DEVELOPING AND IMPLEMENTING A COMPUTER MEDIATED INFORMATION EXCHANGE (CMIE) FOR STUDENT AND FACULTY INTERACTION

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ABSTRACT

The purpose of this paper is to develop and implement a Computer Mediated Information Exchange (CMIE) that will help adult students and their professors to implement a present-day technology tool based upon current computer-human interaction studies for use outside the traditional classroom while using existing hardware. It is by using many new theories and instructional techniques, as well as new innovative technologies in the classroom based upon psychological studies of computer and human interaction that educators can begin to communicate more effectively to adult students and increase their learning potential.

Introduction

For many years, it has been argued that lifelong learning is essential for American workers. Even an advanced college degree is not considered enough to provide the knowledge and skills required for a lifetime of work. Instead, as the argument goes, rapid technical change and new careers mean that people must continually retrain and retool (Dillman, Christenson, Salvant, and Warner, 1996).

Lifelong Learning

Lifelong learning is now considered extremely important, so important that the nation's colleges and universities are asked to educate new high school graduates and to teach returning students as well. Many times, these older students want more education but not necessarily a degree. Often, the older students have attained a high school diploma through an equivalency program and lack the advanced writing skills necessary for many degree programs. Typically, they try to balance work and family with the demands of going to school. Teaching conducted only in the traditional campus classroom will not meet the public's demand for tailored educational services. (Dillman, et al, 1996).

Realizing the non-traditional needs of college students, significance must be placed on the goal or implementation of technology in the classroom. It is vital for educators to meet the challenge and incorporate the new trends into their own teaching styles. Making technical material palatable to those who resist will always be a challenge, but presenting it in the right framework and with the right goals will be the greatest challenge the educator will face as technology transforms the present educational system (Frank, 1992).

The Challenge of Modern Day Education

Educators are continuously faced with the dilemma of how to reduce instructional time, provide more transfer of knowledge, and how to construct better learning experiences for their students (Schornak, 1996).

Centuries ago, an apprentice would work with a master for several years to learn, say, stone masonry. Since stone masons did their job the same way for generations, the long training period was not a problem. After the Industrial Revolution, however, the classroom became the best way to teach fast-changing skills to large groups of people. Today the pace of change is so great, the student's needs are so diversified and dynamic that the classroom by itself is no longer sufficient (Falconer, 1994).

The Adult College Student

According to Dr. William Herlehy of Embry-Riddle Aeronautical University, "The mature adult learner who works full-time in a profession does not bring the same experiences and expectations to the classroom as does the traditional full-time student" (Herlehy, 1992). Additionally, the adult working full-time, raising a family and attending classes is often physically and mentally drained. For these students to learn and maintain interest during an extended class, which may be four or five hours, they must be challenged to continuously participate in the class (Schornak, 1996).

With these axioms in mind, it is important to remember that conducting classes in the traditional manner may not be the way to approach this unique population. Rather, teaching adults requires understanding their behavioral characteristics, determining their unique motivational characteristics, how they learn, and what instructors can do to meet the special needs of this challenging group of students.

To meet the challenges of today's modern technological advances, many colleges and universities are attempting to change how they meet the demand for the more mature student. Specifically, the off-campus satellite campuses that support adult learning are more flexible in the demands on the adult learner who is juggling a degree with a career and/or a family. One such institute of higher education is Embry-Riddle Aeronautical University. The College of Career Education (CCE) programs meets a variety of needs that are unique to the adult student.

With the huge influx of personal computers into homes and schools educators are rethinking the role of Computer Aided Instruction(CAI) in their educational programs. Over the years, two basic approaches to Computer Aided Instruction (CAI) have developed: the linear mode and the tutorial mode. The linear mode brings every student step by step through the learning material. The presentation of material is predetermined and everyone can eventually reach the same conclusion. The tutorial mode, on the other hand, presents material dynamically, or interactively. Different procedures are available for presenting information to the learner. The computer may ask the student questions and then evaluate or even correct the answers or the student may be able to address questions to the machine. The tutorial format establishes a basic structure and gradually elaborates on it. This approach requires multiple passes over the same material, covering basics first and then moving through various details (as requested by the adult student) before going on to another level. Because the linear mode was easier to program, it was used first. However, researchers have long suspected that the tutorial mode may be more effective in teaching based on human and computer interaction. (Lefton and Valvantine, 1986).

