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ABSTRACT
                Many diverse Internet/Intranet-based training (IBT)
opportunities are now available through academic, government, and commercial
sites. Currently available IBT-based programs include the following:
full-featured tutorials, half-hour courses, long-term courses, and seminars
that can be tailored to user-appropriate levels. Situation-based learning is
another effective approach used in IBT. Despite the expectations of many
individuals involved in developing and delivering training, the combination
of hype, emerging technology, and bandwidth restrictions has made the reality
of IBT a challenging goal. Several important verification and certification
issues must also be resolved as the use of IBT expands. The experience of IBT
developers to date has demonstrated that IBT is no easier to develop or
deliver than CD-ROM-based training is. Several experienced IBT developers
have published very specific recommendations for individuals contemplating
developing and delivering IBT. Training programs that run outside ("swallow")
browsers and intelligent electronic mail have been very well received. It is
anticipated that Virtual Reality Modeling Language (VRML) will open the door
to new online training domains. Other products and/or practices that are
likely to be applied more widely in IBT include cellular modem access,
synchronous audio and online lectures, and interactive digitized video.
(Contains 34 references) (MN)

INTERNET/INTRANET TRAINING DELIVERY:
WHAT'S AVAILABLE, WHAT WORKS?

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One of the most frequently asked questions concerning training related web sites is "what training courses are available here?" It seems that everyone has heard the cost-saving promises of Internet/Intranet training delivery, and many are surfing for that promised training pot-of-gold they've heard about. One training site, the OTT SPIDER, provides samples of available on-line training and links to experts working in this area. The successful adaptation of training courses to the ubiquitous world of on-line delivery has been achieved in some very diverse areas. Networking and telecommunications technology have also provided alternative distribution and management of training via downloadable courses and on-line course registrations.

In this paper, a review of courses currently delivered on the Internet/Intranet are presented and evaluated to help characterize the types of training that are best suited for on-line delivery. Corporate, academic, military, and government organizations using on-line training solutions, and individual points of contact are listed. The types of courses/curriculum that have been most successful for delivery on-line are described. Estimates of cost savings and other efficiencies of on-line training, and a discussion of problems/solutions for on-line verification/certification are presented. Finally, a discussion of access to 3-D worlds via Virtual Reality Markup Language (VRML) and the unique advantages that 3-D desktop simulation, on-line synchronous audio, and interactive digitized video may offer for a next generation of on-line education and training, provide a glimpse into what we can expect in the next century.

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INTERNET/INTRANET TRAINING DELIVERY: WHAT'S AVAILABLE, WHAT WORKS?

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INTRODUCTION

What training is available on the Internet? If you conducted a search today using one of the major search engines and the key words "on-line training" over 1,000 hits would be returned. The same search conducted only 12 months ago produced less than 100 hits. While many of these "hits" are on-line training registrations and catalogs of training courses, there are also many on-line training courses available. These free courses range from an Anatomy course for high school students (Interactive Frog Dissection, 1996) to a Cultural Diversity course offered by the Law Enforcement and Corrections Academy, Tarleton State University, Texas (1997). In this paper, the best of these on-line course offerings are described, and their strengths and weaknesses are discussed. The goal is to provide current, working examples of Internet/Intranet Based Training (IBT) as well as points of contact for those in government, industry, and academia who are leading the development of IBT today.

ACADEMIC SITES

CyberSchool is a model for long-term (High School) courses (8 to 15 weeks) which demonstrate excellent utilization of web resources (Layton, 1995). CyberSchool instructors manage students' interactions with course materials, assign reading and grade papers. There must be a certified school available to verify course credit near the student, and the student can take the course at his or her own pace. Use of the local public library, E-mail, and chat rooms is required. Layton reports that electronic discussions were more conducive for shy students and for those who don't respond well to questions in a group/class environment.

Training developers are cautioned that homework assigned over the World Wide Web will require more detail than the same assignments given in a classroom. Instructors are advised to set-up and monitor news groups or list processors -- to avoid having to answer the same questions over and over again. This will decrease the instructor's on-line requirements, stimulate more follow-up questions, and enable new students to read from prior class discussions. A limitation resulting from on-line delivery may be the number of students who can access the server at one time. A chat session may also be limited by server capacity. Regardless of the number of students involved, moderated chat sessions are better than unmoderated sessions as moderators help to keep the discussions on track.

