AUTOMATED PRESCRIPTIVE ASSESSMENTS AND INTERACTIVE DISTANCE LEARNING

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ABSTRACT

Distance learning technology provides the capability to reach multiple, distant, and geographically-dispersed locations with high-quality, real-time instruction. Interactivity improves comprehension and serves as a catalyst for effective learning when coupled with competent design and multimedia. This paper discusses combining the promises of distance learning and interactivity as the basis for an automated prescriptive assessment process. Participants in the United States Atlantic Command's UNIFIED ENDEAVOR exercises attend a relevant curriculum of seminars. They arrive with varying knowledge and experience levels in the processes and procedures associated with the effective functioning of a Joint Task Force Headquarters staff. An automated assessment process will determine individual needs and prescribe tailored curricula and courseware products. Properly focused interactive multimedia courseware can significantly enhance the effectiveness and efficiency of distance learning to meet training requirements.

ABOUT THE AUTHOR

Dr. Wiley N. Boland, Jr. is the ISD, Training Support, and Video Teleconferencing-Distance Learning Supervisor for Materials, Communication & Computers, Inc. at USACOM's Joint Training, Analysis and Simulation Center (JTASC). He has more than twenty-five years experience in instructional products development guiding learners to goals and skills mastery. He is an instructional systems designer with broad experience and background. Dr. Boland specializes in interactive multimedia courseware and electronically delivered training programs. A retired Marine aviator, he holds an educational doctorate from Virginia Tech.

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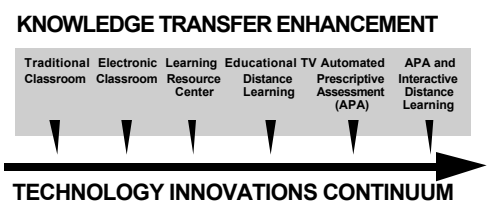
BACKGROUND

Educational and training technology innovations form a continuum of knowledge transfer enhancements. Where traditional learners once attended scheduled classes to the exclusion of other pursuits, today's learners are engaged in work and personal activities as well. In our fast-paced world, an intense need exists to broaden the array of approaches to effective and efficient instruction. Distance learning technology provides the capability to reach multiple, geographically-dispersed locations with high-quality, real-time interactive instruction similar to the traditional classroom. Distance learning technologies coupled with advanced software tools provide interactive multimedia approaches that address the need. An automated prescriptive assessment used in an interactive distance learning environment, the next level on the continuum, offers a new exciting concept in education delivery techniques and unlimited potential.

The term automated prescriptive assessment in this paper is defined as a systematic process to assess potential learners in a content area and prescribe their individualized curricular education or training program requirements based upon the assessment. Educational and training technology innovations produce significant benefits, both concrete and abstract, that can help institutions achieve their most important strategic initiatives such as learner satisfaction and decreased cost to transfer knowledge. Justifying new innovations is less than systematic and totally focused on quantifiable gains. While quantifiable benefits are important, the abstract can also help make a case for innovations. Concrete benefits include increased productivity, reduced cost to transfer knowledge, and lower maintenance costs. Abstract benefits relate to learner satisfaction, decreased frustration with job requirements, and generally higher morale. These abstract benefits can help reduce turnover, which will reduce costs, improve performance, and enhance production quality. Automated prescriptive assessment tools can provide return on investment to institutions risking educational and training technology innovations.



Historically, breakthroughs in educational system performance and functionality produce new products and create mass market opportunities. A new education medium typically experiences initial popularity in public and private education institutional settings then becomes available in the home or office, offering convenience, control, and economic benefit. Visual storytelling began as the theatrical play; evolved into the silent film, the talkie, and television; and is now available as a rented videotape or on a pay-per-view cable channel. Early television supplemented radio with visual images. The VCR allows consumers to control the content and timing of their television viewing experience. Audio compact disks (CDS) and CD players provide sound quality, durability, and accessibility superior to tapes and phonograph records. Affordable personal computers with user-friendly, interactive features significantly broaden the field. Each new product achieved significant success. At least 20 million CD units were sold within seven years of introduction despite initial prices in excess of $1,000 (adjusted for inflation to current dollars) and the absence of an established industry infrastructure (McCarroll 1988, Moulding 1996, and *Standard & Poor's 1996*).