Psychologists know that CAI is not the answer to every learning problem; but it has been of significant help to teachers and students in many school situations. As psychologists'

understanding of human learning and computer interaction continue to grow, so will the number of useful applications to education, especially where new technologies are introduced.

It is not enough to lecture to adult learners, one must stimulate, challenge, and motivate them to assimilate the knowledge and information presented into their personal and professional lives (Stemberger, 1995).

It is by using many new theories and instructional techniques, as well as innovative technologies in the classroom, based upon psychological studies of computer and human interaction (Barnard, 1995), educators can begin to communicate more effectively to adult students and increase the learning potential of those students (Schornak, 1996).

The purpose of this paper is to develop and implement a Computer Mediated Information Exchange (CMIE) that will help adult students and professors implement a present-day technology tool based upon current computer-human interaction studies and existing computer hardware for use outside the traditional classroom.

The World Wide Web (WWW) Technology

Today it is imperative that we provide adult students with the tools they need to utilize the learning resources currently available to them (Thomas, 1996). The World Wide Web (WWW) is a revolutionary advance in the transmission of knowledge. As the popularity of the WWW has skyrocketed over the past two years, so has the amount of information available (Hemphill and Thrift, 1995). It allows access to learning resources on a scale never before considered possible. This is evident in the large and quickly growing number of organizations and individuals who indicate that more information can be obtained on the World Wide Web (Herlehy, 1996).

Nearly everything of importance can be done by using the WWW. So the compelling question is: "Why has education been so slow to realize its potential?" Music can be played, videos can be viewed, e-mail can be sent, airplane reservations can be made directly with the airline companies, packages shipped by UPS can be tracked from home, and video and text based "multimedia" libraries can be accessed (Wolf, et al, 1996).

Just as teachers acknowledged centuries ago, the importance of reading to education, we must accept and pass on to our students that knowing how to access and use the WWW is an essential component of college literacy. Beyond this point, the ability to use WWW browser software will be considered as much a part of literacy as knowing how to read a library card catalogue is today (Tennant, 1996).

Human Computer Interaction

When implementing new technology in classroom situations, the psychology and study of human-computer interaction must be taken into account. This is evident due to the fact that when a person is interacting with a computer system, two highly complex information processors are, in effect, conducting a dialogue. One of these, the person, will be engaged in some purposeful activity which is directed toward achieving a task objective in the home or workplace. The other, the computer system, is the tool that mediates the achievement of that objective. Both parties to the dialogue are manipulating and acting upon information that represents ideas or entities in a particular task domain, for example, business accounts; the component reactions in a chemical plant; spaceships in a game; documents; or even computer programs themselves (Barnard, 1995).

To achieve particular objectives, individual users cannot typically rely on their knowledge of the task domain alone (Morton, Barnard, Hammond and Long, 1979). They must also learn something about the way in which the tool behaves. They need such knowledge to interpret the state of information in the system, to assess how that state relates to their immediate goals and to communicate to the system what action to take in order further to pursue those goals. These activities of interpretation, assessment and pursuit of a course of action all occur in a specific context (Barnard, 1995).

Obviously, that context is very much shaped by the particular style or form of human-computer interface that the system offers. As processors of information, any given generation of system is subject to the constraints of design practices within current hardware and software capabilities. Furthermore, the user shapes the context of a particular interaction. As processors of information, users are subject to different constraints - those of natural human cognition, experience, individual specific needs for using a computer tool and broader motivations for doing so. The context is also determined by representations of the specific entities in the task domain that are being considered by the user and manipulated by the system. In the course of a particular dialogue sequence there is a history. Which is likely to constrain both the user's interpretation of the system state and the system actions that can be carried out. The study of human-computer interaction seeks to understand what it is about the factors within this total context that lead to productive and efficient use of computer tools. Once gained, that understanding should enable us to design innovative and beneficial tools to support human aspiration and even to extend the horizons of learning (Barnard, 1996).

Multimedia Based Learning Potentials

Traditional teaching can be considered a low-tech multimedia activity. College classroom teaching and education pale in comparison to the information and learning that is available on the WWW. The traditional classroom provides a setting in which a number of different forms

of communication coexist, such as speech, writing and projected images; however much of the information in a lecture is poorly recorded or lost. Because of this loss of information, newer high-tech ways of helping college students capture information in the classroom have been and are being developed. Multimedia computer technology facilitates automatic capture, integration and access of multimedia information in the educational setting of the university classroom. Applying computer technology in the classroom setting to support the classroom's group multimedia authoring and review experience leads to an enhanced teaching and learning experience (Abowd, et al, 1996).

