



Usability Testing for a Computer Skills WBT (Web Based Training) Program

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ABSTRACT

Web Based Training (WBT) courses are being used more and more to reach end users whose computer literacy skills need updating before using a software application or performing job-related tasks. These Internet or intranet computer based training modules can provide just-in-time (JIT) training that is individualized for each user, is highly interactive, and is available any time any place (ATAP.) This paper tracks the implementation of an MSCD Basic Computer Skills WBT from its initial development, through usability testing on typical end users, to its deployment on a college intranet.

The usability testing phase for the MSCD Basic Computer Skills WBT was two-phased. A multimedia usability survey was given first to a group of "bridge" students—eighteen year-old high school graduates in a transition program before college. When its feedback did not yield enough information to guide in the final implementation of the WBT, the following semester an effectiveness survey was administered to forty-one of the regular CMS 1010 Introduction to Computers students. The results described are guiding the final installation of the WBT on the college network.

Keywords

WBT, multimedia, JIT, ATAP, computer literacy, RAD

1. INTRODUCTION

WBT (Web Based Training) courses are rapidly becoming a preferred method of providing end users with the necessary skills to use a network confidently for job related tasks. Academic settings are no exception. A web based training course can provide new students with a convenient ATAP (any time, any place) method of acquiring the computer skills necessary to complete a bachelor's degree. Students need to become familiar

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with the individual characteristics of the school network—including the Internet server hardware and software, the computer lab situation, the way to use email and upload and download files to their accounts, and basic survival skills in file management, word processing and spreadsheet applications. These basic minimal computer literacy skills are necessary for the students to complete their courses successfully and obtain a degree from the institution. Often new students do not need a formal course in computer literacy, such as an Introduction to Computers course. Today, many students arriving at college are more computer literate than students were even five years ago. However, there are also greater variations of computer skills than ever before. Some students are highly skilled with computers upon coming to college. Some are woefully lacking in the use of technology to ease their path toward a degree. There is a need for a type of self-paced instruction that students can tailor to their needs and learn the required skills in an any time, any place setting.

The MSCD Basic Computer Skills WBT was developed by three CIS instructors—Drs. Marold, Larsen, and Shaw—on a technology grant from Metropolitan State College of Denver. Along with the assistance of a cadre of hired student workers in the school CAT (computer assistance technology) lab who assisted with graphic design and produced HTML Web pages, they developed an in-house WBT to provide such training for students. They spent two years, from start to finish, developing the eight-module WBT. Before it was deployed on the campus network for all of the Metropolitan State College students and faculty to use, a two-phased usability study was conducted.

2. BACKGROUND OF MSCD COMPUTER LITERACY TRAINING

During the spring semester of 1993, Dr. Ken Shaw received a professional development grant in response to a joint proposal from the CIS and CSI departments—the two school departments that teach a cross-listed Introduction to Computers course. As a result of this grant, a new course was developed for the School of Business (Mawhinney and Shaw, 1993.) The process involved:

- An extensive reference literature search
- Completing a chairperson survey instrument
- Individually interviewing each chairperson of three schools at the college to determine the computer literacy needs for student in their departments.
- Analyzing the collected data

- Modifying the existing Introduction to Computers course.

As a result of this study, the two departments teaching the Introduction to Computers course agreed that a general studies course in which every MSCD student would be required to take or test out of would be advantageous. When it became impossible to implement this planned required course into the general studies curriculum, a new course, The Internet and Beyond, was offered by both departments in conjunction with the established Introduction to Computers course. Along with the Introduction to Computers course, this new course has proven to be a very popular elective. The opportunity to provide the contents of these two computer literacy courses to all MSCD students would not surface for three more years.

3. THE SECOND ATTEMPT: A WBT FOR ALL MSCD STUDENTS

In 1996 in an attempt to hasten the use of technology in teaching, the administration issued an RFP for Mini-Technology Grants. Drs. Marold, Larsen and Shaw received \$22,000 to complete their proposed computer literacy WBT project. The proposed two year development timetable was slashed to one semester. The trio adjusted the initial proposal to accommodate the time schedule, and agreed that implementation could be delayed until the project could be completed. The project production stages with corresponding roles are included in Table 1.

