Automated Training System (ATS)

U.S.A. Internal Revenue Service

In 1979, IRS convened an executive study group to consider IRS training needs in the mid-80's. The group recommended that a major portion of IRS training be decentralized for conduct at local offices, that up to 50% of IRS training be delivered through self instruction, and that computer technology be used to manage this decentralized training system.

Overview of IRS Training

The above recommendations were made for an existing training system that relied primarily on centralized classroom training. Using 1984 data, this classroom training system included, per year, approximately:

- 750 courses
- 1,900 trainee enrollments
- 3,850 instructor staff years
- $38,965,000 total costs consisting of:
  - . $29,700,000 travel and per diem
  - . $ 6,500,000 contracts and services
  - . $ 2,765,000 tuition fees

About 95% of all IRS training is for technical occupations such as revenue agent, revenue officer, special agent, estate and gift tax examiner, etc. Because IRS is the only organization with these occupations, unique and specialized technical training must be developed to meet IRS needs. IRS training courses are supported by trained cadres of instructors who teach on a part time basis and by student and instructor materials, audio visual programs and facilities for the conduct of classroom training.

Organization support for IRS training is provided by training staffs (full time training personnel and full time subject matter experts at headquarters, from client functions, regions, service centers and most districts). Training needs are determined by client functions, frequently working with training staffs. Training courses are developed using the systems approach including task analysis, development of objectives and tests, and preparation of training materials. Training courses are administered by local training staffs and functional analysts using servicewide materials and administrative guidelines.

Problems to be Solved by ATS

In the 1979 Executive Study the following problems with training were identified.

- high cost of traditional centralized classroom training
- lack of flexibility in classroom training due to, for example, group paced, lock step conduct, minimum (18-24) number of students before training is scheduled (for cost effectiveness reasons).
- much time spent reading when 60% of the students were in a travel status.
- slow and inaccurate communication from the teaching site to the development site.

During the years of ATS implementation, additional pressure to change the conduct of training occurred. Pressures included those to reduce the size of headquarters staff, realign more work to the regions and decrease the cost of training.

Benefits of ATS

Both qualitative and quantitative benefits will accrue from the implementation of ATS. Benefits include:

- greater consistency in training at all locations. In traditional classroom training, the instructor is a key factor. Instructors vary in the emphasis and quality of their instruction. This results in a lack of consistency among classes. With ATS, training materials and computer management of training results in the consistency so important in a tax administration agency.

- more efficient and more frequent updates of training materials. Updates of material carried on the computer can be made much more quickly than updates of print materials. Because a classroom instructor is not present to update/correct materials as they are presented, more frequent updates of materials used in computer based training must be made.

- improved quality of training. Comprehensive training materials and the opportunity to proceed at the students own pace, help ensure that content is mastered as the student progresses through the course. Much greater reliance on individual work increases the independence with which students proceed during training and later on the job. Post-testing counseling sessions ensure trainees do not leave training with erroneous information. Because training is typically conducted near the students work site, job activities such as observing work performed or completing basic work activities can be scheduled. This is particularly important in helping new recruits make the transition from the training environment to the work environments.

- improved quality and timeliness of reports on student performance. Performance data on learning activities completed on the computer are automatically captured and displayed. Data on individual students include test results, drill and practice (quizzes) results, performance on simulations, linear programs and branching programs, completion times on all such activities and course segments started and completed. For groups of trainees taking the same course, average completion times are computed and data on individual students is displayed for an entire class. Such data increases the instructor's efficiency in planning learning activities and counseling students and provides management with much more comprehensive data on student performance. Because testing is typically done more frequently, student performance data is generated early and used to help resolve performance problems while there is still time for remedial action.

- reduction in the cost of conducting training. We estimate the cost of running the ATS system over its seven year life to be $32 million - $17 million for ADP costs and $15 million for support cost. These costs are offset by the following systems life benefits:

* $34 million reduction in travel and per diem because trainees remain at or near their duty station during training.

* $70 million in salary costs avoided because the length of training is reduced 30-40% and trainees are returned to the job earlier.

* $900 million in revenue enhancement because enforcement personnel are returned to the job earlier than with traditional classroom training.

This results in a system life cost benefit ratio of approximately 26 to 1.