With all of this technology available, it is curious why universities have failed to develop strategies for using the "communication link" of the World Wide Web. It has been determined that computer-based education and information systems promise universities so much: lower costs, reduced learning time, and just-in-time availability. However, without the right implementation expertise, only a fraction of the benefits will be realized or even utilized (Costanzo, 1996).

Need For Interactive Communication

Education has been and always will be a dynamic field. The university instructor needs to acquire new technology skills that will make them available to their students. The traditional educator will find their former skills totally inadequate for this challenge (Tennant, 1996). The called-for expertise will be in resource-based learning. The teacher will facilitate the student's link to the deluge of words and images of every imaginable kind from literally around the world and do it all hours of the day and night. The tool necessary to make a transforming change is already available. We can surmise many things about technologies of the future and their effect on the teachers. However, if we have only a personal computer and access to the World Wide Web, that is enough to begin revolutionizing higher education (Herlehy, 1996).

Educators can create teaching tools interactive enough to let students seek out information, work at their own pace, and assimilate information when it is most convenient for them. The student can use an on-line service to review class sessions in as little as two or three minute segments instead of 50 minute lectures and also review them as many times as they want. It would be difficult to argue that to review in small segments directly from the primary source is not better than attempting to decipher scribbled notes taken during one to three-hour lectures (Tennant, 1996).

The new role of the college professor will not be to provide information on the subject but rather to guide and encourage students as they decipher the wealth of knowledge from the information deluge. Instructors must become mentors. They will develop the skills needed to nudge students through the crucial tasks of gathering and processing information: problem solving, analysis, decision making, and synthesis (Finn, et al, 1996). The professor will be the

entry point to the world beyond the campus library. He or she will be a kind of "icon" on the monitor--click on the professor and he or she will take the student to, and through, the information world. If this seems absurd remember, in part, it already takes place with the World Wide Web (Herlehy, 1996).

In the modern day (and olden day) traditional lecture format, questions are filtered through the professor and class time is limited. Because of the seating arrangement, students face front and are discouraged from interacting with each other. In an online "chat," or threaded discussion format, using the World Wide Web and new technology, students are not limited by time. Students will be encouraged to debate topics with each other, after class, as well as the instructor.

E-mail as an Important Information System

According to a survey of corporate communicators from 93 Fortune 500 companies, conducted by Cognitive Communications Inc., 42% of all employee communications will be delivered through e-mail by the end of 1997. In fact, the survey says that within the next three years, major companies will communicate by e-mail as frequently as they communicate by print (Federico and Bowley, 1996).

Actually, e-mail is a misnomer. The technology's better name is "shared-idea network"--an information system that provides give-and-take. In other words, e-mail is a flexible and rapid format that encourages (almost demands) two-way communication (Federico and Bowler, 1996).

Computer Mediated Information Exchange (CMIE) Definition

University professors have learned that they need to sacrifice much of the face-to-face intimacy for the sake of giving students the freedom and power to learn (Finn and Manno, 1996). With the mobile and ever busy adult students of today, communication over the WWW, or an Intranet, is an absolute must. This is where the idea for the Computer Mediated Information Exchange was born.

A Computer Mediated Information Exchange (CMIE, pronounced "See Me"), as referenced in this paper, refers to a technological enhanced system that allows electronic communication from an instructor to a student. This communication must allow for easy access to class information, use existing equipment, provide feedback -- either real-time or posted -- and allow interaction between student and instructor without a face-to-face meeting.

A state-of-the-art CMIE is a multimedia learning experience. This multimedia learning experience, designed with human-computer interaction criteria, is a highly engaging presentation of content that is informative, intrinsically motivating, enjoyable, and makes learning easy. Key

characteristics of this type of program include learner control. The greater the learner's control, the more interesting the information becomes, and in turn, the more likely the user will literally learn from the Computer Mediated Information Exchange.

Accelerated Learning With The Use of a CMIE

Keeping the adult learner in mind, educational research has shown that learning can be dramatically accelerated, not just by reorganizing the classroom, but also by stimulating the whole brain and creating an inspiring learning environment. In recent years, researchers have learned much about how the brain functions, The left hemisphere of the brain is analytical: it processes language, logic, and math. The right hemisphere of the brain is creative: it processes visual images, music, and special relations. Most learning, is left-brain dominant, but failing to stimulate the right brain can make learning incomplete and also dry, redundant, boring, and therefore ultimately ineffective. So how can the right hemisphere of the brain be activated? Research has shown that the whole brain can be stimulated --and thus, learning accelerated -- by introducing many stimuluses, most notably relaxation, music, and positive suggestion (Doyle, 1991).

