Usability Study: The Internet Educator

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This report describes a usability test of the Internet Educator, a web-based, educational software designed for elementary-level students. This study was performed by a team of students outside of and unconnected to the designers of the software, and was designed to elicit data related to several goals developed by both the designers and this usability team. The data collected revealed both strengths and weaknesses in the software with regards to these goals.

Introduction

The goal of any usability project is to determine how a technology (in this case the Internet Educator) works with its intended users: to match the aspirations of interface designers, for example, with the goals of the users. Usability can be defined as the "optimum match between users' work intentions, concepts, and work flow, and the work expectations that designers build into the system."[1] In other words, a product that is merely functional is of little use to a person if it is not usable.

http://spunky.resnet.mtu.edu/weli

The two sets of goals we developed for this usability test: one from the MIS designers and another from our own educational goals as students in a usability class. The designers wanted to ensure that the Internet Educator would be beneficial to its users by:

- Developing their typing skills
- Enhancing their Internet researching skills by teaching them about Internet structure and navigation
- Being a viable learning tool
- Being fun to use

Based upon these goals we determined that the best approach to evaluating whether the students benefit from the software would be to look at the educational theories of how children learn. We wanted to establish the processes students use to solve problems, their current knowledge of the Internet and computers, and their attitudes toward learning when using new technologies. Based on all of these factors, we developed the following questions to guide our research:

- Do the students have fun using the software?
- How does the software support the goals of the SIFE team?
- Where do the designers' goals and the users' expectations diverge?
- What problems in the software hinder learning?
- What potential does the Internet Educator have?

[1] Holtzblatt, Karen and Sandra Jones. "Contextual Inquiry: A Participatory Technique for System Design." Schuler, D. & Namioka, A. (Eds.). Participatory Design: Principles and Practices. Hillsdale, NJ: Lawrence Erlbaum Associates, 1993.

Motivation

Our Motivation

We are conducting this study as outside consultants for the SIFE team, without any tangible benefits. We will not receive any prizes or monetary rewards, since we are not members of the SIFE team. We do, however, have several reasons of our own for participating in this project:

- Help develop a product that goes outside the standards of teaching.
- Increase our knowledge and experience with usability practices.
- Educate others to the benefits of usability and how it can be used to create better technology. We hope that by educating designers on these benefits, they will think about usability in future projects.

Teacher Motivation

Since there are two primary groups of users for the Internet Educator – the teachers and the students – there are two different sets of motivations for each group to use the software. The instructors who use the Internet Educator benefit because it gives them a way to easily keep track of student quiz answers and scores. The Internet Educator gives teachers a controlled environment in which to use the Internet as an educational tool. It provides a controlled way to employ the vast amount of knowledge on the World Wide Web in their classrooms. Additionally, teachers also have more control over which web sites the students visit, helping to prevent their access to inappropriate content.

Another motivation for the teachers to use the Internet Educator is to break the preconception that many children have about computers and the Internet: that these technologies are for recreational use only. While computers do provide many recreational opportunities, they also open up a vast number of educational resources. The Internet Educator would help the students realize this.

Student Motivation

The student's motivations are a bit less defined. Ideally students would see the Internet Educator as an opportunity to enhance their education, but it is more likely that they will have less glorified motivations. Students want to get good grades—that's the basic motivation in the American education system. And if using the Internet Educator will help achieve good grades, then that is the student's primary motivation. However, to achieve these goals, they must be able to answer the test question correctly, which means they must be able to find the answers on the web. For our needs, this is the most important motivation. Does the Internet Educator use the student's time efficiently? Does it help or hinder their search for knowledge? We considered questions such as these in our testing.

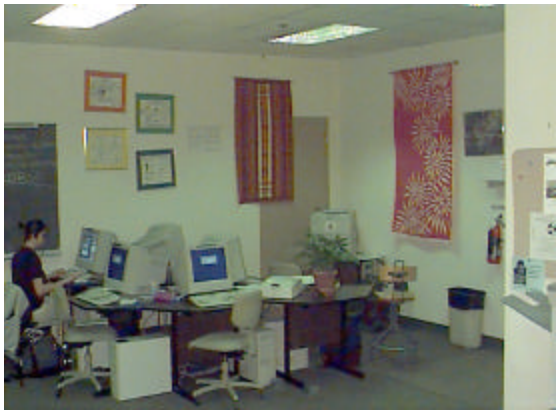
Environment and Context of Use

The environment in which the Internet Educator is used directly impacts how the users interact with the technology. When performing a usability test, there are actually two environments to be considered: the testing environment, and the context in which the software is intended to be used (we will call this the real environment). In a perfect world the two would be the same, but while it may be possible to recreate the physical environment, it is extremely difficult–perhaps impossible–to duplicate all of the other elements that come together to create the complete context surrounding the real environment.

