constructive and significant input into the training materials. The formative evaluation was also intended to provide feedback on the extent to which the materials achieved their goals and to gather more specific information on the Navy CMI system reports available to instructors.

This phase of the evaluation was conducted with instructors and staff personnel from NAS Millington. From 9 through 13 February 1981, the participating instructors and staff personnel met for 4 hours per day in a CMI learning center in the Instructor Training (IT) school. This location was chosen so that a CMI training experience could be produced--

the type of experience that was deemed most appropriate for the summative evaluation of the training program. Therefore, the instructors and staff personnel read and were tested on each of the 12 modules and participated in several group sessions. The purpose of the group sessions was to catalyze instructor comments, critiques, and general suggestions concerning the CMI instructor role training package.

Formative evaluation of the CMI instructor role training package was also conducted at Lowry AFB with six instructors from the IM school and a supervisor from the Material Facilities (MF) course. These individuals reviewed the 12 printed modules in the package and wrote comments, suggestions, or revisions on them.

As a result of the formative evaluation, modifications were made to the pre- and posttraining tests, the wording of the module objectives, and the content of some of the modules. It was also determined that separate versions of the training package were necessary for the Navy and Air Force.

Summative Evaluation

The purpose of the summative evaluation was to measure the effectiveness of the CMI instructor role training package. All of the instructor training sessions were held in a CMI learning center 2 hours per day for 10 days. This evaluation began with the training of Navy and Air Force instructors and concluded with the collection of instructor performance data. The Navy instructors from San Diego participating in the summative evaluation were trained from 2 through 15 March 1981 with data collection from 18 March through 31 August 1981. The Navy instructors from Millington were trained from 23 March through 3 April 1981 with data collection from 6 April through 19 May 1981 in the Avionics A (AVA) school and through 7 August 1981 in the BE/E school. The Air Force instructors from Lowry AFB were trained from 29 June through 15 July 1981 with data collection from 17 July through 30 September 1981.

The daily procedures were the same for summative as they were for formative evaluation. That is, participating instructors read and were tested on each of the 12 modules and participated in various group discussions. The purpose of these discussions was to give instructors the opportunity to practice new skills, share strategies and techniques for implementing these skills, and discuss problems and solutions that instructors experience in performing various roles in CMI.

Data Source

Seven individuals from Millington participated in the formative evaluation of the training package: two instructors from the AVA school, two instructors from the IT school, and one staff person each from the offices of the Chief of Naval Technical Training (CNTT) and the Director of Training. Six Air Force instructors from the IM school and one supervisor from the MF school at Lowry AFB also participated in the formative evaluation.

Ten Navy instructors participated in the summative evaluation of this training program: four from the BE/E school San Diego, two from the BE/E school, Millington, and two from the AVA school, Millington. These individuals--a balance of new and experienced CMI instructors--were selected by their respective commands for participation in both of these evaluations. Ten Air Force instructors, all of whom were assigned to the PME school, Lowry AFB, also participated in the summative evaluation of the training program.

Measures

During the formative evalution, three measures were examined: pre/posttraining tests and the module tests for each of the 12 modules. The pre/posttraining tests contained the same 60 items but the order differed. Each pre/posttest item measured the instructors' knowledge of a specific objective in the training program. Each module test contained five cognitive items and three affective items. The cognitive items were designed to measure the instructors' knowledge of the specific module; and the affective items, the instructors' opinion of the module. An item analysis of each of these tests was performed and used as the basis for revising or deleting specific items.

In the summative evaluation, four measures were used to evaluate the degree to which the participating instructors learned and implemented the concepts, skills, and strategies presented in the training program:

1. A pre/posttraining test designed to assess the instructors' attitudes toward their job as CMI instructor. The tests contained the same 20 items, with the items scrambled, and two subscales: (a) A CMI subscale that measured the instructors' attitude toward CMI as a method of instruction, and (b) a role-understanding subscale that measured their knowledge and understanding of CMI instructor responsibilities. A copy of this pre/posttraining test (CMI instructor survey) is presented in Appendix B.

2. A set of end-of-module tests. After reading each of the 12 modules in the training program, the instructors took a module test consisting of five cognitive and three affective items. The cognitive items were designed to measure the instructors' knowledge of the concepts presented in the module; and the affective items, the instructors' overall impression of each module and their opinions about its readability and utility.

3. A pre/posttraining questionnaire for students of experimental and control group instructors. This measure, presented in Appendix C, was given to the students before the instructors began the CMI instructor role training package and after they had finished it. Because course lengths were shorter than the time between administration of the pre/posttraining questionnaires, different groups of students responded to these measures.

4. Student performance. In the Navy, the student performance variables of interest were the learning rate (LR), the progress rate (PR), the difference between LR and PR, and the number of students eliminated from each learning center. The Navy defines LR as the ratio of the actual total contact time for the student to complete each module to the predicted total contact time. If LR equals 1.00, the student's learning took as long as predicted; greater than 1.00, the student was slower than predicted; and less than 1.00, faster than predicted. PR is defined as a measure of the student's real progress at the completion of each module towards the predicted graduation date. A student with a less than desirable LR (greater than 1.00) could have a good PR (less than 1.00), if extra effort was applied in time available for extra study (2 hours per training day).

The difference between LR and PR was calculated by simply subtracting PR from LR. Students eliminated for both academic and nonacademic reasons were considered in this evaluation.

In the PME school, Lowry AFB, the student performance variables of interest were block scores, block failure rates, and the number of students eliminated during each block. A block[2] is a unit of instruction that is similar to a module in the Navy's CMI course description and contains from 6 to 50 lessons. Again, students eliminated for both academic and nonacademic reasons were included in the data.

Training Procedures

The CMI instructor role training package was in CMI format for both the Navy and Air Force evaluations and was defined as a course to the CMI system. Instructors read the materials and took tests covering them when ready to be evaluated. The CMI system graded each of their tests and gave them their next assignment. Navy instructors were required to complete the training in 2 weeks.