Relaxation is usually oversimplified and misunderstood. It is compatible with, and actually necessary for, success in demanding activities. Relaxation produces alpha brain wave patterns that psychological researchers also find during meditation, thus finding that relaxation releases energy for learning. Young children learn easily and without effort or strain because their learning is spontaneous. Later in life, learners expect learning to be stressful. The result is an instinctive tensing of the body, a tightening of the jaw, a change in the chemistry of the nervous system (in other words, tension). A low-threat, high-challenge environment enables learners to take risks with safety, allowing them to commit and involve themselves fully (Doyle, 1991). This is where a CMIE is so beneficial for instructors to use. The students can get all the information they need, at their convenience, at their own speed, and without being confused or overloaded by an avalanche of new ideas and data (Falconer, 1994). This is extremely important in today's information age because the question becomes: how much new information does the instructor pour into their students? It is unproductive and threatening for the student to be given too much and to try to learn everything at once. With the CMIE, the student can learn at their own pace. This self-paced learning, allows faster paced students to learn enough to satisfy their needs and slower paced students to review what is necessary for them to assimilate.

Psychologists have found that music -- especially Baroque music (the music of Handel, Bach, Vivaldi, etc.) -- when it accompanies new information, helps left/right brain linkage. It creates an auditory and rhythmic association with the material being presented and it promotes a state of relaxed awareness that stimulates an alpha brain wave pattern (Doyle, 1991). With music in mind, the new computerized WWW technology of multimedia and the power of the

personal computer now allows independent, continuous speech recognition and longtime playing of various musical masterpieces. A well-developed CMIE uses music and speech interfaces, along with other multimedia enhancements, while using the World Wide Web allows for easy information exchange. This allows an accelerated growth path for adult users (Hemphill and Thrift, 1995).

The human brain has enormous potential and it is capable of much more than is currently being developed in schools and universities. If teachers believe in their students' abilities to learn and if they convey this confidence using positive suggestions and positive feedback, thereby boosting the student's self-esteem, the student's learning will become accelerated and highly successful. Unfortunately, the reverse is also true. If teachers attempt to double their students' abilities without positive suggestions and positive feedback, the students will be more inclined to fail - executing a self-fulfilling prophecy (Doyle, 1991). Communicating over the CMIE, by using either e-mail or a "chat" mode, the instructor can instantly give positive feedback, constructive criticism, and helpful information to their students at a time convenient to the students busy schedule.

Proposed Design Selection Model

There are many ways to design and develop computer mediated systems for traditional classroom instructors that can be easy to implement and very cost effective. But where does one go for the answers? In considering the needs for Embry-Riddle Aeronautical University, the following guidelines, modified from Joe Costanzo's guidelines of implementing multimedia training (Costanzo, 1996), are adapted and will be used to instruct an educator to select a beneficial and an easy method to set up a system for their personal situation and location. These guidelines include: needs assessment, educational objectives, personality profiles of your student audience, a delivery platform of the CMIE, hardware and software assets available, review of existing information available, awareness of the budget, design, selection of media desired, and story-boarding the CMIE.

The Needs Assessment

The first step with any project is to conduct a needs assessment. The implementation of technology is no different. Many standard training issues and new considerations specific to computer technology will be encountered; therefore, some factors that need to be considered are educational objectives, your student audience, the delivery platform, assets, existing course information materials, and budget constraints.

Educational objectives, a list of clearly defined goals, should be constructed that summarize what the CMIE will be used to achieve. These objectives are the most important part of creating the CMIE since syllabuses and books have been the standard for objectives in the

traditional educational setting. These educational objectives should outline the systems purpose: function to teach, provide feedback, hands-on training, convey specialized knowledge, provide general orientation for the course (i.e. syllabus and homework assignments), and dispense outside research information.

Personality profiles of the student audience must be developed. Are the students of similar or different ages, educational levels, and job categories? Do they learn best through demos, lectures, or hands-on exercises? Are they comfortable with technology?