ATS System Design

The Automated Training System consists of two major elements—Computer Based Training (CBT) to develop, deliver and manage the training of students. The training is supported by computer software purchased "off the shelf" and software adapted to meet unique instructional requirements, and, administration of training to automate data transfer within the system, establish a servicewide messaging capability, support such administrative tasks as scheduling classes and students, class operations, instructor and student notification, ordering materials and assembling courseware, preparing management reports, and performing statistical analysis of management and student performance data already part of the system data base. Because administration of training requirements are so specific to IRS needs, we will focus here on the more generic CBT portion of the system.

Computer Based Training (CBT) is a term used to describe both a way of managing instruction by means of the computer and the delivery of some instruction by means of computer terminals. Typically, such training is conducted at decentralized sites near or at the trainees' posts of duty. Methods such as self-instruction, video, small group discussion, drill and practice, simulations,

etc., are combined for delivery to the student by print, TV tapes, and the computer. The computer is used to track student performance and to accumulate student performance data. Successful CBT is dependent not only upon computer hardware and software, but also upon the overall course design, learning environment, and administrative support. This requires an entire system of training, which is the Automated Training System.

The features of this design are:

- Distributed training at approximately 170 nationwide sites. Each site will have established a learning center with study and discussion areas adjoining an area for computer terminals.

- Stand-alone computer hardware. Each center will operate independently of any other center.

- Overnight update of entire system. The design includes a means to transmit information and update each site overnight. This will allow communication of messages, course updates and student data between sites and the National Office.

- Sophisticated course development and delivery software. IRS courses are technical and complex, which requires a specialized computer language to allow efficient presentation of text and eliciting and judging of responses in a variety of ways.

- Course design that uses various methods and media for presentation. The computer is only one of many ways to present material and not all material is appropriate for the computer.

System Administration

Computer Hardware and Software Acquisition

The computer hardware, software, and maintenance support for ATS were acquired through competitive procedures. Detailed specifications for hardware and software were established. Ten different site types with different configurations of hardware and software were described to meet differing service needs, i.e., service centers with a large number of employees under one roof and conduct of training concentrated in a few months, medium sized districts with peaks and valleys in the need to support recruit training and a fairly steady need for more advanced technical, training and regional training offices where CBT would be developed but where students would not be trained.

The contract was awarded as fixed price to the M/A-COM Corporation. Installation of hardware and software at the approximately 170 sites is spread over 15 months. Software to meet unique IRS training administration requirements is developed over approximately 18 months. Vigorous testing of hardware and software are conducted to ensure specifications are met. The contract was developed at headquarters with considerable field input. Funding was provided by headquarters and the contract will be administered by headquarters.

CBT Course Design and Development

The three traditional modes of training, i.e., classroom, on-the-job training, and self-instruction, will be used, with the computer delivering part of the training, and providing practice, testing, and assisting in the management of training.

Computer based training is a method of delivering training using computer terminals, along with other instructional methods and media, as appropriate. Below is a brief description of the steps IRS takes in designing computer based training.

How To Analyze the Training

The mode - Determine the type of instruction needed:

- In a group - needs group interaction, material requires discussion, or role modeling and motivation are needed. Select classroom instruction (small or large class).

- One-on-one - needs on-the-job conditions with a ratio of one coach to a few trainees, is a review or reinforcement, or needs job practice. Select on-the-job training.

- Can be learned alone - does not need group interaction, or does not contain situations which have multiple correct decisions or paths which would require discussion. Select self-instruction.

The Automated Training System can be used to

manage any of these types of training, but only certain methods constitute CBT.

The method - determine how to deliver the instruction:

- Instructor presented materials
- Group discussion
- Reading
- Demonstration
- Observation
- Practical exercise
- Case study
- Role play
- Performance

(The following are methods specific to CBT)

- Linear - a sequence of instruction not modified by any student interaction. Primarily used for text information.
- Drill and practice - a repetition of concepts, examples, and problems, which gives the student practice on what has been learned. Immediate feedback, specific to the student's response, reference to alternate remedial materials for questions missed, and a progress summary are provided to the student.
- Tutorial - Instruction is presented with a high level of interaction between the student and the computer, interactions are frequent and meaningful, in which the student is asked to answer a question, make a choice, or perform an action. The interaction may cause branching, i.e., the computer presents alternate material based upon the student's answer or upon elapsed time in giving the answer.
- Simulation or Gaming - A real - life situation or problem is presented on the computer with decision points requiring the student to respond or perform an action. Competition may be involved. An example would be tracing a vanished taxpayer by checking the licensing agencies, land records, building managers and neighbors, with the right decisions leading to the taxpayer and success, while the wrong decisions require the student to go back and try again.