Investigators served as the group leaders for all of the training. In this role, the group leader's major purpose was to promote communication between all of the instructors in the role-training program. Techniques of active listening and clarifying statements were used frequently, as were exercises and examples to promote sharing of experiences, problems, and solutions. During the group sessions, exercises in the materials were reviewed often and the group leaders encouraged instructors to learn from each other during these exercises.

During the introductory group discussion, the group leaders explained the philosophy, purpose, rationale, various testbeds, and program schedule to the instructors. All instructors introduced themselves to the rest of the group and detailed their expectations for the training program.

During the group discussion covering Modules 1, 2, and 3, instructors were given an opportunity to ask questions about the material covered and then to engage in practice exercises for active listening and "I-message" skills. The group discussion covering Modules 4, 5, and 6 focused on exercises in the materials in which instructors were required to make plans for their learning centers. The purpose of this group session was to have instructors share their plans with each other and then role play the process of selling one of their plans to their supervisor. Time was also allowed for questions over these three modules.

The purpose of the group discussion covering Modules 7, 8, 9, and 10 was to have instructors share their responses to the various exercises in these materials. Questions about the materials were answered at the same time. The group discussion covering Modules 11 and 12 began with a call for questions pertaining to these two modules. The second activity of this group was for instructors to share their responses to the exercises in the materials. The final activity of this group was to give the instructors an opportunity to share their feelings about the program with the group leaders. The training program concluded with the group leader explaining the evaluation procedures, schedule, and activities.

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[2]Block times were not included as performance measures because of the unreliability of these data during the evaluation period.

Identical group discussions were used in the Air Force and Navy evaluations. Four additional group discussions were held in the Air Force evaluation to enhance the Student Skills Program. They are described in Appendix D.

Data Collection and Analysis Procedures

The Navy CMI system provided the performance data for Navy instructors on the 12 module tests and for Navy students in their respective technical training courses. For instructor performance data on the training package, the most useful reports were the daily CMI student progress report and student response history report. The variables of interest on these reports were the time required for the instructors to complete each module and the module test scores. The CMI learning center status report summarized LR and PR for each learning center in each school on a daily basis. Student elimination data were not available by learning center from the Navy CMI system but were obtained individually from each Navy school.

In the Air Force evaluation effort, all of the attitude and performance measures were administered either by the investigators or by the AIS. The AIS also provided relevant information on eliminations and its various data collection and analysis capabilities were used for in the evaluation. Specifically, the student performance data that the AIS regularly collects were merged with a special study file that was created to collect information not normally collected by the system (e.g., the instructor pre/posttraining tests and all Navy performance and attitude data). The Statistical Program for Social Sciences (SPSS) (Nie, Jenkins, Steinbrenner, & Bent, 1975) was then used to analyze all relevant data.

RESULTS

The training materials developed by this effort have been implemented as a part of the in-service instructor training program in existing Navy CMI schools.

Instructor Attitudes and Knowledge

Instructor attitudes and knowledge of concepts and skills presented in the training package were assessed by end-of-module tests and pre/posttraining tests. The results for these two sets of measures are presented in the following sections.

End-of-module Tests

The same test scoring procedures were set up in both the Navy and Air Force schools. Instructors could take each end-of-module test only once and had to achieve a criterion of 4 out of 5 (80%) on the cognitive items. Instructors who did not reach this criterion were given instructions to review the items they missed with their training leader.

Records kept during the training sessions indicated that the majority of Navy and Air Force instructors passed each module's criterion test on their first attempt. In the few instances where instructors obtained less than the 80 percent criterion, they received explanations and some remediation from the training leaders.

For the three attitude items on each end-of-module test, the response frequencies per item were collapsed across the two extreme response alternatives to arrive at high, medium, and low response categories. Table 1 presents these data by training schools in

Table 1

Instructor Attitudes Toward CMI Training Modules by Schools

CMI Modules		Instructor Responses by Category											
		BE/E School, Millington			AVA School, Millington			BE/E School, San Diego			PME School, Lowry AFB		
		Hi	Med	Lo	Hi	Med	Lo	Hi	Med	Lo	Hi	Med	Lo
Module 1	Liked	X	-	-	-	X	-	-	X	-	-	X	-
	Useful	X	-	-	-	X	-	-	X	-	-	X	-
	Clear	X	-	-	X	-	-	-	X	-	-	X	-
Module 2	Liked	-	X	-	X	-	-	-	X	-	X	-	-
	Useful	-	X	-	-	X	-	-	X	-	X	-	-
	Clear	X	-	-	-	X	-	-	X	-	-	X	-
Module 3	Liked	X	-	-	-	X	-	-	X	-	X	-	-
	Useful	X	-	-	X	-	-	-	X	-	X	-	-
	Clear	X	-	-	X	-	-	-	-	X	X	-	-
Module 4	Liked	-	X	-	-	X	-	-	X	-	-	X	-
	Useful	-	X	-	-	X	-	-	X	-	-	X	-
	Clear	X	-	-	X	-	-	-	X	-	X	-	-
Module 5	Liked	-	X	-	X	-	-	-	-	X	-	X	-
	Useful	-	X	-	-	X	-	-	X	-	-	X	-
	Clear	X	-	-	X	-	-	-	-	X	-	X	-
Module 6	Liked	-	X	-	X	-	-	-	X	-	-	X	-
	Useful	-	X	-	-	X	-	-	X	-	-	X	-
	Clear	X	-	-	X	-	-	-	X	-	-	X	-
Module 7	Liked	-	X	-	-	X	-	-	X	-	-	X	-
	Useful	-	X	-	X	-	-	-	X	-	X	-	-
	Clear	-	X	-	-	X	-	-	X	-	X	-	-
Module 8	Liked	-	X	-	-	X	-	-	X	-	-	X	-
	Useful	-	X	-	-	X	-	-	X	-	-	X	-
	Clear	-	X	-	X	-	-	-	X	-	-	X	-
Module 9	Liked	-	X	-	-	X	-	-	X	-	-	X	-
	Useful	-	X	-	-	X	-	X	-	-	-	X	-
	Clear	-	X	-	-	X	-	-	X	-	-	X	-
Module 10	Liked	-	X	-	-	X	-	-	X	-	-	X	-
	Useful	-	X	-	-	X	-	-	X	-	-	X	-
	Clear	-	X	-	-	X	-	-	X	-	X	-	-
Module 11	Liked	-	X	-	-	X	-	-	X	-	X	-	-
	Useful	-	X	-	-	X	-	-	-	X	X	-	-
	Clear	-	X	-	-	X	-	-	X	-	X	-	-
Module 12	Liked	-	X	-	-	X	-	-	X	-	-	X	-
	Useful	-	X	-	-	X	-	-	X	-	-	X	-
	Clear	-	X	-	X	-	-	-	X	-	X	-	-

