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**A Usability and Accessibility Evaluation of the
Census-in-the-Schools Web Site**

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A USABILITY AND ACCESSIBILITY EVALUATION OF THE CENSUS-IN-THE- SCHOOLS WEB SITE

Human-Computer Interaction Memorandum Series # 120

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Abstract

The Census-in-the-Schools program promotes data literacy and increases awareness of Census Bureau products and activities by providing educators with teaching tools, resource materials, workshops, and other professional development opportunities. In addition to targeting teachers, the Census Bureau's Public Information Office (PIO) is expanding the current Web site to include online activities for students in grades K-12. Specific to this round of testing, PIO has tested web content customized for grades K-6¹.

Before the site was officially released to the general public, the Census-in-the-Schools design team contacted members of the Usability lab, and these two groups created a team to look into usability issues. The Usability Team consisted of the following members: Michelle Rusch (lead), Benjamin Smith, Erica Olmsted-Hawala, and Elizabeth Murphy (SRD), Victoria Glasier and Schere Johnson Jordan (PIO), Kimberly Crews (MSO), and Carolyn Hammersmith (SSD). The accessibility evaluation was conducted by Lawrence Malakhoff (SRD).

¹ Note, the original test plan suggested that the age groups would be within grades K-5. After the first round of testing it was recognized that some of the pages were age appropriate to even 6th graders. Therefore, the test plan was updated and 6th graders were included in the study.

Executive Summary

This usability evaluation was performed on the Census-in-the-Schools Web site. The primary purpose of this usability testing was to observe the understanding and satisfaction of children in grades K-6 as they interact with the Census-in-the-Schools web pages. The purpose of the accessibility evaluation was to assess the site's compliance with Federal regulations as defined in Section 508 of the Rehabilitation Act of 1973, as amended in 1998.

The purpose of the present document is to report findings from usability and accessibility testing of the Census-in-the-Schools Web site for students (K-6). This report documents the methods and procedures used during the study.

The Census-in-the-Schools Web site encompasses resources for teachers and students in grades K-12 in addition to activities and games for the students. The scope of this testing was limited to evaluating the Web pages for Counting Way, coloring pages, State Facts for Students, memory games, quizzes, and word finds for grade levels K-6.

Usability Goals. We evaluated the site against goals for usability and accessibility, as detailed in [Appendix A](#).

Methods. This section describes the methods that were used during the usability study. The study required test participants, facilities and equipment, materials, procedures, and logging of the videotapes, as well as data analysis.

Results.

Findings and Recommendations We identified areas of the site that caused users problems. Reasons for confusion and dissatisfaction may be found in the list of [Usability Problems and Solutions](#) section of this report. Usability problems of high importance and their recommendations are summarized below.

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I. Introduction

This usability evaluation was performed on the Census-in-the-Schools Web site. The primary purpose of this usability testing was to observe the understanding and satisfaction of children in grades K-6 as they interact with the Census-in-the-Schools web pages.

1.1 Purpose

The purpose of the present document is to report findings from usability testing of the Census-in-the-Schools Web site for students (K-6). This report documents the methods and procedures used during the study.

1.2 Scope

The Census-in-the-Schools Web site encompasses resources for teachers and students in grades K-12 in addition to activities and games for the students. The scope of this testing was limited to evaluating the web pages for Counting Way, coloring pages, State Facts for Students, memory games, quizzes, and word finds for grade levels K-6.

1.3 Goals

We evaluated the site against goals for usability, as detailed in [Appendix A](#).

II. Methods and Procedures

This section deals with the methods that were used during the usability study. The study required test participants, facilities and equipment, materials, procedures, logging of the videotapes, as well as data analysis.

2.1 Participants

For usability testing, SRD recruited participants who met the following criteria:

Grades K-2

- The student had experience using a computer (e.g., knew how to use the mouse and the keyboard to play games).
- The student could discriminate between colors.
- The student was able to count.
- The student was able to read at a basic level.
- The student was chaperoned to the test by a parent or guardian.

Grades 3-6 [same as K-2 with the following additional criteria]:

- The student was able to read at or above grade level.
- The student had at least one year of experience with the Internet.