The delivery platform of the CMIE must be determined. The platform question can only be answered by asking other questions: Do the students have desktop or notebook computers? Are their computers PC's or Mac's? Are their computers equipped with sound cards? CD-ROM drives? Will the CMIE need to be delivered over the Internet? If the Internet is necessary, who will be the Internet Service Provider (ISP)? Most importantly, the CMIE platform expectations must not exceed the capabilities of the available hardware.

The media assets that are available, or the ones that will needed to support the CMIE must be identified . Assets include text, graphics, still images, video, animation, and audio such as voice-overs, sound effects, and music.

Review of the existing course information is necessary. What is already available for this course electronically? How much of the course content needs to be converted to the CMIE? Will there be new content?

Awareness of the budget (both time and money) must be considered. What is the time frame for producing the CMIE? Is delivery of the final CMIE tied to another event, such as a term schedules? How long will it take to maintain and update? What are your financial limitations and restrictions?

Once the needs assessment has been conducted, then the CMIE's design can be outlined. This process is critical to determining the CMIE's success. The basic steps in developing a CMIE is (1) analysis of needs, (2) identify the specific items that the student audience needs, (3) selection of the platform to be used, (4) selection of the desired mix of media (text, video, animation, audio, graphics), (5) develop design by story boarding the CMIE ,(6) determine the content's sequence, and (7) design the look and feel of the CMIE.

The story-board consists of hand-drawn or computer-generated visual images of the course information exchange and the relationships among the various content pieces. This may be the only visual reference for the development team or faculty member.

Depending on course design, different computer assets will be stored and used. These assets include either shareware or original videos, animations, photos, and audio recordings. A simple rule to follow is that the more professional the media is, the more polished the CMIE will be. Once created, these assets must be converted to a digital form that is usable by the chosen CMIE platform.

Engineering the CMIE is the stage where the CMIE content is arranged, integrated, synchronized, and uploaded (if the Internet is used).

After the CMIE is finished, it must be tested to ensure that it works properly. The testing platform should imitate as closely as possible the conditions of the targeted audience.

Choosing The Appropriate Design Model For Hickam Center

Using the design model, several additional factors were considered in the implementation of the CMIE at Hickam Resident Center. These factors included the evaluation of multimedia software based on content propriety, technology fit, instructional effectiveness and administrative handiness (Zenke and Armstrong, 1996). Several other primary issues were considered that determined the direction of the CMIE including: bandwidth of the Internet backbone, quality of service (QoS), computation power, I/O (input/output) capabilities, bridging capabilities, standards, and cost of implementation (Haramaty, 1997). Additionally, Wheeler's Law Number 3, "It's best to start with something simple" (Haramaty, 1997), regarding new technology was observed.

The needs assessment for implementation of the CMIE resulted in a positive need for a communications medium for students who had to miss class due to illness or military duty assignments. The need for submission of assignments as well as information concerning the syllabus, assignments or location of research materials were urgently needed. The target student audience was the adult military member, or aviation professional who was subject to world-wide deployments or assignments with little or no advanced notification. Most of these adult students are very comfortable with WWW technologies and are highly motivated to complete their degrees. The delivery platform chosen was that of a World Wide Web Homepage (Webpage, the introductory screen within an Internet Topic) (Parsons and Oja, 1996). The Webpage, lends versatility and accessibility of any WWW browser software (Netscape or Internet Explorer) or computer platform (Microsoft DOS, Windows, or Apple's MAC OS) by any student or faculty member with Internet access. This versatility of varying platforms utilized the existing equipment available at Hickam Resident Center, allowed any student or faculty member to access the CMIE regardless of their Internet access or equipment, and had no impact whatsoever on the budget. The only cost to the Center was the time to develop, implement and update the CMIE.

Limited multimedia effects were chosen for the Webpage due to the speed of accessibility and software loadability (speed in which the Webpages load onto the users computer) of the students and instructors. Highly visual and auditory effects cause significant delays in computer load time on older equipment. Therefore, minimum effects were included, but basic Human Computer Interaction (HCI) design and content were not sacrificed. Once needs assessment was done and the platform chosen, the story-board, or handwritten blueprint, was made to develop the design layout.

Implementation of Experimental CMIE Model

By using the design implementation model, the following CMIE was chosen for use at the Embry-Riddle Aeronautical University College of Career Education site of Hickam AFB Resident Center.