Note. X = Category the majority of instructors chose (> 60%) per item.

terms of the response category chosen by the majority of instructors (more than 60%) for each item per module. In general, Table 1 indicates that PME instructors rated the modules most favorably, while BE/E instructors in San Diego rated them moderately, and, from a relative standpoint, the least favorably. Across the four schools, Modules 3, 2, and 1, in that order, received the most positive (high) ratings; and Modules 8, 9, and 10, the least favorable (low), although none received ratings below the moderate (medium) category. In general, instructors in all four schools seemed to like the training package. They liked the modules and found them to be useful and clearly written.

Pre/Posttraining Tests

Posttraining test measures were administered to experimental and control group instructors at three selected Navy technical training schools. Mean instructor performance on the measures calculated for the total posttraining test and the three subscales scores is reported in Table 2. Although experimental group instructors tended to score higher on all but the extra items, sample sizes for the BE/E and AVA schools in Millington were too small for statistical tests of significant differences between the experimental and control group means on the posttraining test and subscale scores. Results of an independent t-test on the somewhat larger samples for the BE/E school in San Diego indicated no significant differences between experimental and control groups for the total or subscale scores on the posttraining test. However, experimental group instructors tended to respond with lower scores on all scales.

The results of pre- and posttraining tests administered to the 10 Air Force instructors at the PME school, Lowry AFB are also reported in Table 2. Although means were somewhat higher on the posttest, a paired-sample t-test of significant differences between pre- and posttraining test scores indicated no significant differences for the total, CMI, or role-understanding scales. On the extra-item subscale, however, posttraining test scores were found to be significantly lower than pretraining test scores ($t(1,9) = 2.50$, $p < .03$). The items related to the training and skills needed by instructors in a CMI context distinguished pre- and posttraining test scores on this scale. Apparently, the training package increased Air Force instructors' opinion that the existing instructor training program did not fully prepare them for their CMI role and that CMI instructors need more training to make the most of their job.

Student Attitudes and Performance

Student attitudes and performance were assessed by three sets of measures: pre/posttraining attitude questionnaires, selected measures of performance in their technical training course (e.g., training times, test scores), and measures of student attrition (eliminations) from the course. The results for these three sets of student performance measures are presented in the following sections.

Pre/Posttraining Student Attitudes

Student mean scores on the attitude toward instructional method questionnaire are reported in Table 3. Independent samples t-tests were calculated for these data by school and across experimental and control groups for the pre- and posttest measures and separately for the total score and for the three subscales (attitude-toward-CMI subscale, instructor-rating subscale, and student/instructor relationship subscale).

Table 2

Student Test Score Means and Standard Deviations by School and Instructor Group

Variable	Exp. Grp. Inst. Mean	Exp. Grp. Inst. SD	Exp. Grp. Inst. N	Cont. Grp. Inst. Mean	Cont. Grp. Inst. SD	Cont. Grp. Inst. N
BE/E School, Millington						
Posttraining test total	61.50	2.12	2	54.50	2.48	2
CMI subscale	24.50	2.12	2	20.50	3.18	2
Role-understanding subscale	29.50	0.71	2	25.00	2.00	2
Extra-item subscale	7.50	0.71	2	9.00	0.71	2
AVA School, Millington						
Posttraining test total	60.00	2.83	2	59.00	8.49	2
CMI subscale	24.00	1.41	2	21.50	6.36	2
Role-understanding subscale	27.00	0.00	2	28.00	2.83	2
Extra-item subscale	9.00	1.41	2	9.50	0.71	2
BE/E School, San Diego						
Posttraining test total	47.00	4.69	4	50.50	3.00	4
CMI subscale	15.75	4.72	4	17.50	5.92	4
Role-understanding subscale	23.50	1.29	4	25.00	2.00	4
Extra-item subscale	7.75	1.26	4	8.00	2.45	4
PME School, Lowry AFB						
Posttraining test total	61.60	5.13	10	--	--	-
CMI subscale	24.40	3.20	10	--	--	-
Role-understanding subscale	28.00	3.02	10	--	--	-
Extra-item subscale	10.20	1.48	10	--	--	-
Posttraining test total	62.30	5.54	10	--	--	-
CMI subscale	25.30	4.06	10	--	--	-
Role-understanding subscale	28.30	1.64	10	--	--	-
Extra-item subscale	8.70	1.16	10	--	--	-

Table 3

Student Affective Pre- and Posttraining Test Measures by School and Instructor Group