SRD recruited 7 participants for each user group, for a total of 14 participants. Several resources were used in recruiting to ensure a diverse sample. These resources included the listserv for the Prince Georges County Parents Club, local churches, and CraigsList. The parent or guardian of the students who completed a testing session was given \$40 in cash to help cover their travel expenses. These funds and the testing services were provided by SRD at no charge to PIO. In addition to the monetary compensation, each child received a gift bag that included Census Bureau mementos and other appropriate items.

In addition to the 14 participants, two children were recruited for each user group of K-2 and 3-6 to participate in a dry run of the user testing procedure. These participants were recruited through internal employees of the Census Bureau.

Because younger children commonly have a shorter attention span than adults, testing sessions for students in grades K-2 lasted no longer than 30 minutes. Older children in grades 3-6 lasted approximately 45 minutes.

2.2 Test Administrator and Observers

Two researchers administered the tasks to all 18 participants during the testing sessions. Additionally, one to five observers were present in an observation room at the time of administration. The benefit of this was that the two test administrators were able to monitor patterns that emerged from the testing sessions in total, and the observers discussed each user's behavior with the test administrator after each session was completed.

2.3 Facilities and Equipment

Participant Room. The usability participants came to the Census Bureau's Usability Laboratory in Suitland, MD for the testing sessions. The participant sat in a small room, facing a one-way glass and wall-mounted camera, under a ceiling-mounted camera, and in front of a Liquid Crystal Display (LCD) monitor placed on a table at standard desktop height. The workstation included a standard keyboard and mouse. Two microphones picked up sound in each testing room. The Test Administrator (TA) interacted with the participant one-on-one as they were seated in the same room along with the parent/guardian and observers communicated with them via an audio intercom arrangement.

Computing Environment. The participant's workstation consisted of a Dell OptiPlex GX150 personal computer with a Pentium IV processor and 512 MB of RAM, a Dell 17-inch LCD monitor set at 800 by 600 resolution with 256-bit or higher color, a standard 101/102 key quiet keyboard, and a PS2 IntelliMouse with a wheel. The operating system was Windows 2000 for all participants.

Audio and Video Recording. Video of the participant was received by Computer Digital wall-mounted camera, with remote position, focus, and zoom controls. Video of the application on the participant's monitor was fed through a PC Video Hyperconverter Gold Scan Converter, mixed in a picture-in-picture format with the camera video, and

recorded via a Sony DSR-20 digital Videocassette Recorder on 124-minute, Sony PDV metal-evaporated digital videocassette tape. Audio was picked-up from one desk and one ceiling microphone near the participant, and from a push-to-talk console microphone in the test administration room. The audio sources were mixed in a Shure audio system, eliminating feedback, and fed to the videocassette recorder.

2.4 Usability Materials

SRD staff created materials that included a test script, the list of the activities presented to each child at the time of testing, and response cards used to collect information on general satisfaction about the Census-in-the-Schools Web site. All testing materials are provided in the appendices.

SRD staff also provided crayons, markers, and blank paper used by the children during and after the test session in debriefing to illustrate their ideas. For example, if they had another idea for how a page might be presented, they would sketch their idea using the provided materials.

Consent Forms. Because the participants were under the age of 18 and minors, a consent form was used that the parent or guardian was required to sign. Parents or guardians signed a standard form giving the Census Bureau permission to make a video recording of their child's testing session ([Appendix B](#)). The consent form also informed parents and guardians that video clips from their children's tapes may be used for internal research purposes only. Children also completed an assent form ([Appendix B](#)) in which they indicated that they understood the conditions of the test and agreed to participate.

Script: Introduction to a Testing Session. A short introduction was prepared to accommodate the communication level of both age groups. A copy of the introduction is attached to this plan ([Appendix D](#)). A major purpose of the introduction was to assure test participants that they were assisting in evaluating the software, not having their own abilities tested. During the introduction, the participants had several opportunities to ask questions.

Satisfaction Questionnaire. In typical usability studies that target adult audiences, the usability group commonly uses a tailored paper questionnaire to obtain information about the user's satisfaction of the interface. The questionnaire is typically administered at the end of the testing session after all tasks have been attempted. Because of the sensitive nature of this younger population we modified the common protocol to ensure recall. The new format involved verbally asking questions intermittently throughout the testing session. For example, after the user finished exploring Counting Way they were asked a set of questions such as "did you think the Web site was hard or easy?" or "what did you like/dislike most about this site?" A listing of these questions is included in [Appendix E](#).

Debriefing. The kinds of questions asked during the debriefing portion of the test session appear in [Appendix F](#).