Since the Internet Educator is a web site, the testing environment, like the real environment, needed to include computers for the test participants to use. The two obvious choices for location, then, the elementary school's computer lab, or our computer lab, the Center for Computer-Assisted Language Instruction (CCLI) here at Michigan Technological University. While the students may have found their school's lab to be more familiar, we decided on the CCLI because it allowed us control over the environment. This was very important because we worked with young children who would require supervision. In addition, we needed prior access to the lab for setup and preparation, something we may not have had with an elementary school's lab.

The Testing Environment

A description of the CCLI is certainly required here to understand our methodology and steps behind the way we designed our activities and controlled our testing environment.



The CCLI is probably one of the livelier computer labs on campus. There are two main rooms that are connected diagonally by an open passage. We used the computers in one room when actually testing the software, and a conference table in the other room for all other activities. The computers are arranged primarily in pods, or clusters, of four to five computers (the pod we used had five). The walls are of an off-white color and are decorated with an eclectic variety of dressings such as pictures, paintings, banners, posters, comic strips, kites, quotations, flags, and other miscellaneous crafts. There are also plants, stuffed animals, toys, and other miscellaneous knick-knacks spread throughout the room. All of these decorations lend a very informal, unimposing, and fun feel to the lab. As for the computers themselves, they have 17" monitors

set to an 800 by 600 pixel screen resolution. They run the Microsoft Windows 98 operating system, and the default web browser is Netscape 4.73.

While the flamboyant décor of the CCLI is not typical of the average elementary school computer lab, the rest of the physical environment is not drastically different. There is not a standard layout for computer labs, although more often than not the computers are arranged in rows rather than pods.

Contextual Considerations

An important contextual factor was the supervision of the students. In our testing environment, we (the usability team) represented the instructors. In the real environment, the instructor(s) would likely be a teacher the students worked with on a daily basis. Most of the children who participated in our test had never met us. This difference in supervision certainly impacted the manner in which the children behaved and responded to our questions, because the students are not familiar with how we would respond to their words and actions.

During the testing the participants are also not under the pressure of a real test as they would be in a real environment. They knew that their answers to the questions posed by the Internet Educator are not being graded or evaluated–at least not with consequences to them. As you will see in our results, this tended to interfere with their concentration and dedication to the tasks at hand.

Methodology

Since the SIFE team did its own testing for functionality, we decided to work qualitatively. We focused primarily on the educational theories and processes at work as we observed the students using the software and completing the tasks we had set out for them to accomplish during our three hours of testing. We also employed the use of pre / post test surveys to help establish the context in which the students normally work with this technology.

The software was originally designed for use by fourth graders, but we used a mixed age group because we are interested in how differences in skill level and age influenced interaction with the software. The participants, therefore, are all in the 2nd to 5th grade range.

Before test day, we chose several grade-school-friendly Internet sites for the students to use with the Internet Educator. Essentially, we acted as representative teachers, having to enter the web site URLs and questions into the software. The questions varied in depth from quiz to quiz, as did vocabulary and technical difficulty.

The first quiz asked questions with answers all on the front page of the web site, so that the students didn't have to use hypertext links. The answers to the second quiz are located within the web site, but on different levels of the page, requiring the students to demonstrate their navigation knowledge and skills. The third web site was once again only one page. Our goal with this quiz was to determine if the Internet Educator encouraged the students to learn from what they are being tested on. The page was a set of instructions for building and launching paper rockets, and after taking the test the students applied what they just learned by actually building and launching the rockets.

Test Day

The testing session was broken up in the following manner:

1. Introduction
2. Preliminary Survey
3. Coloring Exercise
    a. Draw a Picture of the Internet

b. Draw What You Like About the Internet?

c. If You Could Make a Web Site for Your Favorite Class, What Would It Look Like?