Consumers demonstrate a strong preference for interactive entertainment. As an example according to *Standard & Poor's* and Robert Morris Associates (1994) in 1994, U.S. consumers spent more on interactive, coin-operated arcade games than movie tickets despite the fact that movies are more realistic

than arcade games. Although video game consoles and typical personal computers offer only limited graphics performance, more than 250 million video game consoles and personal computers have been sold worldwide. Currently, 36 million households in the U.S. are consumers of interactive education software. Over time, training/education institution or office markets have the potential to exceed their public counterparts. In 1994, U.S. consumers spent approximately $21 billion on videotape rentals and purchases for home or office use, substantially more than the approximately $5.4 billion spent on movie tickets. It stands to reason that a multimedia interactive automated prescriptive assessment process would be a big hit in the training and education area of the market.

THE PROBLEM

People want to learn and improve their knowledge and skills, but are unable because circumstances consume their access, time, or availability. Nontraditional students such as, nonresident, adults, disabled persons, the elderly, homebound and shut-ins, and those people concerned with shrinking quality time are challenged by improving knowledge for personal and career reasons. Those facing this challenge encounter associated problems: limited time, schedule, money, traffic, parking, crowded schools, course sequence, and the occasional poor learning experience, indifferent teacher, or abrasive administrative person. Another problem unique to distance learning relates to situations where the specific expertise is only available in a few locations in the world. The prescriptive assessment concept may alleviate such situations and be an alternative way to get those experts to disseminate information quickly and effectively through distance learning techniques. People desire to learn and because of their personal circumstances, are not able to do so .

A specific example of this problem involves participants in the United States Atlantic Command's (USACOM) Joint Task Force (JTF) Command and Staff Training Program, UNIFIED ENDEAVOR (UE) Exercises. Joint operations are critical to war fighting now and into the 21st Century. Rather than focusing on one specific Service, Combatant Commanders are now capabilities-based, requiring the integration of the unique skills and abilities of each military Service. Participants arrive with varying knowledge and skill levels.

USACOM uses three tiers of training to prepare commanders and their staffs to meet the needs of Unified Commanders facing contingencies around the world. Tier 1 focuses on Service tactical training, Tier 2 addresses joint field tactical and operational training, and Tier 3 focuses on joint operational and strategic commander and staff training. Tier 1 conducts Service training that ensures forces are proficient in tactics, techniques, and procedures. Tier 2 coordinates joint training opportunities and provides specific joint mission essential tasks for incorporation into unit training. The Services are brought together in the field to hone their skills in a joint environment. The interoperability of our Service forces is an important aspect of this joint training. Tier 3 is USACOM's UE Exercise program providing training for Commanders, Joint Task Forces (CJTFs) and their staffs and components, focusing on the operational and strategic levels of war.

Tier 3 training is conducted in three sequential phases using computer models in a simulations-driven exercise, rather than large field training exercises. Phase I is comprised of Academic Training Seminars conducted for the core element of each designated JTF. This training focuses on the CJTF and staff roles, staff procedures, joint planning, joint doctrine, and joint tactics, techniques, and procedures (JTTPs). USACOM's Commander-in-Chief (CINC) is the principal trainer, setting the training objectives and providing training guidance. Observer/trainers (O/Ts) are select functional area subject matter experts who design and execute the training. A senior observer (retired flag/general officer) provides guidance to the CJTF and assists in the learning experience. This phase requires four days and is normally conducted at the Joint Training, Analysis and Simulation Center (JTASC) in Suffolk, VA. The seminars are designed to provide the commanders and principal staffs with an understanding of the fundamentals of joint operations and an opportunity for the JTF members to receive the CJTF's guidance on operational concepts. Currently, more than 60 seminars have been developed to support the JTF Training Program. The CJTF and principal staff select seminars for the various phases, each is then taught by the appropriate O/T, and supplemented by other specialized support when required.