2.5 Usability Testing Procedure

Before any testing began, we conducted two practice sessions or “dry runs.” We used a Census Bureau employee as a participant in the dry run. Based on the dry run, we tweaked the tasks and the protocol slightly. For example, if there was confusion about a task question, we reworded the question to make it clearer.

The test administrator (TA) welcomed the participant and gave a short introduction to the test session ([Appendix D](#)). At this point, consent and assent forms were completed by the parent and/or guardian and the child. An ice breaker was also given in the beginning to help make the child feel comfortable. For the younger group (grades K-2), the ice breaker involved engaging the children in an activity that involved paper, crayons, and markers where they drew a picture of a Web site or something they liked. For the older group (grades 3-6), the children were asked to pull up a Web site that they liked on the Internet and talk about it. The writing/drawing materials were provided by SRD and used throughout the test session as a resource for the children to express their ideas as they responded to using the Census-in-the-Schools Web site.

After the introduction, the TA explained to the children that we wanted them to share their feelings even if they were negative. Following the explanation about sharing feedback, the test administrator opened the Census-in-the-Schools Web site and gave the participant the task(s) by reading them aloud. The TA remained in the room along with the parent for both age groups.

Event Sequence from greeting the participants to dismissing them. The typical session progressed as follows:

- Consent and assent forms
- Ice breaker
- Introduction
- Participants were presented with Census-in-the-Schools web pages
- Census-in-the-Schools team have the opportunity to ask questions
- Debriefing
- Payment and gift bag given to parent/guardian and participant
- Parent/guardian and child were excused

Tasks:

Grades K-2

For users in grades K-2, the test facilitator sat in the room with the participant and read the task scenarios aloud. These scenarios required the participant to do the following:

- Interact with the Counting Way home page
- Use the family coloring page
- Use the kids' coloring page
- Use the houses coloring page
- Use the US map coloring page
- Play the memory game

- Use the word find (for advanced and older children)

See [Appendix G](#) .

Grades 3-6

For users in grades 3-6, the same protocol as used with grades K-2 was used for administering the tasks, however the set of tasks was different:

- Select an avatar that will serve as a buddy and guide during the quiz
- Take the quiz
- Use the State Facts for Students
- Use the Kids' coloring page
- Use the US map coloring page
- Play the memory game
- Use the word find

Because timing was limited (30 minutes for grades K-2 and 45 minutes for grades 3-6) the students did not complete all of the activities presented above. To ensure that all pages were tested we used several variations of activities to make sure all relevant pages were tested.

At the conclusion of each task, the participant was asked to indicate their satisfaction with the Web site by responding verbally and/or with response cards to questions presented in [Appendix E](#). At the end of the session, the participants were debriefed. The debriefing portion of the session consisted of a general discussion of how the participants felt about the site overall.

Finally, the TA thanked the participant, had the parent or guardian sign the payment voucher form and paid the parent or guardian. In addition, we gave a small prize to the children to take home with them.

It is important to note that the current usability testing group has not formerly had experience in working with children as test participants. We relied on a former member of the team, Dr. Juan Pablo Hourcade (Assistant Professor, University of Iowa), who has a strong background in working with children on user-interface design projects (Hourcade, Bederson, & Druin 2003a; Hourcade, Bederson, Druin, Rose, Farber, & Takayama 2003b). In addition, we relied upon authoritative resources from the University of Maryland (UMD) where they have a distinguished program for working with children in the practice of usability. The UMD program is headed by Dr. Alison Druin, an internationally known expert in working with children on design projects (Druin, 2002, 1999, 1998; Druin & Solomon 1996).

As this test plan was created, two other formats were presented as alternatives for the testing procedure. A description of these alternatives and the reasoning behind why they were not selected for the study are included in [Appendix H](#).

2.6 Usability Goals

We evaluated the site against goals for usability, as detailed in [Appendix A](#).

2.7 Interaction between Test Administrator (TA) and Participant

Test Administrator Probes and Questions.

2.8 Logging

The testing staff used the Observer 5.0 logging software, developed by Noldus (2003). We use this software to document and analyze our observations of participant behavior and to time segments of each session. Each session log was automatically synchronized with the corresponding videotape so that it will be possible to locate particular incidents on the tapes by going to the logged time code and to determine task durations by subtracting beginning from ending times.

