Testing the OLPC (One Laptop per child) XO-1 Interface with Children: A Usability Case Study

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Abstract: Usability testing is a keystone activity for user-centered design. Although user centered design has been studied and practiced in the literature on adult computer products, the works on addressing the need to include the user in the design of children’s computer products is still limited. Recently, low cost mobile platforms have been developed for basic education and released into the market. OLPC (One Laptop Per Child) XO laptop is an example of these platforms which was designed as a tool to educate underprivileged children worldwide, with the goal of providing “one laptop per child”. The purpose of this study is to conduct a usability test on OLPC XO’s interface in order to find out the problems on the current interface and understand the effectiveness of icons and navigation.

Keywords: Usability testing, children

1. Introduction

Usability testing is a keystone activity for user-centered design. Although user-centered design has been studied and practiced in the literature on adult computer products, the works on addressing the need to include the user in the design of children’s computer products is still limited. Comprehensive usability testing with children is the essential component to create educational products that are child-friendly and child-approved [1]. “Involving children in the design process and in usability testing is the key success and certainly guarantees the development of more adequate interfaces” [2]. This paper presents the results of the usability test that was conducted with children on OLPC XO-1 interface.

Recently, low cost mobile platforms are developed for basic education and released into the market. OLPC (One Laptop Per Child) XO laptop is an example of these platforms which was designed as a tool to educate underprivileged
children worldwide, with the goal of providing “one laptop per child”. OLPC XO is developed by The One Laptop Per Child Association, Inc. (OLPC) which is an U.S. non-profit organization set up to oversee the creation of a cheap, affordable educational device for use in the developing world. XO-1 was developed to provide education to the underprivileged children by “making them more active in their own learning, through collaborative and creative activities, connected to the Internet, with their own laptop, as a human right and cost free to them” (OLPC Mission). Child ownership, low ages, saturation, connection and free and open software are stated as five core principles of OLPC.

Sugar graphical user interface was developed for the OLPC XO-1 and used as an interface on the laptop with the goal of providing social experiences to students with collaboration and sharing capabilities. It differs from traditional desktop metaphor with its focus on child-centric activities, social interaction through shared activities, journaling metaphor that is the chronological organization and record of child’s interactions with the laptop and also with peers. Additionally zoom metaphor is used to relate four district views of the interface: home, groups, neighborhood and activity. Icons play an important role on the interface representing the related activities and actions on the laptop.

The following questions were answered in this study:

- How do users from different cultural and social backgrounds perceive the interface navigation and the representations of the icons?
- How can user experience be enhanced through universal design?
- What are the characteristics of children that impact the outcome of usability tests?

2. Usability Methodology

This usability study included two concurrent phases: Surveys analysis and on-site usability tests. Surveys were designed and implemented both in United States and in two other countries (Korea and Brazil) to understand how children from different cultures and countries perceive the icon representations. On-site usability tests were conducted to examine the laptop interface deeply and gather children’s perceptions through extensive observation and interviewing.

2.1 Survey Procedures

Two surveys were designed specifically to test the icons on the interface with children: Guess What and Pick One. In the “Guess What” survey, children were asked to guess what the icons (images to represent the activities on the laptop interface) represented to them. Additionally several icons were designed by the researchers as an alternative to the current icons used on the interface. In the “Pick One” survey, children were provided these icons along with original XO-1 activity
icons and were asked to choose the icon which best represented the related computer activity. These two surveys were translated to Korean and Portuguese and they were e-mailed to the teachers in those countries. The teachers were asked to implement the “Guess What” survey first not to influence children’s responses on the second survey. Additionally children who participated on-site usability tests were asked to complete the surveys right before the usability test sessions.