A Webpage, was developed on the World Wide Web using the local Internet Service Provider (ISP) for Hickam AFB Resident Center of Embry-Riddle Aeronautical University's (ERAU) College of Career Educations. This Homepage, or Webpage, consisted of the Resident Center's general information, links (or pointers) to other Webpages that makes it easy to follow the thread of related information (Parsons and Oja, 1996) to other Hawaiian ERAU locations, links to the Daytona Beach, Prescott, and College of Career Education Webpages, Student and Faculty Information, and the CS-109, Introduction to Computers Reference page. The basic CMIE, Student and Faculty Resource page, was the doorway to library accesses and basic research information for help with their classes. The CS-109, Introduction to Computers Class specific CMIE, was developed which included simple postings of specific class information, meeting dates, syllabus, test dates and important announcements. Additionally, links to important locations on the World Wide Web (called Websites), and software links that allow a search of any given subject (called search engines) were included. E-mail response capability was included that allowed communication between the instructor and student and the submission of course assignments. Additionally, a link to the Yahoo Chat server using "Ichat" software was included. This allowed free access to live on-line discussions between instructor and students. Predetermined schedules for live on-line chat time with the instructor was included on the CMIE Homepage.

Evaluation

The Internet affords a unique opportunity for educators to create rich online learning environments. Creating a rich online learning environment is a challenging and difficult prospect for educators to effect without some concentrated thought to visual presentation of the course information and activities and the functionality of the interface. The functionality of the interface involves the interaction style (e.g., menus, command, language, graphical user interface [GUI], etc.) that the student uses to communicate with the computer, as well as the

navigational process a learner must follow to locate information or complete a task. The visual presentation and functionality of the online course interface form a mirror that reflects how the learning environment will be perceived by students and faculty as a dynamic location for communication and learning (Dringus, 1995).

The Hickam AFB Resident Center CMIE, though simple and fairly low-tech in design, allows a much needed dimension to the mobile active life of the adult student while using the existing hardware capabilities of Hickam AFB Resident Center. The meaningful interactivity of the World Wide Web hypertext links by using branching (the ability to move from one topic to another or to link to related information) provides frequent opportunities to choose and do research at a time and place convenient with the student's lives (Costanzo, 1996). Additionally, the CMIE allows the students the freedom to search for topics of interest or to seek remedial instruction.

Usability Analysis

Psychologists have established a number of important facts about the mental machinery of people which are pertinent to design problems. Psychological theory aims to connect these and offer facts into a predictive and explanatory framework, in much the same way that a physical theory, like Newtonian mechanics, aims to predict and explain the behavior of physical systems (Nielsen, 1994). By applying Nielsen's model (Nielsen, 1994) for design based upon psychological theory, the following was noted by two users of the newly implemented CMIE.

Some things do not look or sound the way one thinks. The design of the backgrounds of the CMIE were found distracting from the actual content of the Webpage. One user noted that the background was too busy and he found it hard to concentrate on the words of the page. The original backgrounds reflected Embry-Riddle Aeronautical University's logo, which is a blue encircled eagle. The background was tiled and lightened up, was aesthetically pleasing and contrasted the black letters; however, it was distracting to the user. Therefore, only the index page of the Web Site reflected the distracting logo background. Instead of using text base, which was hard to see on the Index page, a table with graphical buttons was displayed allowing the background not to be bothersome. The rest of the Webpages were changed to reflect a plain light solid-colored background.

Only some of the contents of a complex display are likely to be seen. What is seen depends on size, color, organization, and movement as well as where the viewer is looking, what the user knows about the structure of the scene, and what the user is trying to do. To the user there are two groups of data; if the elements are in close proximity, this association will be even stronger (Tullis, 1988). With this information, instead of using frames and or a complex single page, the Webpage was designed using simply arranged links to whatever

information the user was needing. The Index page became a link to other sub-pages using simple graphics, some of which move, and large simplistic text. The blue hypertext links protocol (an unspoken norm of the World Wide Web) was observed. The users found the design of the pages to be easy to understand, use and effortless to find the information that they were looking for.

Precise movements take longer than gross movements (Fitts and Posner, 1967). For example, if an interface makes use of numerous buttons or sequences of button presses, the distance between buttons in the sequence and their size becomes an issue. There are good quantitative models which predict how long a movement of a given length and requiring a given precision will take. The CS-109 class CMIE was simply constructed using a pale yellow solid background, black text, and large colored buttons to indicate important links. The buttons were strategically placed at different locations vertically, yet near each other. This helped reduce the possibility of accidently pressing the wrong button. Once again the users found this simple design easy to understand and navigate. The only complaint was that of desiring more choices.