Logging also allowed us to code participant behaviors, such as comments and instances of confusion, and then to analyze these behaviors for frequency of occurrence. Logging was completed by trained interns from the Usability Lab. Logging was done after the test sessions were completed, entirely from the session videotapes.

2.9 Identifying and Prioritizing Usability Problems

The first part of this report gives positive highlights of areas from the CIS Web site that the children really liked. The second section includes a summarized list of usability problems that are prioritized as high, moderate, or low. The highest priority will be assigned to any issue that would be considered a “showstopper,” i.e., unless this issue is resolved, visitors to the site might not be able to understand it, which may lead to their abandoning the Web site. Moderate-priority issues add to the difficulty of exploring the Web site. If satisfaction measurements are reported in the negative on occasional instances they will be considered moderate priority. Low-priority issues cause some minor annoyance or frustration to the participant but do not increase difficulty significantly. Other suggestions made by the students or parents are included with these issues.

Satisfaction was measured in terms of “hard or easy,” “fun or boring,” and “like or dislike.” If measurements are reported in the negative (i.e., boring or disliked, or hard if not also fun or liked) in many instances they will be considered high priority. In addition to reporting the problems, this report includes recommendations for improving usability.

III. Results

3.1 Positive Findings

Counting way

In general, children reported that this page was fun. There were no negative comments on the colors. Both children and the parents really liked the song. Children, especially the younger ones liked the objects that moved around and made noises (i.e., the sign that went “boing!,” the boy dribbling the ball, and the hat that flew off of the man’s head in the far back of the page).

Coloring Pages

Children considered these pages to be fun.

Kids’ coloring page

The children really liked the option of being able to change the facial features. In fact, in several instances when asked if they could change anything on the page they said that they would make it possible to change more features similar to how they could change the face (for example, add clothes, animals, etc.)

Family coloring page

We received positive feedback on this page. Specifically, this page was found to be easy and fun because it had a lot of large shapes that were easy to color.

Memory Game

Children really liked this page because it provided something for them “to do.” They would often want to play again after going through it once which indicated that it was a winner.

Word Find

Because of its level of difficulty, the word find was only tested with children who were entering the second grade or older. Similar to the memory game, the students liked this page because it gave them something to do.

3.2 Usability Problems and Solutions

Counting Way

High priority

- The purpose of the page (counting) was not clear to the students.
- Children wanted something interactive, something they could play with. They would often go directly to the left navigation panel and want to select another option because they did not immediately see something for them to do.
- The children did not pay attention to the words in the pop-up captions.
- They did not notice the text at the top of the screen and when asked to read it, they often struggled to read and/or understand “Census Bureau.”
- The song can be turned off. Even after the song is turned off, however, the car honking does not stop. The sound of the honking is heard in the background even when this page is not active (that is, if the child has gone on to work on the memory game and Counting Way is still open the sounds will still be heard). Children like to be able to feel like they can control things. By not allowing the option to mute the car honk they do not have control. The only option is to close the page.
- Children and parents tended to like the song, however it only plays once. In order to replay the song the page must be refreshed. There is no replay song option on the page.

Moderate priority

- Words for the song are hard to notice and/or read because of the placement on the page.
- Counting the houses is confusing because some of the structures could be confused for another type of building. For example, the building on the far left side of the page is confusing because it is not clear if it is one building or two. In addition, the second building from the left of the page is confusing because it is unclear if the structure is a shop, a shop with an apartment on the top, or simply just an apartment/home. See Figure 1 for an illustration.
- There are two characters on this page that could be recognized as either adults or children. This led to different responses to “Count the number of children in this picture.”

Low priority and other suggestions

- The Census does not count animals. Because the page instructs the children to count animals it might be misleading to the children that the Census Bureau counts animals.



Figure 1: The green circled tall building to the left is confusing because it is not clear if this is one building or two. The green circled building at the right is confusing because it is unclear if the structure is a shop, a shop with an apartment on the top, or simply just an apartment/home. The purple circled characters could be recognized as either adults or children.

Recommendations:

If the page is not updated to become more interactive:

- Present the page as an intro/splash page with navigation becoming the major focus.

If this page is updated to become more interactive:

- Provide a place for the children to enter a number after they have counted so that they can check their answer and/or get feedback.
- One parent recommended that once the child triggers a pop-up that a voice asks the questions, for example, "How many animals do you see?"
- Possibly replace the word "Census Bureau" with "We," or "Census."
- Another suggestion was that the words of the song should show up with a bouncing balls going across each of the words as the song plays (for example, similar to karaoke).
- Increase the visibility of the lyrics by placing the words on a white (or another light and solid) background.