Variable	Exp. Grp. Inst. Mean	SD	N	Cont. Grp. Inst. Mean	SD	N
BE/E School, Millington						
Posttraining test total	97.76	14.47	38	97.54	13.98	37
CMI subscale	46.87	9.10	38	46.11	9.42	37
Instructor subscale	31.63	6.04	38	32.62	4.37	37
Student/instructor subscale	19.26	3.01	38	18.81	3.08	37
Posttraining test total	107.08	11.15	120	108.91	11.47	122
CMI subscale	49.98	8.51	120	52.43	7.88	122
Instructor subscale	36.09	3.84	120	35.56	4.27	122
Student/instructor subscale	21.01	2.60	120	20.92	2.70	122
AVA School, Millington						
Posttraining test total	94.83	14.93	36	92.72	16.84	36
CMI subscale	43.00	10.56	36	45.31	9.53	36
Instructor subscale	33.19	4.32	36	29.92	6.13	36
Student/instructor subscale	18.64	3.10	36	17.50	3.87	36
Posttraining test total	106.90	11.59	10	101.94	10.50	18
CMI subscale	52.10	6.62	10	48.17	5.82	18
Instructor subscale	33.80	4.13	10	34.22	4.18	18
Student/instructor subscale	21.00	3.06	10	19.56	3.15	18
BE/E School, San Diego						
Posttraining test total	95.53	14.20	49	94.58	16.77	52
CMI subscale	45.49	9.95	49	46.46	8.82	52
Instructor subscale	31.53	5.35	49	29.87	6.98	52
Student/instructor subscale	18.51	3.18	49	18.25	3.42	52
Posttraining test total	102.07	11.14	152	99.00	12.25	118
CMI subscale	48.34	7.75	152	47.34	8.42	118
Instructor subscale	34.41	4.26	152	32.84	4.93	118
Student/instructor subscale	19.32	2.80	152	18.82	2.95	118
PME School, Lowry AFB						
Posttraining test total	91.43	12.65	7	100.75	14.42	12
CMI subscale	47.43	6.58	7	50.75	9.60	12
Instructor subscale	24.29	6.95	7	28.83	6.74	12
Student/instructor subscale	19.71	1.25	7	21.17	3.24	12
Posttraining test total	100.98	14.35	40	103.63	12.46	53
CMI subscale	48.18	9.35	40	51.34	7.88	53
Instructor subscale	33.50	3.92	40	32.53	5.82	53
Student/instructor subscale	19.30	3.36	40	19.75	2.95	53

Analysis of the pretraining test results indicated no significant differences between the students of the experimental and control group instructors at the three Navy schools and the Air Force PME school for the total scores, CMI subscales, and student/instructor r lationship subscales. Significant differences between the scores of student groups on the instructor subscale were found only for the AVA school, Millington. There the students of the experiment group instructors rated their instructors more highly than did the students of the control group instructors on this pretraining test measure on a separate variance estimate for the t-test ($t(1,63) = 2.62$, $p < .02$).

Analysis of the posttraining test results revealed significant differences between scores of the students of the Navy experimental and control group instructors on three t-tests. BE/E, Millington students of the control group instructors reported having more positive attitudes toward CMI than did the students of the experimental group instructors ($t(1,240) = -2.33$, $p < .02$). BE/E, San Diego students of the experimental group instructors rated their instructors more highly ($t(1,268) = 2.75$, $p < .01$) and generally had higher scores on the posttest measure than did students of the control group instructors ($t(1,268) = 2.13$, $p < .04$). In addition, it was noted that:

1. Students of the experimental group instructors at the AVA school, Millington tended to report more positive attitudes toward CMI than did the control group instructors' students ($t(1,26) = 1.57$, $p < .13$).

2. Students of the experimental group instructors at the BE/E school, San Diego tended to report higher scores on the instructor/student relationship subscale than did the control group instructors' students ($t(1,268) = 1.41$, $p < .16$).

3. Students of the control group instructors at the PME school, Lowry AFB tended to report more positive attitudes toward CMI than did experimental group instructors' students ($t(1,91) = 1.73$, $p < .09$).

Student Course Performance

Table 4 reports the means of the LR, PR, and their difference for students of experimental and control group instructors in the three Navy schools. For these data, samples were again too small for a statistical test of significant differences. An independent samples t-test of the larger student groups in the BE/E school, San Diego indicated no significant differences between groups on LR, PR, or LR - PR.

Measures of student course performance in the PME school, Lowry AFB were block scores and number of attempts on the block test. Means of these data for Blocks 1 and 2 of the PME course are presented in Table 4 for students of experimental and control group instructors. The difference between the number of Block 1 test attempts before passing made by students of experimental and control group instructors was significant, using a t-test with separate variance estimate ($t(1,91) = 2.71$, $p < .01$). Difference in the number of Block 2 attempts for experimental and control group instructors' students was not statistically significant.

Table 4

Student Course Performance Means and Standard Deviations
by School and Instructor Group

Variable	Exp. Grp. Inst.			Cont. Grp. Inst.		
	Mean	SD	N	Mean	SD	N
BE/E School, Millington						
LR	.97	.04	2	.93	.06	2
PR	.91	.03	2	.87	.06	2
LR - PR	.06	.01	2	.06	.01	2
AVA School, Millington						
LR	.92	.00	1	.93	.00	1
PR	.84	.00	1	.05	.00	1
LR - PR	.08	.00	1	.05	.00	1
BE/E School, San Diego						
LR	1.02	.05	4	1.01	.02	4
PR	.91	.02	4	.90	.02	4
LR - PR	.11	.03	4	.11	.02	4
PME School, Lowry AFB						
Block 1 score	84.93	9.05	44	80.31	14.65	55
Block 2 score	87.52	8.83	33	83.86	9.71	28
Block 1 attempts	1.04	.30	46	1.26	.48	55
Block 2 attempts	1.00	.00	33	1.04	.19	29

Notes.

1. LR = learning rate; PR = progress rate.

2. For PME School, the number of cases available in subsequent blocks was too small for reliable analysis.

Student Eliminations

The number of experimental and control group instructors' students eliminated from the Navy and Air Force schools during the evaluation period was the final measure of student performance. Table 5 reports both the actual number of eliminations and the percentage eliminated from each Navy school using student throughput figures.[3] Air Force elimination rates, also provided in Table 5, are based on actual students enrolled versus those eliminated in each group during the evaluation period, as maintained in the AIS data base.

Table 5

Student Elimination Data by School and Instructor Group

	Exp. Grp. Inst.		Cont. Grp. Inst.	
Eliminations	N	%	N	%
BE/E School, Millington (N = 172)				
Academic	4	2.3	5	2.9
Nonacademic	4	2.3	9	5.2
Total	8	4.7	14	8.1
AVA School, Millington (N = 140)				
Academic	6	4.3	9	6.4
Nonacademic	1	0.7	1	1.4
Total	7	5.0	11	7.9
BE/E School, San Diego (N = 268)				
Academic	32	11.9	29	10.8
Nonacademic	17	6.3	15	5.6
Total	49	18.3	44	16.4
PME School, Lowry AFB (Exp. Grp. N = 79, Cont. Grp. N = 84)				
Academic	0	0	1	1.2
Nonacademic	0	0	0	0
Block failures (first two blocks of course)	3	3.8	14	17.7

[3]Navy school elimination rates were derived by a formula, based on the average number of students under instruction in each learning center during the evaluation period. This average was multiplied by the number of weeks in the evaluation period for each school. This product was divided by the average course length to get the total student throughput for a learning center and school. The number of students eliminated was then divided by the total throughput to get the elimination (or attrition) rate.