Phase II is the Operation Order (OPORD) Development Exercise focusing on JTF staff planning procedures and the application of joint doctrine and JTTPs. It includes participation by a CINC, the CJTF and staff, and the JTF components. The CINC will again be the principal trainer, with O/Ts and senior observer facilitating and assisting in meeting training objectives. This exercise phase enhances team building and assists the CJTF and staff in developing and validating standing operating procedures. The phase requires six days, including one day of seminars focusing on JTF formation and joint planning procedures. Following the seminars, the JTF staff is presented with a crisis situation, based on a real-world scenario, and is then required to develop an OPORD, complete with supporting component orders and Time-Phased Force and Deployment Data. The CJTF's course of action development and wargaming efforts are supported by the full range of the JTASC's modeling and simulation capabilities.

Phase III is the OPORD Execution Exercise beginning soon after Phase II and includes participation by a CINC, the CJTF and staff, and the JTF components. Once again the JTF staff assembles at the JTASC. The focus is on JTF planning procedures, decision making, and the application of joint doctrine and JTTP. The CJTF, O/Ts, and senior observer have the same roles as in Phases I and II. The phase also requires six days including one day of seminars focusing on functional tasks and preparing the staff for their respective responsibilities in the OPORD execution. Following the academic training, the JTF executes their plan in a simulations-driven war game.

USACOM executed one developmental UE in 1995. USACOM has since executed two iterations of the UE series of exercises, with an eventual capacity of eight per year. All eight will not be a full three-phase exercise; four will be three-phase and four will be something less. This will allow other JTFs to train at the JTASC. The goal is to conduct JTF staff training for only those ad hoc JTF's designated in the USACOM area of responsibility. Documents developed to assist in the training of USACOM JTFs include the JTF Headquarters Master Training Guide (MTG) and the JTF Headquarters Standing Operating Procedures (SOP). The MTG is designed to provide a descriptive, performance-oriented training guide to assist leaders in training their units and serve as a link between the Universal Joint Task List and joint doctrine. It also serves as a guide for the JTF Headquarters in actual operations. The publication is viewed as a single source for information, in outline form, to guide training of the JTF. The MTG is organized into sections along the lines of a typical "life-cycle" of a JTF. The SOP is a central reference for guidance on establishing and operating JTF headquarters. The SOP presents an overview of the CJTF's responsibilities and major decisions to be made in the process of organizing and establishing the headquarters. It is intended to be a companion document to the MTG.

The overarching goal of the USACOM JTF Command and Staff Training Program is to prepare CJTFs and component commanders and staffs to perform joint operations. However, this paper focuses on the issue of the training audience arriving at the JTASC with varying levels of knowledge and skills. The limited time to train, classroom space, and academic training seminar content material does not provide a match for every UE participant's needs.

OBJECTIVE

The concept objective is to develop an automated prescriptive assessment for use in interactive distance learning environment that brings the learning to the learner. The prescriptive assessment concept permits learners to "see and touch" course and lesson content at their convenience using a combination of proven technologies: instructional systems development, interactive courseware, teletraining, and cyberspace. The prescriptive assessment concept provides a realistic computer-based study/learning environment for a pretest based upon curricular objectives. The assessment and prescribed individualized curriculum ameliorates learner knowledge on a very personal basis and in tune with proven adult education tenets. Finally, the prescriptive assessment concept fulfills learner requirements and expectations, to learn what is needed based upon knowledge and skill level assessment.