4. Internet Educator Quizzes
    a. Making a Violin
    b. Chow Club Kids Stuff (Nutrition site)
    c. The Space Place (space, astronomy & science)
5. Exit Survey

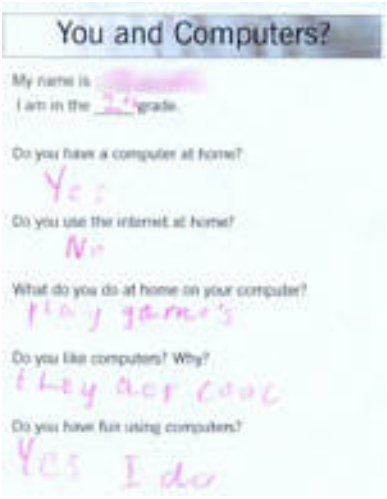
One of our first objectives was to determine whether the software was suitable to the knowledge level of the target users. We needed to determine if there are barriers to be overcome by the students before the software would be usable, and if the designers' goals are suitable for these students. To do this, we used a series of preliminary surveys.

Pre-test Surveys

We decided that surveys would be the easiest and most fun way to obtain this information. Through these surveys, we hoped to determine the students' exposure to computers and the Internet, and where and why they use these technologies.

As the students arrived, we introduced ourselves, and then gave them an entrance survey. This entrance survey was a simple set of general questions aimed at understanding how the students felt about technology, the Internet, and computers. This survey helped us establish each student's experience with these technologies.

We also wanted to understand how the students viewed technology, computers and the Internet outside their school environment. We had them answer three questions about how they picture the Internet by drawing their answers with crayons. Not only would this be fun for them, but it encouraged them to give more imaginative, and therefore more interesting, answers to the questions.



Internet Educator Quizzes

Once they finished the three coloring exercises, we moved on to the three online quizzes we had already prepared.

For the first quiz, we broke the students up into two groups of two, with the eldest student working alone. This made it easier for them to get familiar with the software, and it mirrored the classroom environment, as students are often asked to work in groups.

We set them in front of the computers and gave them basic instructions to see if they could navigate their way through the software and to the sample Internet sites and quizzes.

They answered questions for two sample sites, and then took a snack break. We then had them complete the final quiz (on how to build paper rockets).

Once each individual student had finished their quiz, we printed the instructions of

"How to Build a Bubble Powered Rocket" and went about actually building the rockets. When everyone finished their rocket, we went into the hall and launched them.

Post-test Survey

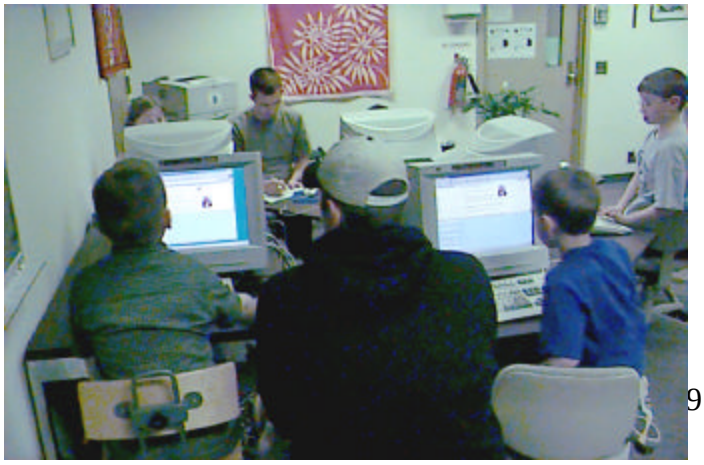
We finished with an exit survey to find out what the students are taking away from the experience. Specifically, we asked the following questions:

- What did you learn today?
- What was the most fun?
- Would you like your class to do projects like this at school?
- Would you use this web page at home to do fun projects?
- Did you have fun today?

Results

Typing

Goal: Develop student's typing skills



Outcome: The Internet Educator furthered the typing skills of student's whose classes had included a typing class. For those

without, the Internet Educator promoted the use of bad typing skills.

One of the goals for the Internet Educator prototype was to develop the students' typing skills. Unfortunately, this usability test was not a long-term test and we will not be able to concretely establish if the students' typing skills are improved.

The testing established which students had experience with typing, or some form of training in typing technique. The younger students all used one finger when typing and used the hunt-and-peck method to establish where the keys are located. One of the younger students in particular searched methodically through the keys starting at the upper left and moving across the keys until he reached the lower right. Once this student began to learn the placement of the keys he was able to remember the location later on. The two older students both used two hands to type up their answers and proceeded through them without difficulty typing. This memorization process accelerated their typing speed and they proceeded through the later segments of the third quiz more quickly.