Project Manager: Gwynne Larsen	Coordinate efforts of entire team; keep documentation. Assign time schedules, allocate budget. File completion reports.
Executive Producer and Instructional Designer: Kathryn Marold	Divide content of a computer literacy and an Internet communications course, plus specifics of MSCD network into eight modules. Navigation plans and storyboards. Coordinate the physical contents of all material, and responses of beta testers.
Content managers and editor: Gwynne Larsen and Ken Shaw	Author components of each module. Provide necessary screen captures. Provide tutorials. Author accompanying hardcopy communications and MSCD network manual for student purchase.
Usability Testing: Paul Robertus, MBA, the adjunct professor teaching Bridge and CMS 1010 Classes	Gather responses to pilot surveys. Direct overt observation of end users, and author formative anecdotal information. Author an effectiveness instrument to administer to CMS 1010 students in Fall, 1998. Do statistical analysis.

Table 1: MSCD WBT Team members and Their Roles

Faculty: Marold, Larsen, Shaw	Subject Matter Experts who determined all content to be converted to multimedia Web deployed network program. Editors for each module as it was finished. Executive producers who approved each component.
Faculty: Gwynne Larsen	Conduct a front-end needs analysis. Study surveys administered to 2 beginning computer classes. Survey key faculty users in each school at MSCD, as to what should be added or deleted from the WBT.
Hired Assistants: Bonnie Bunce, Marilyn Lambert, April Hoffman, seven student beta testers.	Interface design, HTML coding of content, storyboarding and layouts, multimedia and Web consultants.
Hired CAT Lab Students Dream Team under Director Steve Ernst	Graphic design, interface design animation, programmers, network implementation, authoring software, platform delivery choice, disk storage of modules, maintenance.

The Mini Technology grant that the CIS faculty received was timely. It provided release time and the professional development opportunity at exactly the time that the Web was maturing. Multimedia instruction delivered on the Internet became a reality during the development cycle. (The production lengthened into a two-year process, as was first estimated in the proposal.) Online learning had become one of the most popular applications of the World Wide Web (Reinig, 1998.)

4. REVIEW OF WBTS AND ONLINE LEARNING

The changes in the content and delivery of the computer literacy course at Metropolitan State College are by no means unique. Content changes as technology changes; we all recognize the information systems field in general as one of the most volatile. In addition, the delivery of courses in every educational setting—academic or corporate—has moved from the "master scholar, chalk and talk" model to a more participatory, interactive environment. Educational arenas all over the world are experiencing similar changes in content and delivery of their courses.

Web-based training—instruction delivered via a web browser through the Internet or an intranet—is one way to deliver the content. It can be cheaper, more efficient, and sometimes more effective than classroom training (Infoworld, 1998). WBTS evolved directly from CBTs (computer based training that was not Internet delivered, but was still delivered via the computer.)

CBTs in turn evolved from the older text-based CAI (computer assisted instruction) linear programs that were popular in the 1970s and 1980s (Marold, 1998.) By the time online classes were introduced, teachers had realized that students have different learning styles and they create their own meaning when learning new things. What students do themselves in the learning process makes more of a difference in content retention and transfer than what the teachers do (Berge and Collins, 1995.) There is even solid evidence that the concept of a "course" is outmoded in today's WBT environment (Shank, 1998.) Roger Shank of the Learning Sciences Institute at Northwestern University says:

Horses run courses set up at pre-established standardized distances at various racetracks. Students are not horses....Web courses must differ from what is currently offered on campus (p. 23.)