2.2 Usability Procedures

On-site usability tests were conducted with five children who live in the United States to determine the problems on the current XO-1 interface and to gather their reactions about the laptop. The following usability procedures were followed before, during and after each test:

1. On the selected day, parents were given a hard copy of the Parental Consent Form and children were given a hard copy of the Assent form for Minors to review prior to the test. After gathering the signatures, a predefined script was read to the participants to ease the introduction section and also reduce the bias of introducing the test differently to participants.

2. Pre-interview questions were asked based on the study’s goals such as age, education, and familiarity with computers and interest.

3. Participants were administrated “Guess What” and “Pick One” surveys before the usability tests.

4. Participants were informed that the video recorder was going to be turned on. They were assured that their faces were not going to be taped.

5. Task list was provided and the participants were given 30 minutes to complete the tasks.

6. Post-interview questions were asked to gather participants’ views on the laptop interface.

Usability tests were conducted in the usability laboratory at the university that was specifically setup for the usability tests. The room was quiet and only the children, tester and observer stayed in the room during the usability sessions. Each test was conducted with a child individually. The usability laboratory consisted of computers around the perimeter of the test room with a table in the middle. Two cameras were placed in the room to capture the laptop screen and child’s hand movements. Children’s faces were not recorded. The child sat at the table and the XO Laptop was set up in front of him/her. Back camera was zoomed to the laptop screen and side camera was zoomed to children’s hand and laptop keyboard. Tester used the testing protocol, sitting right next to the children while the observer-note-taker kept an eye on the running film and/or sat to the left of the user.
During the usability tests on the original laptop interface and on the prototype, children were given the tasks to perform. The tasks were all short sentence tasks and varied in complexity:

- Task 0: Turn the computer on
- Task 1: Check the weather on the Internet
- Task 2: Take your picture using the laptop camera
- Task 3: Type: “I am using the OLPC laptop” in the Write activity. Name the file and save it. Close Write and reopen your saved file
- Task 4: Draw an apple in the Paint activity. Name the file and save it. Close Draw and reopen your saved file
- Task 5: Exit all the activities and shut down the computer

3. Data Analysis

The data gathered from surveys, interviews, observations and usability testing were analyzed using qualitative and quantitative methods of analysis. Qualitative analysis procedures were used to analyze the interviews and observations notes using preference measures such as usefulness of the interface, ease of use overall, ease of accessibility and satisfaction with the interface. Trends and discrepancies were studied through a careful analysis of the data, and emergent themes (organized by topics) were being established. Quantitative analysis were used to analyze survey responses and performance measures such as the time to complete each task, count of all error of each task and count of hints provided to the children [3].

4. Results and Discussion

4.1 Survey Analysis Results

19 children between the ages of 7 and 11 were administrated “Guess What” and “Pick One” surveys in Brazil, Korea and United States. Survey results demonstrated that children had different understandings of the icons. Some of these may be attributed to the culture and environment that they live in. For instance the children in Brazil guessed the record activity icon as “Brazil’s Flag”. Chat, Write, Paint and Draw icons were consistently guessed correctly throughout the survey. Only three children guessed Internet icon correctly. Other guesses ranged from ball to cage. For the Conversion activity icon, children guessed music waves, cardiogram, mountain and TV. The journal was another icon that was never guessed correctly in all user responses. Many of the children associated this icon with Write activity. This could be related to their unfamiliarity with the
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journal concept in real life or on the computers. “Guess What” survey results demonstrated that some of the icons used on the computer interface were not very effective in communicating to children about the function of the activity that they were representing.

After the administration of “Guess What” survey, children were asked to complete “Pick One” survey choosing the icon which best represented each activity. The icons in the first column were the original icons used on the XO-1 interface. Only the write icon on the original interface received the majority of the votes from children. For other activities, the icons provided by the researchers were preferred. The icon used to represent person in XO and in fact used as a brand image did not get majority of votes from children. This is also consistent with the results of the “Guess What” survey results. For the Internet activity “WWW” icon received the majority of the votes. This might be due to children’s familiarity with the computers and World Wide Web. Camera icon designed by the researchers received the majority of the votes. Children’s who are familiar with built in cameras on the computers might have preferred this icon due to its physical similarity. Children had different understandings of the icons. Culture, their familiarity with the computers and the language might have affected their responses in the surveys. The next step could be to take and try out the icons that were voted on here, and redo the “Guess-What” survey using these new icons.