For the Navy schools, elimination rates for the students of the experimental group instructors were substantially lower than those for the students of the control group instructors at both the BE/E and AVA schools, Millington while the elimination rate for the experimental group instructors' students tended to be somewhat higher for the BE/E school, San Diego. In comparing the elimination data from each of these three schools, it can be seen that the attrition or elimination rate for the BE/E school, San Diego is more than two times that of the other two schools. These differences may be explained by the difference between the entry requirements for the AVA and BE/E schools, Millington and those for the BE/E school, San Diego as well as differences in course length.

Slightly different data are reported for the PME school, Lowry Air Force Base. Given the length of the evaluation period (7 weeks) and the length of the course (30 weeks), reliable student data for only the first two blocks of the course were available. For this 4-week portion of the course, no students of the experimental group instructors were eliminated, while one student of the instructors in the control group was eliminated. Another variable related to student elimination is the number of block failures for these first two blocks. For experimental group instructors, only three students (4%) failed either the first or second block test, compared to 14 students (17%) for control group instructors.

In summary, the Navy findings in the area of student performance generally indicate no difference between the course time measures of the students of the experimental and control group instructors, but some advantage for the experimental group instructors in terms of eliminations from the course. The Air Force findings indicate better test performance and fewer failures for the students of experimental versus control group instructors.

Comments and Observations

This section provides instructors' comments about the training package, supervisor's and management personnel's comments on and reactions to the package, and information obtained from observing instructors and from talking to them in the CMI learning centers.

Instructor Comments

A variety of comments on the training package were made by Navy and Air Force instructors during and immediately after the training sessions. These comments are summarized and identified separately for Navy and Air Force instructors in Table 6.

The data reported in Table 6 indicate that both the Navy and Air Force instructors liked the training package and found it relevant and helpful. Instructors in both services did feel, however, that more time should be provided for instructors to read and study the materials outside the training class period and that school management personnel should take this type of training with instructors. Navy instructors also seemed to appreciate receiving information on how the computer could assist them with their learning facilitator role and found that the ideas presented in the modules helped them cope with frustrations in their CMI instructor roles. Suggestions for other topics instructors would like covered in the package included (1) more details on the realities of the CMI instructor's job, (2) information on how to handle students that are older than their instructors, (3) guidance in how to work with students who focus on getting ahead of schedule instead of understanding and remembering the material, (4) more details on leadership skills and behaviors, and (5) more techniques for handling problems with management.

Table 6

Comments on CMI Instructor Role Training Package
Made by Navy and Air Force Instructors

Comment	Source of Comment	
	Navy Instructor	Air Force Instructor
Concepts taught well.	X	X
Examples very relevant.	X	X
Exercises provided good practice.	X	X
Length of training seems adequate.	X	X
Group discussions were helpful.	X	X
Materials had an impact on changing my thinking and behaviors.	X	X
Management should take this course with instructors.	X	X
Off-duty time should be given to allow instructors to study materials outside training class.	X	X
Course most helpful for CMI instructors with some experience in learning center.	X	X
Ideas presented help in coping with frustrations of CMI.	X	-
Sections on how computer can help provide a good and accurate reference.	X	-

Note. X = Comment made by at least one CMI instructor.

Comments and Reactions of Supervisory and Management Personnel

At the Navy schools in Millington, several supervisory and management personnel, both military and civilian, participated in part of the training and commented on the training package. In the Air Force PME school, Lowry AFB, supervisory personnel responsible for the second-shift, experimental-group instructors as well as civilian personnel responsible for curriculum development commented on the package.

Navy supervisory and management personnel comments can be summarized as follows:

1. The materials, format, concepts, and range of topics covered were felt to be highly relevant and needed areas of CMI instructor training.

2. The length of the training package, including group discussions, was felt to be appropriate for implementation either as part of existing Navy instructor training for new CMI instructors or as in-service training for existing CMI instructors.

3. The same package or a somewhat abbreviated version could be used for training CMI school supervisors and upper level management.

4. The package in current form would be appropriate for training contract civilian instructors at the BE/E school in Great Lakes.

Comments from Air Force supervisory and management personnel were similar to those of Navy instructors, particularly in expressing the feeling that the materials, format, concepts, and range of topics covered were highly relevant and needed areas of CMI instructor training.

Observations of and Discussions with Instructors

Some observation of Air Force instructor behaviors in their CMI learning centers and some discussions with the instructors were conducted at Lowry AFB. It should be noted that Air Force instructors received both the CMI instructor role training package and the student skills package and that some potentially more positive effects may have been due to the combined benefits of both packages.

Observations of instructors in the experimental group and their students in the learning centers at PME school, Lowry AFB learning centers generally indicated that:

1. Experimental group instructors had visible rapport with their students.

2. Their students asked questions freely and interacted well with their fellow students.

Discussions with the instructors in the experimental group in PME school indicated that:

1. They were motivated to try the new techniques they had learned in the training package and to generate alternative methods for doing their job.

2. They used active listening and other effective communication techniques presented in the package with some success to handle conflict situations with students.

3. They engaged in frequent dialogues and instructor-initiated contacts with students and encouraged group discussions whenever feasible.

4. They encouraged students to take more responsibility for their own learning and study behaviors (e.g., letting students keep their own performance records, letting students establish their own break schedules).

In summary, these data generally indicated favorable instructor, supervisory, and management attitudes toward the training package and, at least for the Air Force instructors, the use of the skills in the training package appeared to contribute to positive learning center climates and positive student/instructor relationships.

CONCLUSIONS

The quantitative and qualitative findings in the evaluation of the CMI instructor role training package indicate that the package met the goal of providing relevant and needed

training in the Navy and Air Force CMI settings. Instructor training in theoretically-based CMI roles was also seen as contributing to more positive student attitudes toward CMI and their CMI instructors in some of the Navy schools and to generally lower student elimination rates in the majority of the participating Navy schools and the Air Force school.