Mental operations take time. It takes time to recall information from memory or to make a decision. It is possible to make reasonable quantitative estimates of the times involved, at least for fairly simple operations, and it is possible to break up complex operations into simple parts for purposes of estimation. The CMIE page found through the CS-109 page, and the Student and Faculty Resource Web page introduced Human Computer Interaction (HCI) World Wide Web links. This was done as a listing, causing the user to scroll down the available list. The title name was the link along with a small button, and the link was detailed by a brief description in black text. Again the users found this simple design easy to understand and navigate. The only complaint was that it took time to scroll down the Webpage, but it was easy to make a choice regarding links due to the availability of the narrative description following each HCI subject link. Another complaint was wanting more availability of HCI selections.

People get faster the more often they perform a task. The Power of the Law of Practice (Newell and Rosenbloom, 1981) states that the more frequently a task is performed, the quicker it will be accomplished. The rate of improvement is rapid at first, dropping off as the task becomes performed more often. Since the design is new, there is lack of feedback pertaining to the simple design of the CMIE. It is assumed that after the newness wears off, a more detailed design needs to be developed for experienced users. The primary consideration is the number of Webpage layers one must go through before reaching the "chat room."

Novice users may perform tasks differently than expert users. There are individual differences in the way that knowledge is mentally represented between novices and experts. Such knowledge is a direct reflection of the way that a task if both understood and organized by people at different levels of expertise (Egan, 1988). This is of primary concern since the two

primary critiques received about the CMIE were from expert users. A questionnaire will be developed to incorporate feedback from not only expert users, but from novice users. With this information, the CMIE can truly be adapted to meet a wide-range of expectations.

Conclusions

Technology has radically changed many professions during this century. Physicians have seen the introduction of drastically different tools and techniques, accountants use electronic rather than paper ledgers and architects are able to totally redesign a building in only a few minutes by just looking at a computer generated image (Terrell, 1995). As our technology advances, the current educational system is failing to prepare our children to compete in the workforce. Organizations have to rely more and more heavily on company training, development specialists, and the colleges and universities. This presents a very large challenge to the U.S. adult educational institutions (Schuler, 1995). Not only does the adult learner's learning styles need to be addressed, but the need to "catch up" on technological advancements in the classroom are of utmost importance.

Many colleges and universities are attempting to change how they do business to meet the demand for the more mature student. For the military student, government funded education centers contract universities to establish sites at off-campus (satellite) resident centers to provide educational opportunities for training and development. The off-campus instructors at these resident centers have to be more flexible in meeting the demand of the adult learner who is juggling a degree with a career and/or a family. This is where new technology, especially a CMIE, can be a great asset and benefit not only for the adult student, but for the adjunct instructor.

Realizing the significance that should be placed on the goal or implementation of using technology, not only in the classroom, but as a tool for communication outside of the classroom is paramount. It is important for educators to meet the challenge and incorporate the new trends into their own teaching styles. However, making technical material palatable to those who resist will always be a challenge, but presenting it in the right framework and with the right goals will be the greatest challenge the education system, and the educator, will face as technology transforms the present educational system (Frank, 1992).

Despite the increased use of computers in the home, workplace, educational learning, and mediated instruction, the classroom still has a role to play (Falconer, 1994). The CMIE is not a replacement for the classroom, but an enhancement that allows the classroom, and time spent away from the classroom, to be used in a way that is much more focused on imparting knowledge and uses technology available which directly applies to adult learning theories and Human Computer Interaction research.

References

Abowd, G., Atkeson, C., Feinstein, A., Hmelo, C., Kooper, R., Long, S., Sawhney, N., & Tani, M. (1996) Teaching and Learning as Multimedia Authoring: The Classroom 2000 Project. ACM Multimedia 96. Boston, MA. p. 187-198.

Barnard, P. (1995). The contributions of applied cognitive psychology to the study of human-computer interaction. Human-Computer Interaction: Toward the year 2000, 2nd ed. Morgan Kaufmann Publishers, Inc: San Francisco, California. p. 640-658.

Costanzo, J. (1996, August). Diving into digital. Training & Development. (Vol.50, No. 8, p. 55-56).