Tips for those embarking on extended length IBT are to: Start small, Target a specific audience, Determine their level of comfort with computers, Assess their domain competence with a pre-test and, if necessary, Cover prerequisites. Expect that most will not respond well to a 100% asynchronous learning environment. Therefore, it is advisable to create a chat room or live board for a synchronous environment. Historically, distance learning has had a relatively high drop-out rate and requires highly motivated students who can exercise discipline in the use of their time. Finally, make sure assignments are date/time stamped when sent, as delays can, and do, occur on the web.

Eastern New Mexico University (ENMU, 1996) has a wonderful site for those putting together on-line training materials. ENMU provides templates of exams, syllabi, exercises, schedules, assignments, mail-to's, everything required to get a course on-line without having to master Hypertext Mark-up Language (HTML) and scripting languages. This resource is highly recommend for an immediate "jump-start" in putting course materials on-line. By performing a "save-as" function and typing name, course, questions, etc., new courses can be posted on-line and students can access them immediately.

GOVERNMENT SITES

The Defense Acquisition University (1997) offers interactive tutorials which provide a comprehensive review of basic Mathematics. The math refresher module is intended for use by DAU course participants, but is open to anyone with access to the www. The site's "help" function explains how to use a "subway" map to navigate the site. Each lesson opens with written objectives and ends with test items. Upon completion of test item, the student can hit the answer bar to immediately access test scores. One weak area of the site is one must scroll to find some of the buttons. Due to this design, users may or may not find or be aware of realize the scroll bar. The site is well cross-referenced for remediation of specific areas following exams.

The Federal Acquisition University (FAU, 1997) presents a campus map on its home page and the user selects/moves about various buildings on the site. The layout is intuitive -- one finds course materials in the book store, registers for courses in the Registrar's office, and meets other students on-line in the student lounge. FAU points out that the Internet is the great student participation "equalizer" - there is less concern that shy and reluctant individuals will choose not to participate. The on-line courses also allow for collaborative learning between student and instructor and student to student levels. FAU uses a "survival skills" course to prepare the users' computer (with plug-ins) and the student for their course format. FAU also provides a list of both the advantages and disadvantages of IBT.

The U.S. Army Training and Doctrine Command, Fort Monroe, Virginia and the Army Training Support Center, Fort Eustis, Virginia have jointly developed one of the Army's first efforts at delivering distance learning over the Internet/World Wide Web. The course, Action Officer Development (1997), was constructed using Information Mapping, a technique that greatly enhances information clarity, arrangement, and ease of site navigation (Beckno, Wright, Huggett, 1997). The course was designed to impart basic staff skills to Army officers ordered to Joint/Washington, D.C./headquarters-level duty assignments. The Information Mapping format and simple graphics make the site and content visually appealing and easy to comprehend. Though developed for Army officers, the course "crosses over" easily to all military services, government organizations, and most commercial and academic institutions where there is a requirement for mid-level managers to perform administrative functions which prepare upper level management for information and decision meetings and presentations.

COMMERCIAL SITES

Digitalthink offers a one-half hour, full featured course on-line course "Smart Searching: The Power of Simple Searches" which features interactive quizzes, hands-on exercises, discussion/chat areas, and instructor audio clips. Upon arrival at the home page the user registers by name and provides a password. This name and password creates a locker for the user and enables him/her to access the training programs they have paid for (and/or have access to) by keeping a record of their progress. From the locker users have access to the chat room, help, their student profile and a discussion lobby.

Digitalthink recommends first taking the orientation course to be familiar with their style of teaching. In the next five lessons, the user learns how to:

1) Work through an exercise and submit answers

2) Take a quiz and read the Results page

3) Post a message to the Discussion area

4) Use the Locker toolbar and Course toolbar

5) Complete course orientation.

In some cases, the student submits course work to a Digitalthink tutor, while other exercises just ask for confirmation of completion of assigned tasks. Quizzes can only be taken once. Checking the "scores box" provides individual student scores as compared to others who have taken the course.

Price Waterhouse and Oakes Interactive are training their company's consultants via the Internet with their Virtual University (Niergarth & Oakes, 1997). The system is accessible to 8,000 users and the courses employ discussions, site maps, chatrooms and automatic updates. Similar to other IBT courses,

assigned instructors act as monitors for student progress and monitor web chats during assigned times of the day (2-4 hours per day). Students reported that having a search feature in an on-line lesson/chapter is a very useful feature. Progress flags let the students know where they last left an on-line course and takes them to that location automatically. The system operates using an Oracle database running on a Windows NT file server. Corporate users enter their career data when beginning to use the system and a file is created and maintained to let the student know what courses are recommended for advancement.