The face validity and feasibility of the package were recognized by Navy management personnel and the training materials have been implemented as a part of the in-service instructor training in Navy CMI schools. The Air Force is continuing to validate and refine the theoretical role model and training further by incorporating training for all nonconventional instruction environments in Air Force instructor training.

The use of an implementation strategy that emphasized user involvement and participation is felt to have contributed to the acceptance of the training package and experimental procedures.

RECOMMENDATIONS

The Navy CMI schools should continue to use the training materials as part of their in-service instructor training. Future changes in the CMI system should be accompanied by appropriate changes in the instructor training in accordance with the CMI instructor role model.

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APPENDIX A

DESCRIPTION OF CMI INSTRUCTOR ROLE TRAINING PACKAGE

DESCRIPTION OF CMI INSTRUCTOR ROLE TRAINING PACKAGE

Module 1. The Role of the Instructor in CMI. The purpose of this module is to introduce instructor-trainees to the training program, its historical background, and the seven theoretical CMI instructor roles. The first part of this module discusses the differences between CMI and more traditional methods of instruction in terms of the responsibilities of students and instructors and the active versus passive view of the learning process. The second part of this module describes five common capabilities (diagnosis, prescription, performance evaluation, reporting, and flexible scheduling of various functions) and how these capabilities can help instructors perform efficiently and effectively. The third part of Module 1 discusses how inadequate training and less-than-ideal systems can cause negative attitudes and describes some general techniques for controlling negative attitudes--in both instructor and students. The final part of this module presents a brief outline of each of the remaining 11 modules.

Module 2. Preparing to be a CMI Instructor. This module is divided into two parts. The first part contains four exercises to help instructor-trainees investigate their attitudes, opinions, and possible biases about their job as a CMI instructor. The second part describes and exemplifies the three basic skills--systematic thinking, stress management, and effective communication--that are essential to perform all CMI instructor roles.

Module 3. Understanding the Technical Training Student. The purpose of this four-part module is to help instructor-trainees understand technical training students better. The first part describes the growing-up and development processes and the characteristic behaviors, problems, and conflicts of late adolescence and early adulthood. The second part discusses Maslow's (1954) hierarchy of needs and describes how this model can explain the behavior of many technical training students. The third part discusses the self-fulfilling prophecy and its role in motivation and learning, as well as techniques for helping students develop and maintain motivation to do well. The fourth part discusses the typical problems that students experience in technical training. These problems are categorized into three general areas: academic, personal, and maturity and life-coping skills.

Module 4. The Instructor as a Learning Manager--Planning the Environment. Module 4 begins the academic or professional CMI instructor skill training. The module discusses how planning is critical to the efficient operation of a CMI learning environment due to (1) the limited amount of time instructors have to spend with individual students, (2) the variety of student needs that instructors must address, and (3) the importance of instructors taking control of their job responsibilities. Common reasons why many instructors do not make plans are discussed and positive approaches to planning are described. Planning the learning center environment is divided into environmental and physical-arrangement considerations. Exercises in each of these areas help instructor-trainees identify physical aspects of their learning center for which they need to make plans. The end product of this module is a personalized list of alternative plans, resources, or suggestions for achieving efficiency and consistency in the learning center environment.

Module 5. The Instructor as a Learning Manager--Planning Instructional Events. This module focuses on the instructor as a planner of four different areas of instructional events: (1) building student self-management skills, (2) building student self-directed learning skills, (3) creatively handling computer downtime with extracurricular activities, and (4) developing temporary supplemental instructional materials for main-line materials

that are awaiting formal revisions or corrections. As with the previous module, Module 5 contains numerous exercises to help instructor-trainees create in each of the four instructional-event areas such end products as a personalized list of alternative plans, resources, and suggestions for maximizing the impact of instruction events.

Module 6. The Instructor as an Implementor of CMI Plans. This module focuses on various techniques that instructors can use to implement their plans. The first part describes and exemplifies seven steps that need to be completed before a plan can be implemented. The second part of the module describes and exemplifies four steps involved in putting a plan into operation. Various simple techniques for evaluating data are described and how the computer can be used to monitor and implement plans is discussed. In the exercises in this module, instructor-trainees choose one of their plans from either Module 4 or 5 and work through the seven preparatory steps and the four implementation steps. The final section of this module discusses how the computer can help instructors monitor and evaluate their plans.

Module 7. The Instructor as an Evaluator. This module focuses on the instructor as an evaluator of student performance and notes the importance of using both formal information--obtained from the computer--and informal information--obtained from conversations with students and other instructors--to evaluate student performance accurately. A four-step model for the evaluation process is described and exemplified. This module also discusses various strategies for providing positive and negative motivational feedback to students and emphasizes the importance of individualizing this feedback to the needs and feelings of each student. Several exercises in a case-history format are presented to give instructor-trainees practice in applying the model to "real life" situations and providing the appropriate feedback to students. The last part of this module details how the computer can help instructors accurately evaluate student performance and provide effective feedback.

Module 8. The Instructor as a Diagnostician. Module 8 presents a four-step model depicting the diagnostic process and discusses how to use this model to identify quickly and efficiently the causes of performance problems that poorly performing students are experiencing. Examples and practice exercises are presented to help instructors diagnose academic, personal, or maturity and life-coping skills problems. Again, the final part of this module discusses how the computer can help instructors diagnose student problems. Particular emphasis is given to how to use computer reports and other student data available from the system.

Module 9. The Instructor as a Remediator. In this program, remediation refers to techniques and strategies for assisting students with academic problems. This module describes treatments to improve study skills, concentration management, basic skill deficiencies, and educational background deficiencies. In the exercises in this section of the module, instructor-trainees identify various base and community programs to which students with major problems in these areas could be referred. This module also stresses the importance of follow-up activities for all types of remediation and emphasizes the evaluation of alternative solutions. A five-step model of the remediation process is described and exemplified and a section on how the computer can help instructors become effective remediators is presented.