This process was beneficial for the younger students who haven't had a typing class because through typing the students are able to remember and learn key locations. The Internet Educator benefits the students by placing them in a new learning environment where they can create new associations towards memorization and typing skills and do so at their own pace. The disadvantage to memorization is that it can be frustrating for the students and is a passive learning process, which is more of a task than a learning activity.

Enhancing Internet Research Skills

Goal: Enhance Internet research skills

Outcome: The Internet Educator exposes students to the internet genre, and they learned some of the basic levels of information on the internet.

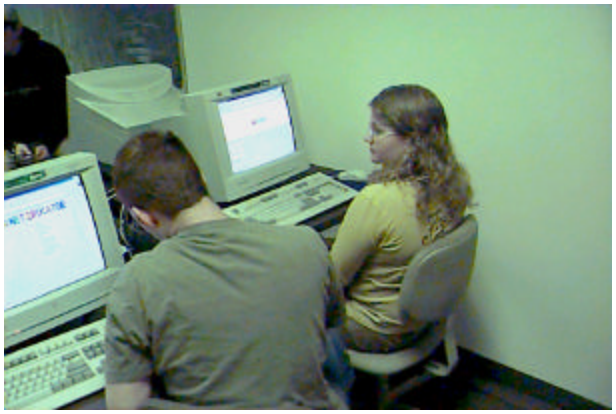
The wealth of information on the Internet provides a good resource to enhance the students' research skills. The Internet Educator tries to teach students about researching web pages and documents by quizzing them on subjects, requiring them to search the text for the answers. Researching requires proficiency in tasks such as reading, browsing, searching and the good decision-making skills required to access the value of the information. These are skills that the students have already learned from their associations to text. The Internet Educator helps students expand these skills by encouraging them to search for answers within multiple layers of information in a potentially unlimited encyclopedia. These skills varied from student to student, from the fifth grader getting 100% of the quiz correct to the second graders having difficulty dissecting the text and

finding the answers. All of the students are observed applying these skills during the first exercise when they are asked to answer questions about how a violin is made. The questions varied in difficulty, some with answers in highly visible places and others being buried within large paragraphs. The older students used all of the researching skills required to answer the quiz questions, while the younger students showed the greatest proficiency when using visual techniques to answer questions.

Internet structure and navigation

Goal: To teach students about Internet Structure and Navigation.
Outcome: The Internet Educator teaches students about basic structure, but hinders student's learning of navigation and URLs.

The SIFE team designed the Internet Educator to teach the abstract concepts of Internet structure and navigation to the students. Using the forward button, the back button and links to move between different layers of information, students can search for specific information on a web site. Knowledge of layers allows them to search for information in a methodical manner and uses learning skills that they are already familiar with such as using books. This is a skill that the older students had no difficulty with, but the younger students seemed to learn quickly. By working cooperatively, the younger student learned these navigation skills from the older student when taking the second quiz. These skills stayed with the younger student and he was able to navigate through the layers of information on the third quiz without assistance.



When one of the groups clicked on the "Intranet" link on the main page and are taken to a separate web page in a separate browser window. The students attempted to use the back button to return to the main page, but did not understand and became frustrated when they are unable to do this. Because the site avoids discussing URLs (by using icons and links), the student did not realize that he was in a new window, and, hence, was unable to return to the Internet Educator without assistance. While the navigational relationships of pages within the Internet Educator site is clear, the program never discusses URLs or the relevance of links and locations outside the constraints of the Internet Educator site; students are done a disservice by this omission.

Recommendations

- Improve the effectiveness of the instructions and to move students through the site more efficiently, the text should be shorter and more relevant and have a stronger presence on screen.

- Discuss URLs explicitly to ensure that students can return to the program if they become lost within a new browser window.

- Layout of elements on the screen should create a definite visual path that guides the user through the initial program pages

- Consider using split-screen layouts throughout the program

- Include materials or tutorials to address web site credibility issues

- Continue regular Usability Testing during iterative design process

- Consider inviting the continued participation of HU classes and STC majors, in order to assure professional usability expertise at every phase of the project.

Conclusion

To be successful on the market and in the classroom, the Internet Educator must serve the educational benefit of the students in ways not found in current technologies. While the Internet Educator has good beginnings, there are a few areas, which need to be redesigned and reworked to be successful and helpful to students and teachers.