The WBT frees us from the semester or quarter-long modular division of content; the content does not have to be delivered in a ten or fifteen week time span. We can deliver a JIT (Just In Time) course that can be taken ATAP (any time, any place) that better serves today's student. The older method of packaging and delivering material was tied to a text-based, institution-bound environment. Educators everywhere are looking at and developing new approaches. We realize that we need to deliver instructional content when and where it is needed—at home, at work, or in the school. WBTs are a way of doing that.

Developing WBTs demands a new system of development, and a new look at instructional design of content. One approach that has been getting increased attention recently is the use of Rapid Application Development (RAD) model. This approach calls for the application of all of the tools and techniques of information engineering, but applied within the scope of a single application system prototype walkthrough (Hobbs, 1992). It is a platform-independent software development approach that can potentially reduce the time required to deliver high quality software (Chasan, 1997). The RAD development lifecycle is designed to give much faster development and higher quality results than the traditional lifecycle. It is designed to take maximum advantage of powerful development software that has evolved recently (Martin, 1991.) If using the RAD systems development for Internet courses, the developers use GUI programming tools such as the Web authoring packages (*Java* or HTML editors or visual programming languages such as Visual Basic or Lingo (*Authorware* or *Director*) or Open Script (*Toolbook* or *IconAuthor*.)

Fast development does not mean "quick and dirty." It is necessary to build applications of high quality. Indeed, much higher quality is needed for WBTs than is found in many of the applications built with traditional methodologies. One of the integral elements of the RAD methodology is usability testing. To ensure that systems are easy to use, usability testing should be done with end users. Usability testing should be done at the prototyping stages, when teams test subsystems, and when the final system is tested. It is built into the development life cycles. Real end users should evaluate the system (Martin, 1991.) Although usability testing is similar to what has commonly become known as beta testing, it differs in that it has formative

and summative periods. It also frequently uses both covert and overt observation and other qualitative research methods. The usability testing with a RAD system usually combines traditional qualitative and quantitative data analysis, so that anecdotal information and direct observation notes can measure the user's perception of program quality (Patton, 1990.) The instruments used to evaluate the MSCD Basic Computer Skills WBT were developed to determine the end users' perception of the program's worth before it was available across the campus. RAD experts agree that before a new product is created or an old one improved, it is essential to perform a usability evaluation. Then at the pilot phase, and the full implementation stage, usability analyses should be performed. This assures that developers don't find out the product doesn't work the hard way! (Interface Analysis Associates, 1998.)

There is a growing body of research that has established that online learning can be both effective and efficient. We are moving from the stage of justifying WBTs to concentrating on authoring them better (Hall, 1997.) Findings by researchers of online courses consistently bear out that there is little or no significant difference in achievement and performance of students who take online courses as opposed to those who take courses in the classroom setting (Mawhinney, 1998.) With these findings in mind, the team concentrated on building a better computer literacy skills WBT for all students in the three schools at Metropolitan State College of Denver.

5. PLANNING, BUILDING, TESTING

The process of designing and building a WBT for all students at the college was an ambitious one. The original plan included offering the WBT as a mini-course that would be required of all students who did not take the Introduction to Computers course, or could not successfully test out of a computer literacy requirement. Curriculum changes at academic institutions are notoriously slow. Therefore, this part of the proposal is still pending. The actual production of the MSCD Computer Skills multimedia Web based training program began even before the Spring '97 semester started, and included modules on beginning Internet use, local server use, basic computer skills, beginning computer concepts, Windows 95, word processing, spreadsheets, communications, and online research using the Internet. The faculty part of the project was completed in one semester, but the programmers who needed to encode the content of the storyboards into a multimedia format were newly hired student interns without training. The interns were assigned to complete many competing projects for faculty, so the WBT project moved ahead very slowly. Several lead student programmer interns graduated, or left for better paying part-time work. New students interns had to be hired and trained to take their place. The production slowed considerably. By the Summer semester of 1998, the WBT was complete enough that a small group could test it before the final edits were done, and it was deployed on the school-wide network. The formative pilot usability study was conducted with a group of "bridge" students. These are students who graduate in the Spring and need a transition period before entering college in the Fall. There is an eight-week Introduction to Computers Bridge course held in a small-group computer lab

setting. This group was well suited to be subjects in the usability-testing phase.