All of Price Waterhouse's courses are delivered real-time on the Internet and not downloaded for two reasons:

1) The course cannot be stolen, compromised, or altered as easily when it runs real-time on the Internet.

2) With no downloadable courses in existence, there is no concern that old or out-of-date courses will still be in use as courses are updated.

Niergarth and Oakes defined five different levels of experience for users accessing on-line training, enabling courses to be tailored to a user-appropriate level (based upon the user's registration data). One benefit of IBT is that a seminar course previously completed in 40 hours is now completed in only 25 hours.

Follow-up/Refresher Training

Situation Based Learning is intended to demonstrate how training can be delivered/used on the job. Through the use of case scenarios, direct links of knowledge can be applied to the job. Nations Bank delivers situation based training as follow-up training over their E-mail network. The largest follow-up training course is a 350K file and is created with an off-the-shelf authoring system. The simple network delivery system works in a variety of E-mail interfaces and provides an opportunity for interaction in the form of training, questions, and/or exercises. The Nations Bank courses use a lot of written data and very simple graphics. The introductory pages teach users basics, i.e., how to use scroll bars or how to respond to questions. The time required of the employee is 10 to

20 minutes, as it is assumed he/she wants to complete the training quickly and get back to work.

The user may be asked for anecdotal information about how training was used on the job. Then trainees' responses are reviewed and broadcast to other trainees as a "best practice." Nations Bank reports that new ideas can result in new training or in training enhancements of existing courses. The follow-on training can include surveys, multiple choice, or true/false questions or text entry exams -- anything within the capability of the authoring system. It was advised that remedial or cyclic loops be avoided as more than 20 minutes of follow-on training was considered too much of an intrusion onto the job site.

Return files can come back as a text file to the Nations Bank training instructor/manager who can turn it into a summary report on several trainees, or a report can be automatically generated by Lotus Notes. Training files were not "zipped" or compressed, as unzipping or decompressing took "too long" for some employees. (Others not familiar with "zipped" files simply returned files as "unusable.") Finally, it is recommended that instructors avoid sending out more than one follow-up course per week, as more resulted in user avoidance of the follow-on training. "User friendliness" testing was critical for success, e.g., "end of text" at the bottom of the message scroll bar let students know they had seen all the material and that the scroll bar was not stuck.

ON-LINE COSTS AND EFFICIENCIES

Currently, many media rich PC's use QUAD speed CD-ROM's to deliver full-motion video in interactive courseware. To move that much data over the Internet would require a near ten-fold increase in bandwidth over today's available T-3 line capacity. A hybrid approach -- with bandwidth intensive graphics, audio, and video, run locally from a CD-ROM and with network control of the delivery sequences, is the most efficient way to deliver media-rich courseware today. However, those delivering IBT today have largely opted to limit the use of graphics and employ very little or no audio or video in their courses.

A Training "Pot-Of-Gold? (Not Really!)

Those involved in training development/ delivery have a long history of endorsements of the

latest in training technology, and have long dreamed of how each new technological development would revolutionize training. However, from video-disks to intelligent tutoring, a training revolution has yet to be realized, and today most courses are still delivered in a classroom. What is different about IBT, is that it is not the training community alone that is directing its implementation. Today, Chief Financial Officers are dictating the implementation of IBT for their organizations, rather than the training departments having to make impassioned pleas for adoption of the new technology. Unfortunately, the combination of hype, emerging technology, and bandwidth restrictions combine to make the reality of IBT a challenging goal.

VERIFICATION/CERTIFICATION ISSUES

Historically, the academic community has had the most experience with providing training over the Internet and is better acclimated to use of the web for educational purposes. The academic community was the first to use the Internet as a tool for their work, as an enhancement of classroom experience for asynchronous portions of a course, and for research. For example, Vanderbilt University (1997) uses pretest and needs assessments on their web site for some courses and the pretests, assignments, and multimedia development lessons can be taken weeks or days ahead of time. Armed with feedback from the pretest scores, instructors can then teach at a level appropriate to the students' abilities.

JD Edwards offers certified testing over their Intranet, with over 50 tests for their sales, customer support, and training personnel. Their custom-built product enables tracking, scoring, report compilation, screen capture presentation, exhibits and examples, and also allows students to change answers during testing. The Emdicium Group, Inc. managed the project, designing and developing the software and the first on-line test. (Production Modeling Corp. then developed the software as no off-the-shelf authoring packages were available offering all these requisite features.) Test items and results are all secure and item distracters are randomized each time a test is called up. Each test has a unique time limit and has a start/stop clock. Trainees are only tested on newly presented materials, they are not retested on material once they have previously passed. Tests are sub-scored by topic and item analyses are also conducted automatically. Users comments occasionally leads to

identification of a need for additional training, revised training, or a new job performance aid.