Module 10. The Instructor as a Counselor and Career Advisor. The purpose of this module is to discuss effective techniques and resources for helping students with their personal problems--personal counseling and career advising techniques. The same basic model of the remediation process is presented and applied to the process of personal and

career counseling. In numerous exercises, instructor-trainees identify responsible and reputable referral sources for students experiencing major personal problems, and the importance of using these resources and following up on their performance when they are used is stressed. This module concludes with two case-history exercises.

Module 11. The Instructor as a Modeler. The purpose of this module is to discuss (1) the implications of the fact that students often model or mimic the behavior of instructors and (2) how modeling can be used to help students who lack maturity and life-coping skills. An explanation of how students learn through both imitation (role models) and direct teaching in areas of personal responsibility and maturity and life-coping skills is presented. In numerous exercises, instructors evaluate their learning center behaviors in terms of the model they present and make plans for improving that image.

Module 12. Coordinating CMI Instructor Roles--Putting it all Together. As the final module in this training program, Module 12 summarizes the previous 11 modules and helps instructor-trainees "put it all together." A model that depicts how each of the roles performed within the learning manager and learning facilitator areas can work together is presented and four basic techniques for "changing hats"--switching between instructor roles--are described and exemplified. After several case histories exemplifying efficient and inefficient ways to combine instructor roles are presented, instructor-trainees complete three case history exercises.

APPENDIX B

PRE/POSTTRAINING TEST (CMI INSTRUCTOR SURVEY)

CMI INSTRUCTOR SURVEY (Pre/Post training)

DIRECTIONS: Below are statements instructors have used to describe how they feel about Computer-Managed Instruction (CMI). Please read each statement carefully and then blacken the appropriate space on your answer sheet to indicate how you feel about CMI.

There are no right or wrong answers, but it is important to answer each question as honestly as you can. Do not spend too much time on any one question, but choose the answer which best describes how you feel.

Subscale*			Not At All	Somewhat	Moderately So	Very Much So
E	1.	I feel that I need more training in how to make the most of my job as a CMI instructor.	4	3	2	1
R	2.	Students' attitude toward CMI is greatly affected by their instructor's attitude toward CMI.	1	2	3	4
R	3.	One of the most important jobs of a CMI instructor is to help students learn.	1	2	3	4
C	4.	I prefer lockstep instruction to CMI.	4	3	2	1
R	5.	When a student has a personal problem, I don't feel I have the time or skills to help him or her.	4	3	2	1
R	6.	To do well in CMI, a student needs to know how to take responsibility for managing his or her learning.	1	2	3	4
C	7.	Students in CMI are isolated and cannot easily work together.	4	3	2	1
R	8.	Changes in CMI procedures cannot be made by instructors because of management policy.	4	3	2	1
E	9.	When down time occurs, students must continue working on the assigned lesson.	1	2	3	4

Subscales*

E = Extra Item
R = Role Understanding
C = Attitude Toward CMI

Subscale*			Not At All	Somewhat	Moderately So	Very Much So
C	10.	CMI instructors spend most of their time keeping records rather than helping students.	4	3	2	1
E	11.	I need new skills for teaching in CMI that I did not learn in instructor training.	1	2	3	4
R	12.	Instructors in CMI have trouble helping students adjust to self-paced, computer-based learning.	4	3	2	1
R	13.	Even though the computer records lots of student performance data, I'm not sure how it can help me diagnose and treat student problems.	4	3	2	1
R	14.	Individual instructors are limited in what they can do because the computer controls instruction in CMI.	4	3	2	1
C	15.	I spend less time helping students learn in CMI than I do in monitoring student progress.	4	3	2	1
C	16.	Clerical tasks take so much time in CMI that I don't have time for student problems.	4	3	2	1
C	17.	In CMI, I feel frustrated by the lack of control I have over how my learning center is run.	4	3	2	1
R	18.	Lockstep instructors have greater flexibility in planning instructional events than CMI instructors.	4	3	2	1
C	19.	CMI allows me to spend more time working with individual students than lockstep instruction.	1	2	3	4
C	20.	The CMI system frees me from many of the clerical and administrative tasks involved in being an instructor.	1	2	3	4

APPENDIX C

PRE/POSTTRAINING STUDENT ATTITUDE TOWARD INSTRUCTIONAL METHOD MEASURE

ATTITUDE TOWARD INSTRUCTIONAL METHOD
(Pre/Post Student Attitude Questionnaire)

This test contains two parts. In the first part you will be asked to choose answers which describe how you feel about Computer-Managed Instruction (CMI). In the second part, you will be asked to choose answers which describe how you feel about your instructor in CMI. It is important to answer each question as honestly as you can.

PART 1 DIRECTIONS: Below are statements which students have used to describe how they felt about the way they were instructed. Please read each statement carefully and then blacken the appropriate space on your answer sheet to indicate how you feel about the way you were instructed. There are no right or wrong answers. Do not spend too much time on any one statement, but choose the answer which best describes how you feel.

DO NOT MARK ON THIS TEST FORM.
USE YOUR ANSWER SHEET ONLY.

Subscale*			Not At All	Somewhat	Moderately So	Very Much So
C	1.	There was plenty of time to study on my own.	1	2	3	4
S	2.	I felt I was not given enough individual personal attention.	4	3	2	1
C	3.	I found myself trying to get through the materials rather than trying to learn.	4	3	2	1
C	4.	I felt I could work at my own pace.	1	2	3	4
C	5.	I was not sure how much I learned with CMI.	4	3	2	1
C	6.	There are too many distractions with this method of instruction.	4	3	2	1
C	7.	CMI makes learning too mechanical.	4	3	2	1
C	8.	I felt frustrated by the number of tests I had to take.	4	3	2	1
C	9.	CMI does not seem to be any better than classroom instruction.				