The media - determine what to use to deliver the instruction:

- An instructor
- Printed modules
- TV tapes
- Overheads
- A computer

Each training objective in the course may require a separate mode, method and media determination. ATS allows the flexibility of using a variety of modes, methods and media in one course.

Factors Favoring the Selection of CBT

- Students are located in widely-scattered areas.
- Different instructors have produced inconsistent training.
- There is a need for training on demand rather than waiting
- until a class is available.
- Training needs to be up-dated or changed frequently.
- The course material:

* does not require a great deal of interaction between student and instructor or student and another student.
* lends itself to frequent interactions between student and computer.
* can be measured by objective tests.

Example of a CBT Design Used in Revenue Agent Training

An example of the use of CBT in a course is the Revenue Agent Unit I prototype course which was divided into two phases, with the first phase, the

CBT phase (called this because of the use of computers in the training) covering basic tax law, and the second phase, the classroom training phase, covering complex tax law and interactive skills. The CBT phase included:

- Information presented in printed modules with drill and practice on the computer for each lesson. When each module was completed, the student was tested on the computer.

- Small group sessions were interspersed throughout the course to allow students to apply what they had learned. When a few students were ready, they came together with an instructor to work out examination problems using the tax law they had just learned. These sessions also provided the student an opportunity to ask general questions and to participate in discussions.

- Randomly-scheduled modules on topics that trainees could learn at any time were designed into the course. These gave flexibility to the course and to students in planning their work, since these modules did not require the computer.

- Special job activities were planned in which students observed and participated in actual job assignments. These were scheduled according to job resources and student schedules.

Supporting the Conduct of CBT at Field Learning Centers

Approximately 170 CBT sites are located in districts, regions and Service Centers, nationwide. These sites are composed of computer, small group discussion, self-study and instructor areas. Training is conducted away from the student's work area in an area conducive to learning.

Instructors (used in recruit training courses but may be replaced by an administrator or technical resource persons in non-recruit courses) are trained in the skills necessary to conduct the course and in the day-to-day computer operations. On-site training and/or data processing personnel back up the learning center site administrator. Either local training personnel or the appropriate functional manager has "managerial responsibility for the learning center and students and instructor participating in courses.

As mentioned earlier, software to support the administration of IRS training is another element in the overall support of CBT conducted in learning centers.

Generalizations and Other Approaches

As described here, we anticipate the ATS will meet the extensive IRS training requirements. It rests on an established system of classroom training and is supported by existing training staffs. Data processing staffs are already in place in the field and are supporting other computer applications. However, the approach may be totally inappropriate for organizations in different circumstances.

Among other approaches to using computer based training to help meet the training needs of tax agencies are the following:

- commercial CBT courses are more likely to be available on general subjects such as accounting, time management, secretarial training, language skills and could be purchased for already owned equipment such as IBM personal computers.

- simple authoring languages such as Scholar Teach 3 or Tencore could be used to develop CBT courses for already owned equipment. If there is little need for extensive collection of student performance data, the development process is much easier.

- off-line job aids could be developed to speed learning of work activities already performed on the computer. Practice files could be established to allow employees to do work activities without changing real data.

- access to an instructional computer mainframe or time sharing service could be purchased. The computer would be run by

others but the employees could have access to computer based training through phone lines.

- for more centralized conduct of computer based training, a contractor could be paid to develop courses and run the facility. The tax agency would still have many of the benefits, i.e. reduced training time, greater consistency, without the need for specialized staff to support the effort.

Closign

We see Computer Based Training as a very powerful tool for conducting training, administering the system, and managing the resources involved. We would hope other tax organizations will increasingly find ways to use this technology to meet their training needs in the context of their unique organizational circumstances.