On-line tests should avoid multiple choice questions that require scrolling, i.e., all answer choices should be visible on the same screen as the question. Tests can be downloaded in only a few minutes, and timed such that once the downloaded test is opened the user has a predetermined amount of time to complete the exam. Students cannot access test questions without taking the test. JD Edwards set time limits based on the number of test questions and previous users' time requirements. Test questions are always in RAM, never on the user's hard drive. In contrast, accessing a test via a web browser automatically creates a cache file of the test. Thus, browser delivery of secure tests should be avoided as it compromises the security of the test. At JD Edwards each test required less than one megabyte, and completed test results were typically less than half a megabyte. D.O.C. Software offers an on-line example of the test required to become a Certified Oracle Database Administrator. The sample test offers on-line instant scores and feedback on what the correct answers. The "help" links to their staff provided timely (within the hour) feedback to questions.

CSX Transportation's Rail Division recently completed Federal Rules Certification of 11,000 employees via a new computer-delivered training and testing system (Nicholson, 1997). The ambitious project started just four years ago; their latest implementation effort certified 99.7% of the target population within 90 days. Previously, the eight hour Federal Rules course was classroom-based, with limited instructor preparation, weak facilitator guides, and use of ad-hoc teachers.

Designing the interface for a mostly non-computer literate population, the CSX student interface resembled that of a Bank ATM. The user kiosk had to insure equipment security and comfort for the user. The courses were based on a modular format of six "runs" or train jobs with situations presented in logical event sequence. Testing was done open book (as it had been in the past), and students could "test out" on a rule (which gave an immediate reward of time). The system enables centralized record keeping, fully functional management interaction, and bookmarks for students wanting to return to where they left previously uncompleted training. It also tracks scores and records student progress.

How do you avoid legal problems with on-line testing? First, determine whether certification is the sole requirement for promotions, and if so, additional predictors will be required. For example, on-the-job performance assessments should also be required for certification leading to promotion. Thus, multiple predictors are needed for a valid certification process that will fulfill legal requirements. An organization can also have competency data forwarded to the same database.

LESSONS LEARNED

Experienced IBT developers recommended not using the traditional web browser as an interface, as users tended to "get lost" when presented with too many options. (For example when sent to get plug-ins without guidance). Rather, have the training program run outside of, or "swallow" the browser. Several IBT developers reported using intelligent E-mail (a crude type of "push" technology) was very well received by users. Posting scanned-in photos of the student asking the question adds a human feel for remotely located students who are involved in the same IBT course.

Many of the working IBT sites visited presented a course outline, electronic chapters, a practice quiz, and a final test. The test scores are sent automatically via E-mail back to the database. An important feature of more advanced test interfaces was that students could change answers as they worked on the test (something taken for granted on paper and pencil tests). An option can be made available to change the course language to a foreign language. The DoD might want to investigate whether such a translator could be used to adapt training among different branches of the Armed forces. For example, a single Prevention of Sexual Harassment course could be automatically adapted so that the examples use rank and titles appropriately to the student's military branch. Development of courses in an object-oriented training data base would make this and other needed features possible.

Developers should plan to use the same template for every course interface. This saves time, money, and creates a familiar interface for the user as they advance from course to course. When choosing authoring packages seek: optimal compression rates, options to use different image files; capability to run off web servers, compact disks, Java, and Active X; and, for some, check for available Macintosh plug-ins.

An important distinction is that academic on-line training emulates courses that may last many weeks in length, while corporate on-line training typically is emulating courses which last for only hours or a few days. For this reason, much of the detail created for academic course support (pre-tests, assignments, etc.) is perhaps overkill for shorter corporate distance learning. In the military, over 90% of current training is lecture/seminar based, and courses vary in length from hours to many weeks. The solutions already developed for these different types of courses should be considered when designing IBT. Many academic on-line courses rely on the student's local school library and/or the public library to carry the required books and supplementary readings. Students are also often provided E-mail addresses of others registered for the same course and instructions on how to participate in chat sessions. Students can be required to participate in chat sessions, and one student assigned as a chat monitor, can E-mail the chat transcripts back to the instructor.