- Make it apparent that sensitive objects are clickable or that something would happen if you hover.
- Update the buildings and characters to make it apparent if they are houses, adults, or children.
- Include a control that allows the children to play the song again. One suggestion would be to use the sign that is on the Memory Game in order to maintain consistency. In this case, it might be useful to alter the sign to include the turn song/sounds off also.
- Include a control that allows children to turn off the sounds, or make all sounds mute when the song is turned off.
- Remove the option to count animals.

The Census Bureau Counts Communities

More than half of children 6 to 17 years old participate in sports after school.




Number of tries:
14

Figure 2: The “Play Again” sign or some variation of it might be used on Counting Way as a means for the children to replay the song.

Coloring Pages

Kids' coloring page

High priority

- Children struggled to select the crayons because there is not enough space on or around the crayon that is sensitive to being selected.
- Some children did not realize at first that the crayons do not work like regular crayons. That is, they tried to “drag to scribble” as opposed to “click to fill.”
- When changing features using the changing facial features panel the crayon always stays active. That is, if you position the cursor a little ways off from the panel you still see the crayon (Figure 3). The presence of the crayon caused confusion for some children where they thought that they needed to set the crayon down first in order to change the features. The children were frustrated when they were unable to do so.
- Some children struggled with the background. They would often accidentally change the background color when they meant to change a color on a feature found on the children.

Moderate priority

- The children often selected the facial features (i.e., hair, nose, eyes, and mouth) they wanted and then used the crayons to color the rest of time. Thus spending most of the time using the crayons. In the current set up, the panel is somewhat of a barrier between the coloring page and the crayons.
- If you select a facial feature and then color it and then go to change the feature again then the color reverts to white. The child then needs to color it again.
- The girls were very detailed about their pictures and some expressed that they would prefer to not see the face feature panel or the arrow when the page is printed out.
- The page currently prints as two stacked graphics. For example, see Figure 4. When the pages are sent to print using File > Print the left navigation is printed above the coloring page. It is not obvious that the printer icon solves this problem.
- There was confusion using the white crayon. The current default crayon is white and if you try to start coloring right away nothing will happen because the picture is already white.
- The children often liked what they saw on the page; however they often said that they would like to see more. For example, several indicated that they would like to be able to change the clothes on the children. In addition, several mentioned that they would like to see something else besides the flower that appeared on the child's shirt (like an airplane). Another suggestion was that animals be included on the page.
- It was difficult to read the label on the crayon (the word is fuzzy). One child wanted to use the tan crayon, however could not find it. There is a crayon that is labeled “tan,” however the word is hard to read so they did not find it.