Subscales*

C = Attitude toward CMI
S - Student/Instructor Relationship
I = Instructor Rating

Subscale*			Not At All	Somewhat	Moderately So	Very Much So
S	10.	While in this course, I felt isolated and alone.	4	3	2	1
C	11.	Compared to lectures, this CMI course was a better way for me to learn.	1	2	3	4
C	12.	CMI is a poor use of my time.	4	3	2	1
C	13.	I feel I could have learned as much without having to take so many tests.	4	3	2	1
C	14.	I seemed to learn very slowly with CMI.	4	3	2	1
C	15.	CMI makes me want to work harder than when I'm in a lecture class.	1	2	3	4
X	16.	I felt no one really cared whether I worked or not.	4	3	2	1
C	17.	In view of what I learned, CMI seems better than classroom instruction.	1	2	3	4
C	18.	I prefer CMI to traditional instruction.	1	2	3	4
S	19.	I could have learned more if I hadn't felt pushed.	4	3	2	1
C	20.	I liked knowing how much time I had to finish the course.	1	2	3	4
S	21.	My learning center was well-arranged.	1	2	3	4
S	22.	I felt the rules and discipline in my learning center were fair.	1	2	3	4

PART 2 DIRECTIONS: For the following items, think about the instructor you know the best in your CMI learning center. Read each item carefully and then blacken the space on your answer sheet that best describes how you feel about the instructor you know the best in your CMI learning center. In the space marked "Course" on the bottom of your answer sheet, fill in the name of your CMI learning center instructor.

My instructor _____:

Subscale*						
I	23.	is well organized.	1	2	3	4
I	24.	has some good ideas.	1	2	3	4
I	25.	helps me handle my learning problems	1	2	3	4
I	26.	shows me new and better ways to study.	1	2	3	4
I	27.	helps me take responsibility for my own learning.	1	2	3	4
I	28.	is easy for me to talk to.	1	2	3	4
I	29.	helps me handle my personal problems.	1	2	3	4
I	30.	notices when I do well.	1	2	3	4
I	31.	is a person I respect.	1	2	3	4
I	32.	helps me understand the career field.	1	2	3	4

APPENDIX D

ADDITIONAL GROUP DISCUSSION TOPICS IN AIR FORCE CMI INSTRUCTOR ROLE TRAINING (INCORPORATING STUDENT SKILLS PROGRAM)

ADDITIONAL GROUP DISCUSSION TOPICS IN AIR FORCE CMI INSTRUCTOR ROLE TRAINING (INCORPORATING STUDENT SKILLS PROGRAM)

Student Skills Discussion 1

There were four main topics covered in the group discussion dealing with the introduction and values clarification modules (student skills modules 1 and 2). First, the purpose of all of the groups covering the student skills program was discussed. This purpose was explained as primarily an opportunity for instructor-trainees and the group leaders to exchange ideas, information, and suggestions regarding the materials and to help instructor-trainees learn how to lead similar groups with technical training enlistees as the students. The second topic of this group was to discuss the philosophy of the students skills program—mainly that all of us choose the way we want to perceive reality and that we can choose to take positive self-control of our thinking and behavior. The third topic of this group was to discuss the important concepts presented in the introduction module. These included Maslow's hierarchy of needs, the self-fulfilling prophecy and the use of self-talk and imagination, being your own coach, practicing imagination, and the steps involved in controlling or changing bad attitudes and beliefs. The fourth topic of this group was to discuss the important concepts presented in the values clarification module. These concepts included the importance of confidentiality in all values clarification exercises, the concept of values clarification, the purpose of this module—knowing yourself and developing self-awareness—and the importance of contracts and charts for skill maintenance.

Student Skills Discussion 2

The group discussion covering the career exploration and goal setting modules (student skill modules 3 and 4) began with a discussion of the purpose of the career exploration module, which is to help students figure out how technical training fits into their overall career goals. The important concepts from this module were then discussed. These concepts included (1) the decision process, (2) the difference between a good decision and a good outcome, (3) the influence of parents on career decisions, (4) the importance of hobbies and leisure activities in making career decisions, (5) how to evaluate risks and costs, (6) how to make realistic plans, (7) the use of imagination in career decisions and plans, and (8) the use of self-talk to help make decisions. The purpose of the goal setting module was then discussed. This discussion included the idea that goal setting is a skill that can help students make the changes they have outlined in the previous two modules. The final topic of this group was a discussion of the important concepts presented in the goal setting module. These concepts included: (1) the skill of questioning; (2) the use of imagination and self-talk in setting goals; (3) the technique of brainstorming; (4) the criteria for effective goal statements; (5) the concept of costs/benefits; (6) the importance of preliminary activities in setting goals; (7) the importance of contracts in setting goals; and (8) the importance of evaluation in setting and achieving goals.

Student Skills Discussion 3

The group discussion covering the stress management and the effective communication modules (student skills modules 5 and 6) was identical in format to the previous two groups. That is, the purpose of the stress management module was discussed first and followed by a discussion of the important concepts in this module. The purpose of the effective communicaiton module was then presented and followed by a discussion of the important concepts in this module.

The purpose of the stress management module was to teach strategies and skills that could help students deal with the stress they encountered when trying to attain their goals. The important concepts in this module included: (1) the definition of stress, (2) identifying the cause of stress, (3) the difference between good and bad stress, (4) the importance of mistaken beliefs in precipitating stress, (5) "do, think, say" strategies for managing stress, (6) ineffective methods for handling stress, and (7) the importance of using some type of skill maintenance strategy to ensure that the stress management skills become a permanent part of the students' behavior.

The purpose of the effective communication module was identified as another set of strategies and skills to help students achieve their goals and manage interpersonal stress. The important concepts of this module included: (1) the definition of effective communication, (2) the difference between assertive, nonassertive, and aggressive styles of communication, (3) reasons for acting nonassertively and aggressively, (4) ten common rights that all people have and the mistaken beliefs that people have about these rights, (5) "you-messages" versus "I-messages," (6) effective listening skills, (7) changing ineffective to effective communication skills, and (8) the use of skill maintenance strategies.

Student Skills Discussion 4

The last group discussion for the student skills program covered the problem solving module (module 7). The purpose of this module was to provide a summary for the entire program--a problem solving exercise for the students. The important concepts of this module were then discussed with the instructor-trainees. These concepts included: (1) the steps in the problem solving process; (2) the difference between and the futility of retreating from or denying problems; (3) the importance of incubation in solving problems; and (4) how the developmental tasks of the target population--namely, military technical training students--can be successfully achieved by learning the skills presented in this program.

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