IBT Lessons Learned Summary

- IBT is not any easier than CD-ROM based training to develop or deliver. All problems related to distribution must be corrected *in advance*.
- Users must be ready for audio if you plan to use it (many did not).
- Don't "reinvent the wheel" with each new course. Typically, course development will be intensive for the first project, and minimal on the second, third, etc.
- Bandwidth and software requirements must be set to the level of the least common denominator.
- Always minimize graphics in order to cope with the trainee's bandwidth limitations.
- It is important to keep the user from getting lost in a browser if the training provides links to on-line information. Better to not even let the user see the browser, i.e., have the browser subsumed under the interface.

TRAINING 2000:
WHAT CAN WE ANTICIPATE?

Virtual Reality Modeling Language

It is anticipated that Virtual Reality Modeling Language (VRML) will open the door to new on-line training domains. Although no formal studies have been made as to the effectiveness of VRML as a training aid, the development of enhanced cognitive training strategies are inevitable. VRML offers instructors an opportunity to construct virtual worlds that will teach concepts that require three dimensional (3D) representation. Using 3D images as props, for role-playing, or as procedural demonstrators, trainees will move beyond mere descriptions or static two dimensional images. A networked graphical simulation may provide a new mechanism whereby concepts can be more readily and successfully understood. The addition of a graphical layer to the presentation will enhance the multimedia aspect of distributed training.

The VRML 2.0 Standard (1997) is now the standard format for distributing 3D images across the Internet. This text-based language is used by application developers to implement interactive 3D graphics and multimedia content. It offers the flexibility to capture complex scenes, including textures, lights and viewpoints. Advantages of VRML include: 1) it is a distributed system and has been designed from the outset to be used in a networked environment, 2) It is an ASCII Text file that can be easily created and read, and 3) once the local system downloads, the file the network is no longer used. All motion and animation is produced locally by the VRML enabled browser.

Today VRML standards are still in the early stages of development. The VRML Consortium (1997) is a non-profit corporation formed to provide a forum for the creation of open standard VRML specifications. The consortium will serve to accelerate the world-wide demand for products (based on standards) via the sponsorship of market and user education programs. Several of the issues being addressed include: limited bandwidth and memory, compatibility with existing computer languages, and compatibility with existing browsers.

Examples of VRML on-line:

VRML Models can be hosted on any machine on the Web. Just as HTML can be saved on any machine on the Web and accessed via a URL -- VRML offers the same feature. The objects within a VRML model can act as a link to another file. These links can be an HTML file, a Sound file, another VRML file or even a different "Camera" in the current VRML file (thus providing two views of the object(s) in question). Training developers will be able to embed VRML as a window inside an HTML file, or load VRML objects as a whole page.

There are several sites on the Web demonstrating the use of VRML listed in the bibliography. To access the examples, a Plug-In (1997) may be required to enable the browser to activate the VRML code. In fact, the biggest problem is the lack of support in most current browsers. For example, most browsers do a poor job of rendering non-default properties. During attempts to view different VRML files, files with the .wrl file extension (filename.wrl) may be encountered that are not compatible with the current browser. Some investigation may be necessary to determine which plug-ins are required to achieve a working example. Such "tinkering" would certainly be beyond the capabilities of an entire training population. Until full VRML access becomes automatic for all browsers, one would not want to include it in on-line training courses.

VRML is more than just a new tool. It represents a new era in interactive training development. The requisite VRML standards are to be developed through a consensus process. Thus, the term "Collective Intelligence" has been used to describe the development properties which make it impossible to predict or control this process. The bottom line is that VRML is expected to be compatible with many computer languages. As network bandwidth and data compression methods are improved and new browsers are developed, new and exciting real time multimedia capabilities will be available on the Internet. In short, VRML may open many new doors of opportunity for the training community. Of course, as with any training tool, the effectiveness of this tool will be dependent upon the training developers. It is said that a picture is worth a

thousand words; if so, what will these 3D graphical images be worth in tomorrow's instruction?

Alice: Download a 3D Environment

The User Interface Group at the University of Virginia has created a 3-D graphics programming course called Alice (1997). The program is free on-line and provides tutorials and demos for an interactive scripting environment based on an object-oriented, interpreted language. Created for undergraduate, non-computer science students, alpha tests with one of the author's children (age 13) resulted in successfully scripting 3-D graphics after viewing the tutorial lessons. Alice is supported by DARPA and was created under the direction of Randy Pausch (1997). Like other successful training programs, Alice does not run in a browser, rather it sets up its own executable files for user interaction. Thus, the user is kept from "wandering off" during the tutorial. The feedback is immediate, with a window for scripting and another providing a view of the created 3-D object. As correct lines of script are entered, the user receives immediate feedback in the viewing window. Experimentation and exploration are fostered and learning truly becomes experiential for the student.