This effort is twofold: first, the planning, analysis, design, development, implementation, and management for this revolutionary concept using interactive courseware delivery media to assist the learner

in efficient use of time while accomplishing educational goals; second, this prescriptive assessment concept acquires a leadership role in the emerging virtual arena and determine its application.

The automated prescriptive assessments used in an interactive distance learning environment can be planned, analyzed, designed, developed, implemented, and managed as an entry into the distance learning market. Creating an automated prescriptive assessment requires interfacing and maintaining an assertive interactive multimedia standard and generating support for the standard. Considerations for promoting and extending the automated prescriptive assessments in an interactive distance learning environment include:

1. extending automated prescriptive assessments in interactive distance learning technology to foundations, corporations, and government support agencies for distance learning, educational technology, and telecommunications

2. developing interactive courseware capable of operating with cable and telephone networks and other delivery vehicles

3. executing an alternative business model based on nonrestrictive software licenses bearing royalties and active technical support for both hardware and software

4. extending automated prescriptive assessments and interactive distance learning technology through strategic partnerships with leading hardware, software, and media content providers

CONCEPT

Educational technology innovations model a continuum ranging from traditional learning to limitless capabilities relative to distance learning using the information super highway, virtual reality, and artificial intelligence. Automated prescriptive assessment in an interactive distance learning environment resides beyond classical television-based distance learning. It integrates technologies and provides learners and institutions full use of courseware, administrative services, and resources. The concept is achieved with commercial off-the-shelf technologies and proven interactive multimedia courseware development tools. The interactive multimedia courseware product permits distance learning that appeals to the entire education spectrum. Automated prescriptive assessment in an interactive distance learning environment provides access to the non-traditional student population and expands the implementing institutions' student base.

Automated prescriptive assessments and interactive distance learning applications facilitate realistic simulations in the education environment, life like procedures and scenarios, technical information retrieval, information services, and a backbone education network. Accompanying these performance breakthroughs, the design employs custom graphics, memory management, as well as advanced video and audio compression techniques.

It is universally accepted that distance learning is instructional technology whose time has arrived. It provides the capability to reach multiple, distant, and geographically-dispersed locations with high-quality, real-time instruction similar to that found in the classroom. Interactivity improves comprehension and serves as a catalyst to effective learning when coupled with competent design and multimedia. Interactive multimedia is rapidly becoming the norm in both schools and businesses and enhances distance learning. A varied curriculum content employing interactive multimedia programs uses training dollars effectively and efficiently. This paper discusses combining the promises of distance learning and interactivity as the basis for an automated prescriptive assessment process.

The premise of this paper endorses an approach to make training and education more effective and efficient by using automated prescriptive assessments and interactive distance learning. The participants in the UE exercises at the JTASC attend a relevant curriculum of seminars. These participants arrive for their training with varying levels of knowledge and experience in the processes and procedures associated with the effective functioning of a JTF staff. An analysis is underway to identify and develop training media for these processes and procedures. The results will be twofold: first, provide the

participants with the most appropriate curricula and courseware products; second, determine individual needs by an automated prescriptive assessment process.

Combining this assessment process with distance learning, a proven medium that can directly address learner and institutional needs, is the vision for meeting learner expectations. However, incorporating the last feature of this approach, interactive multimedia, must be done cautiously. We cannot be charmed by the lure of new technology and misled from the goal: effective and efficient transfer of knowledge. Interactive multimedia courseware can significantly enhance the effectiveness and efficiency of distance learning to meet individual training needs.

CONCEPT OPERATION

The operation for the automated prescriptive assessments concept involves participant identification, enrollment, automated prescriptive assessment, course activity, asynchronous events, projects, evaluation instruments, course completion, and operation benefits. Exercising the automated prescriptive assessments concept entails an analysis of training tasks for evolving training requirements' feedback from established courseware users. The analysis provides a listing of training objectives (terminal objectives and learning objectives) and corresponding questions. In the case of UE Exercises at the JTASC there are approximately 600 objectives for the training requirements with four to six corresponding questions for each objective. The question library, with more than 2,000 questions, provides a sufficient test-bank for the automated prescriptive assessments concept.