5.1 Details and Results of the Two-Phased Usability Test

The first usability survey used for the Bridge Classes achieved limited statistical impact with only 11 surveys completed. Only students who had exceeded mid-course progression completed the surveys. This assured that their use of a lab session to review the module under limited supervision did not hinder their required course workload. The instrument was a simple set of questions asking subjects to approve or disapprove of layout, graphics, amount of interactivity, manner in which information was grouped on the screen, and other instructional design issues, without focusing on individual modules. Then there was a comment area for anecdotal information for each item.

5.1.1 The First Usability Survey Results

The quantitative results were 81 % affirming, 7% not confirming, 10% not knowing, and 1 % responding as unimportant regarding a particular characteristic. While this data generally favored the presentation of the WBT, it did not provide a sense of direction for specific improvements. Qualitative data was gathered with three questions: 1) what did you like, 2) what did you dislike, and 3) what would you change? Some of the specific answers were:

- Needs more color to stand out
- Needs more background color
- Explanations need to have less computer lingo
- Use keystrokes instead of the mouse to navigate
- Some colors are not very attractive
- The program is in small understandable chunks
- Straight-forward facts
- Modules were in a nice order, basic to complicated

These are representative responses; more were provided to the development team for consideration. The findings from this first survey caused the team to re-examine the general interface of the WBT, but they needed data more specific to the content of each of the eight modules.

5.1.2 The Second Effectiveness Survey Results

A second instrument was used in the CMS 1010 Introduction to Computers course the following semester. (See Figure 2.0 appended.) Forty-one

random subjects answered questions after using the eight modules at least once. Demographic data was gathered on age, gender, previous computer experience, full or part-time student status, number of class hours enrolled in, and if the subject had ever taken an online course. Table 2.0 shows the demographic distribution of subjects.

Variable Number of Subjects (n=41)

Age 18-21	26
Age 22-25	12
Male	14
Female	27
No Computer Experience	7
IBM computer experience	6
IBM & Apple experience	2
Underclassman	33
Upperclassman	8

Table 2.0 Demographic data from Effectiveness Survey

When the computer skills WBT was designed, it had been targeted for the student under twenty-five years of age who had little experience, since that is the student population of the current introductory computer literacy course. Fortunately, the subjects fit that profile almost exactly. Sixty-three per cent were 21 or under. Almost all were 25 or under (93%.) There were practically the same number who had some experience on IBM/compatible computers as those who had no experience. There were two who had some experience on both types of computers, but when the subjects rated themselves (from beginner-1 to expert-5) on their level of computer literacy, only two rated themselves as proficient. The subjects of the effectiveness survey were ideal for its purpose.

The data analysis showed that all eight modules were well-received by both upper and lower classmen. The least popular modules were on the UNIX operating system and the one on word processing. The latter was probably redundant for most students, whereas many general business students view the more complex UNIX operating system used on the Metro network system as a "necessary evil." Beginning students do not have insight into the significance of UNIX for Internet activities and file management with their student accounts. Figure 1.0 below shows the rating of each WBT module, broken down by grade level. The scale was from 1 (superior) to 5 (below average.) The module on Windows '95 received the highest rating. It is interesting that the module rated the highest was also an operating system WBT. In this case, however, students probably perceived this content as very useful. Windows '95 was relatively new, so they knew little about it, and they judged that these skills would be extremely useful, whereas the UNIX skills would not be as useful. It is also interesting to note how close the effectiveness

ratings were for all grade levels. They all clustered around the 2 (Good) rating, with sophomores rating the modules highest overall.