Dillman, D., Christenson, J., Salant, P. & Warner, P. (1996, Spring/Summer). What the public wants from higher education. The Center Update. The Center for Adult learning and Educational Credentials. The American Council on Education. p. 1-2, 15

Doyle, J. (1991, January/February). Innovations in training. Credit. (Vol. 17, No. II p. 10-1 4).

Dringus, L.P. (1995, Fall). Interface issues associated with using the Internet as a link to online courses. Journal of Interactive Instruction Development. (Vol.8, No. 2, p. 16-20).

Egan, D.E. (1988). Individual differences in human-computer interaction. Handbook of Human-Computer Interaction. Amsterdam: Elsevier Science Publishers. p. 543-568.

Falconer, T. (1994, March/April). No more pencils, no more books! Canadian Banker. (Vol.101, No. 2, p. 21-25).

Federico, R. & Bowley, J. (1996, January). The great e-mail debate. HR Magazine. (Vol. 41, No. 1, p. 67-72).

Finn, Jr., C.E. & Manno, B.V. (1996, Winter). Behind the Curtain. Wilson Quarterly. p. 44-53.

Fitts, P.M., & Posner, M.I. (1967). Human Performance. Basic Concepts in Psychology Series. Belmont, DA: Wadsworth Publishing Company, Inc. Brooks/Cole Publishing Company.

Frank, H. (1992, September). Teaching technology and business lessons. Networking Management. P. 84, 86.

Haramaty, L. (1997, January). The future and promise of Internet telephony. Telecommunications (Americas Edition). (Vol.31, No.1, p. 47-48).

Hemphill, C.,& Thrift, P. (1995) Surfing the Web by Voice. ACM Multimedia 95. San Francisco, CA. p. 215-222.

Henderson, D.K. (1996, April). Virtual Work. Air Transport World. (Vol. 33, No. 4, p. 69-71).

Herlehy, W. (1992, February). Philosophy of Adult Education. Embry-Riddle Aeronautical University, College of continuing Education.

Herlehy, W. (1996, November 13). Education tailor-made for the times. Fourth Annual Symposium on Teaching Effectiveness. Daytona Beach, FL: Embry-Riddle Aeronautical University. p. 74-84.

Lefton, L. & Valvantine, L. (1986). Mastering Psychology, 2nd ed. Boston: Allyn and Bacon. p. 63-67,166.

Morton, J., Barnard, P.J., Hammond, N.V. & Long, J. (1979). Interacting with the computer: a framework. In E.J. Boutmy and A. Danthine (eds.) Teleinformatics '79. Amsterdam: North-Holland. p. 201-208.

Newell, A., & Rosenbloom, P.S. (1981). Mechanisms of skill acquisition and the law of practice. Cognitive Skills and Their Acquisition. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers. p. 1-55.

Nielsen, J. (1994). Usability Inspection Methods. New York: John Wiley & Sons, Inc. Pp. 341-362.

Parsons, J.J. & Oja, D. (1996). Computer concepts. (2nd Ed.). Cambridge, Mass.: CTI. P. G1-9 & 10.

Schornak, G. (1996, November 13). Accelerated learning techniques for adults - an instructional design concept for the next decade. Fourth Annual Symposium on Teaching Effectiveness. Daytona Beach, FL: Embry-Riddle Aeronautical University. p. 56-73.

Schuler, R. (1995). Managing Human Resources, 2nd ed. Minneapolis, St. Paul: West Publishing Company. p. 516-539.

Stemberger, C. (1995, March/April). Adult teaching strategies. Adult Learning Magazine. p. 12-13, 26.

Tennant, R. (1996). Libraries Share Their Resources-Digitized Holdings on the Net. Syllabus. (Vol. 9, No. 81 p. 37-38).

Terrell, S. (1995). A transitional model for the introduction of technology. Paper presented at the Florida Educational Technology Conference. Orlando, Florida.

Thomas, L. (1996). Making the Abstract Concrete. Syllabus. (Vol. 9. No. 7, p. 10-12).

Tullis, T.S. (1988). Screen Design. In Handbook of Human-Computer Interaction, edited by Helander, M., 377-411. Amsterdam: Elsevier Science Publishers.

Wolf, W., Liang, Y., Kozuch, M., Yu, H., Phillips, M., Weekes, M. & Debruyne, A. (1996). A Digital Video Library on the World Wide Web, ACM Multimedia 96. Boston, MA. p. 433-434.

Zenke, R. & Armstrong, J. (1996, August). Evaluating Multimedia. Training. (Vol. 33, No. 8, p. 48-52).