4.1 On-Site Usability Results

4.1.1 How do users from different cultural and social backgrounds perceive the interface navigation and the representations of the icons?

There was not much difference on the performance results in terms of user’s different cultural and social backgrounds. Since the users in United States were all familiar with computers and English language, cultural and social factors did not emerge as an indicator of performance measures during the usability tests. However their different levels of technology skills impacted their decisions during the navigation on the interface. Children who were much more proficient in technology use tended to explore the interface more and were less afraid of making errors. They also used different tools which were not required by the tasks.

Children from different cultures and social backgrounds perceived the representations of icons differently. While representing images, they used cultural cues. It can be concluded that it is important for designers to be aware of universal or local representations of the icons in the design of computer tools for children.

4.1.2 How can user experience be enhanced through universal design?

Based on our results we could conclude that icons and navigation could be designed to enhance user experience. If universal physical attributes are used in the icon design and if the navigation is made simpler, children can use the
interfaces with less error and less frustration.

4.1.3 What are the characteristics of children that impact the outcome of usability tests?

The characteristics of children impact the outcome of usability tests [4]. Some of these characteristics are analyzed within the scope of this study.

Capacity and inclination to verbalize: Children had different verbalization capabilities. We asked children to think aloud during the usability tests and their level of translating experiences to verbal statements varied. Children below the age of 12 are likely to be unable to think aloud [5]. In our study, there was no relationship between the age of the participant and think aloud process. For instance, 7 year old male child used think aloud during the testing, however 12 year old male child did not want to talk or comment on the actions. Therefore it is sound to expect that these capabilities of children might have an effect on the outcome of the usability test rather than indirectly through their ages [4].

Capability to concentrate: Children can concentrate for about 30 minutes. In our experience, the concentration levels varied [5]. Children’s technology skills, motivation to play with the laptop, time they could allocate for the usability test and parental presence impacted their capability of concentration. Children who were more capable in using the laptop and had less frustration showed more concentration on the tasks.

Children’s motivation: Motivation is another factor that could impact the outcome of usability tests [4]. Facilitator’s interventions, enjoyment, frustration level and technology skills were some of the factors which affected children’s motivation levels in this study.

Ability to adjust to strange environments and surroundings: Social environments, location and physical environment might impact the usability test outcomes [4]. Conducting the test in a usability laboratory provided us a quiet and isolated environment and therefore the tests were run smoothly without any outside intervention.

Knowledge of language and concepts: Language abilities of children varied and they could have impacted the results of this study. We tried to use age and culture appropriate language during the usability testing. For instance, computer technical jargons or terms were not used during the testing. The analogies used in the laptop design such as activity, keep, close and home were used in the tasks and facilitator’s hints.

5. Conclusion

Usability testing with children could bring children’s different perspectives to the design process, which could not be gathered otherwise. Gathering their experiences and insights particularly at the early phases of the design process
could enhance the usability of the computer products and improve the effectiveness of educational approaches before it is “too difficult and costly to change” [5]. This is especially important in the design of educational products for underprivileged children who are from different cultural and social backgrounds and with variety levels of computer experiences.

Understanding how users from different cultural and social backgrounds perceive the navigation and icon representations, more usable and useful educational products could be developed for children through an extensive user testing. This study is an attempt to enhance the interface design of this child-centric laptop by receiving substantial user feedback. The results of this study warrant further study. It is recommended that the OLPC laptop interface needs to be tested in the countries where they are being used by actual users. Gathering their feedback on the interface along with extensive observation could provide valuable feedback to the designers. Moreover further study could also investigate the use of icons in different cultural and social contexts.

References