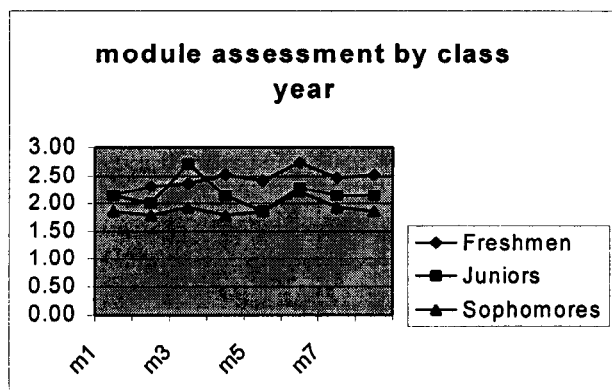


Figure 1.0 WBT Module Assessment

6. CONCLUSIONS

This initial attempt to create a WBT authored by professors using a new methodology and new technology was a learning experience for the faculty, for the student interns in the instructional lab, and for the instructor using it to teach a class for the first time in introductory computers. The WBT is still not universally available to all students on the Intranet. Very little was found from the first usability test except that the WBT was generally well received. The results of the effectiveness survey with the forty-one CMS 1010 students revealed more: it showed that learning basic computer concepts from this particular WBT was perceived as effective and enjoyable. This does not mean we can conclude that they learned any better or any faster than with any other another method. That is not the purpose of a usability test. If one measures effectiveness by how well a student learns basic computer skills from a WBT, as opposed to students taking in-classroom instruction, a comparison of those groups before and after their instruction should be done. When and if the entire project plan is implemented, a study can be done to compare performance and achievement of students who used the WBT with students in a traditional classroom setting who did not use the WBT. In addition, it is generally agreed that self-assessment and self-reporting have flaws. To determine whether a subject's self-assessment of his/her computer literacy level is accurate, a standardized computer literacy score would have to be related to his/her self-rating.

One of the findings that the team did not anticipate was that the subjects believed that the WBT should be introduced within the classroom CMS 1010 course, and that it should be introduced at the beginning of the course—in the first to the fifth week. The WBT can be used for the classroom Introduction to Computers course, as well as a stand-alone WBT that is independent of any

formal class. The two-phased usability study did show that the MSCD Computer Skills WBT was usable, and it is an effective alternative to traditional classroom instruction.

With the lessons learned from the two instruments, and the edits the findings dictated, the MSCD Computer Skills WBT will be officially offered to the entire campus in the Fall of 1999.

Last Name: _____	First: _____	Age: _____
Gender: M__F__ Student Status: Part Time__Full Time__		
Freshman__ Sophomore__ Junior__ Senior__ Other__		
Previous Computer Experience:		
None__ Apple__ IBM/compatible__ Other__ Both__		
Have you ever taken an online course before? Y__ N__		
If so, list the course name: _____		
How many hours are you taking this semester? ____		
Rate your level of computer literacy:		
Beginner__ Novice__ Competent__ Proficient__ Expert__		
How many years have you been using a computer?		
<1__ 1-2 years__ 2-3 years__ 4-5 years__ more than 6 years__		
A. Rating the modules		
Please rate the effectiveness of the 8 modules on scale from 1-5		
1=superior 2=good 3=above avg 4=average 5=below avg		
1. Understanding Computer Hardware/software		
2. Navigating in Windows '95		
3. Using Word Processing Concepts		
4. Network ID and Password		
5. Understanding Computer Communications		
6. Using UNIX systems		
7. Doing Online Internet Research		
8. Using Spreadsheets and Charts		
B. In your opinion should these modules be included in the CMS 1010 course?		
Yes, definitely. ____		
Yes, with some changes and modifications. ____		
Undecided. ____		
No, find another means to deliver content. ____		
No, this would not be a good learning method. ____		
C. If above was yes or yes with changes, in your opinion, when should these modules be included?		
In the 1-5 week of the semester. ____		
In the 6-11 week of semester. ____		
In the 12-16 week of semester. ____		
Should use modules continuously throughout the course. ____		
Should not be required for course, but only supplemental. ____		

Fig. 2 Appendix : The Effectiveness Survey for MSCD Computer Skills Web Based Training

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