Participant Identification

Those individuals assigned to a particular UE Exercise or curriculum are the identified participants for the automated prescriptive assessment concept, or any individual with particular interest in the content material may also enroll. Participants contact the JTASC and acquire the enrollment package in person, by mail, or electronically (if internet capability is available). Floppy disks, CD-ROMs, and an instruction card comprise the initial package. The communication software is provided via floppy disk (or internet).

Enrollment

Participants assigned to UE Exercises and/or anyone desiring the JTF Staff training will enroll on-line for distributed training modules. Participants access communication software via the provided floppy disk and interfaces (or internet) with the JTASC. Participants enroll using interactive screens.

Automated Prescriptive Assessment

Participants access communication software via floppy disk (or internet). An interactive instrument based upon course objectives and content assesses participant course knowledge. The software then generates a hard drive file on the participant's computer. This file is a hierarchical presentation of participant strengths and weaknesses relative to course objectives and content. Participants may review this file during each new study/learning session, providing effective learning guidance

Course Activity

Participants access interactive multimedia courseware via CD-ROM (and later the internet). Using interactive screens, participants may execute any training "mechanic." These mechanics include preparation, interactive multimedia courseware, and study. Preparation is a reading assignment using hypertized text on the CD-ROM. Interactive multimedia guides the participant through learning, skills acquisition, and practice. Embedded questions and lesson, unit, or phase evaluation instruments challenge participants and monitor progress. The study mechanic reviews specific text and data directly relating to objectives, enhancing participant knowledge transfer. These features maximize virtual campus capabilities.

Asynchronous Events

To provide human interactions the curriculum may permit or require asynchronous events to round out the learning. At predetermined intervals during the course or at the participant's discretion, the instructor/expert is accessed with communication software via floppy disk (or internet). Using interactive screens, participants communicate questions, comments, and assignments to the instructor, who responds a few hours or days later. This feature also compiles cohort participants'

questions and comments, providing course cohesion, collaboration, and the "flavor of the cohort."

Projects

If lengthy or comprehensive projects are part of the curriculum, the participants need an opportunity to "turn in" their work. Again, participants access communication software via floppy disk and, using interactive screens, may submit their project or assignment requirements. This continues until the project is completed.

Evaluation Instruments

In the traditional instructional paradigm, the learner's progress is measured by an instructors prearranged test schedule. The instructor/expert rewards and admonishes the learner according to their performance. Normally the testing reflects the instructor's learning style. In newer learning models, the learning evaluation is accomplished by self or peer review (under institutional guidance) at the time of content or task mastery. The total work environment is motivating and engaging for learners. Traditional testing remains important, but ceases to be the sole means of evaluation. If a course or curriculum requires written evaluative instruments, participants may write them electronically. The participants access communication software and using interactive screens, participants complete evaluation instruments measuring participant course content knowledge.

Course Completion

Participants access communication software via floppy disk and using interactive screens, provide completion data and completes the learning activity.

Operation Benefits

Participants access communication software via floppy disk. Using interactive screens, participants may search the institution library for titles, periodicals, and other resources. Follow-on capabilities include two-way video, two-way audio, real-time white board, and on-line chat. These features achieve the true virtual campus and full capability of distance learning.

CONCLUSION

Technology innovations, especially when embedded into proven applications they are designed to support, can produce significant benefits to both learner and institution as a whole. Whether the benefits are concrete or abstract, they are real, and should be thoroughly analyzed at the beginning of a learning intervention.

Automated prescriptive assessment integrates educational technologies and implements a distance learning, interactive multimedia experience that broadens the educational spectrum for institutions and individuals. The concept responds to problem issues and provides all learners electronic access to interactive multimedia courseware, administrative services, and institutional resources. We will test this concept over the next two years at the JTASC and will report the results in 1998.

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