Cellular Modem Access

Today cellular Internet/Intranet access for world locations that have undeveloped communications resources are already in use. In fact, several organizations plan to move to cellular modem access as a US standard for their training in 1998. While the ramifications of a cellular standard are beyond the scope of this paper, for many military applications it is a logical choice. Today those seeking to deliver training to remote locations have already found that cellular access is the most economical solution.

Synchronous Audio & On-line Lectures

All training available today in industry, academia, or the military can be categorized as one of three types. They are: written documents, computer-based programs, or lectures/seminars. Of these three types, approximately 90% of all training is delivered in the seminar or lecture format (Reid, 1997). Simply converting seminar based training to written documents or interactive courseware is not always desirable, often due to the need for a live instructor "in-the loop." Despite its availability, video-conferencing simply has not been widely utilized by training professionals. However, several new on-line synchronous audio systems are available today, offering a low-cost alternative to expensive resident lecture/seminar based courses. The new delivery systems typically offer audio conferencing, combined with an interactive white-board for illustrations or slide presentations. FarSite (DataBeam, 1997) and BrightLight (Avalon, 1997) are two such products and, although these operate in the native TCP/IP Internet environment, they (like the other successful on-line training examined) are not browser dependent.

The audio conferencing systems enable use of anything from Power Point, to html, to avi, to Excel all in the same delivery window. BrightLight uses the same tools and windows for course development and course delivery. Thus, the instructors only need to learn one interface for on-line instruction. Navy training developers should note that Bright Light operates within a Win95 or NT environment, and is therefore compatible with the Commander-in-Chief, Pacific Fleet's IT21 (1997) initiative and proposed technical architecture. The real advantage of these systems over stand-alone ICW and other multi-media based training is having a live-instructor answer the myriad of questions students may ask. Live interactivity between instructor and student has been found to be a key factor in the success of distance learning programs (Sherry, 1996).

Interactive Digitized Video

Seminars are often videotaped and then very seldom viewed. However, digitized video on a CD-ROM can be made interactive if E-mail links are added. Several companies are offering computer delivered seminars and lectures that allow the student to fast forward, select a slide, or search a transcript for specific areas of interest. The interface is a combination of three windows: one window presents a "talking head;" the second window has the slides or visuals used by the presenter; and the third is a scrolling transcript synched to the speaker's voice. Eye tracking tests (Reid, 1997) found that the user's vision tends to make a triangular movement from the slide, to the "talking head," and the scrolling text. Over half of those tested watched the text scrolling, 25% watched the "talking head" the most, and the rest tended to focus on the slides. Thus, different learning styles are

accommodated by the mix provided. With speed control set at twice the recorded speed, the tape tends to rivet the learner's attention and cuts the seminar time in half. (The speakers voice pitch is lowered so a "squeaky" voice does not result). Where as much as $50K could be spent for complex CBT, only $3K is required for an hour of interactive seminar. One organization reportedly cut its annual course development costs from $800K (CBT development costs) to $40K (Interactive Digitized Video development costs). With delivery via CD-ROM, the learner can be provided access to the speaker via E-mail, threaded discussions, or chat groups during seminar viewing.

Training 2000 Summary

All of the products described in this final section are available and working today, although not as widespread training applications. Which products will prove useful for training and be generally adopted by training developers remains to be seen. VRML offers the promise of desktop simulations -- and a level of interactivity for trainees previously only available on-the-job or in simulated environments. Learning to program 3-D environments may already be as intuitive as many of the paint and draw programs familiar to children today. Cellular modem access is already the lowest common denominator for those delivering training "anywhere, anytime" in corporate America. Synchronous audio on-line may overcome the problems of video-teleconferencing (e.g., still having to meet in one location at one time) and is already enabling on-line seminars to replace lecture-based training in some areas. Finally, digitized videos of seminars enable trainees to fast-forward through a lecture, or search for a specific point at will. Questions can be addressed via E-mail. If training in the next century looks and feels very familiar to us, it will be because the technology has finally made that possible.

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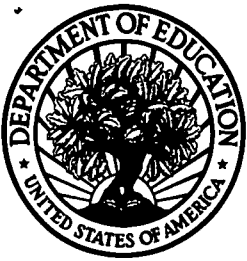
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