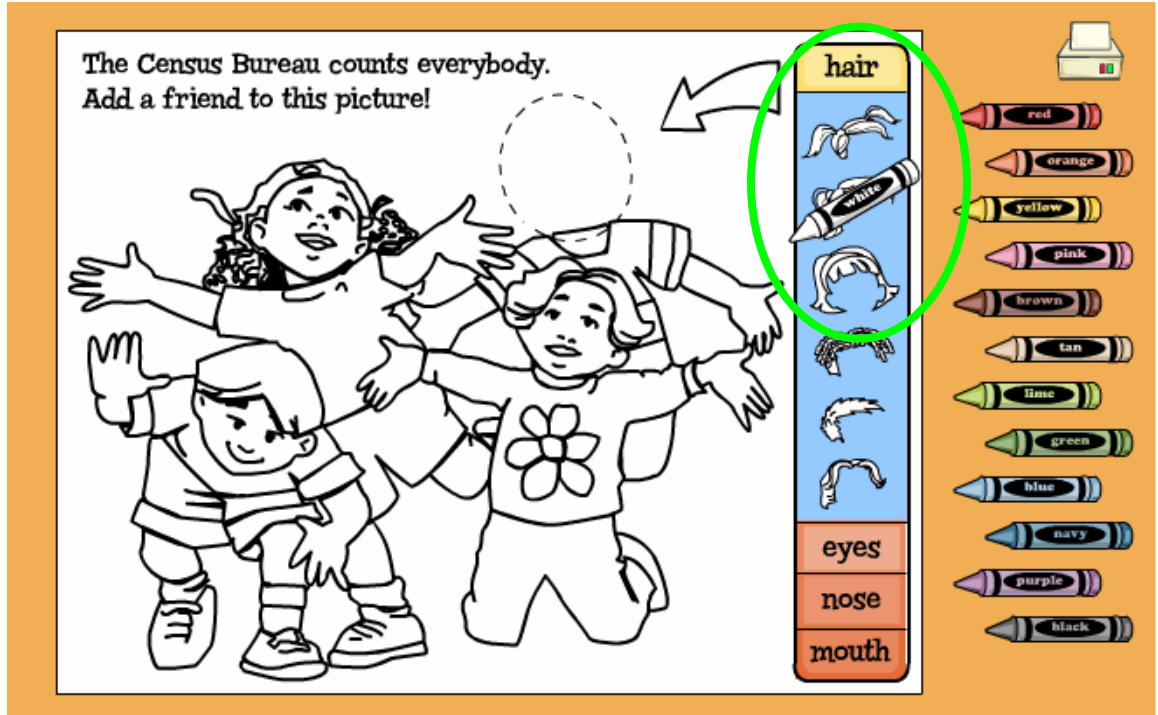


Figure 3: If the cursor is not in exactly the right place when selecting from the changing panel the crayon appears.

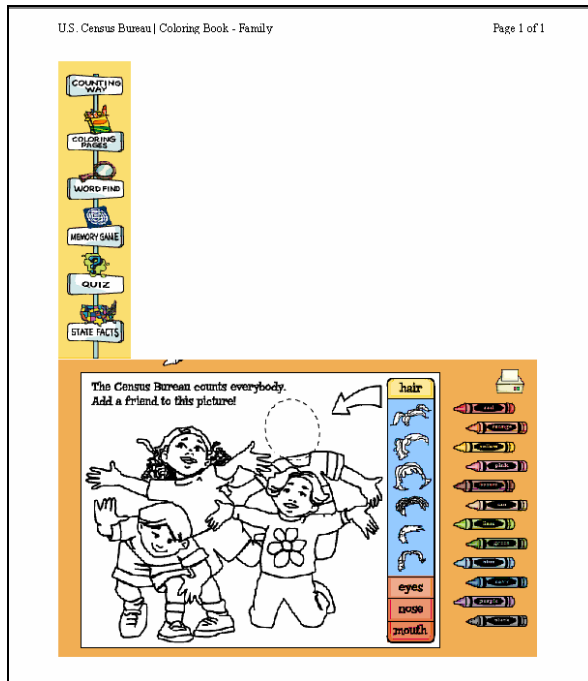


Figure 4: When the pages are sent to print using File > Print, the left navigation is printed above the coloring page.

Recommendations:

- Two ways to improve selectivity are 1) increase selection space surrounding the crayon and/or 2) increase the size of the crayon. The size of the label on the crayon is currently difficult to read. If the size of the crayon were to be increased the readability of the labels would be improved.
- Highlight the crayon when it is available to be selected while the child is hovering over it.
- Allow the user to “set down” a crayon without picking up a new one.
- Move the panel with change eyes/nose/hair/mouth features to another location, i.e., to the top as a horizontal panel or to the left of the coloring page.
- Update the page so that facial features retain their color upon being changed. For example, if a child chooses a hair style and colors it brown then if they go to change the hair again the new hair style will appear brown.
- The print icon on the page sends only the picture to print. This layout is ideal, however could be improved if the arrow and facial feature changing panel were removed. If the arrow cannot be taken out, move it over so that when you print it out that can be cut off without messing up the shape of the picture.
- Provide more options for changing features. For example, changing clothes and/or pictures on clothes, and/or provide the option to add animals.
- Change the default white crayon to another color besides white, or don't have a crayon selected by default.

Houses coloring page

Many of the problems from the Kids' coloring page apply to the other coloring pages, but are not repeated here.

High priority

- Children have problems using the Houses coloring page because the shapes are too small.²

Recommendations:

- Change the selection properties on very small items so that they are easy to color, or make the houses larger.

U.S. Map coloring page

This page was not extensively tested because it is designed for older children.

² Children have difficulty using software with small visual targets. This is due to children's developing motor skills (Hourcade, 2003). Fitts' law studies have shown that young children's performance in pointing tasks is significantly lower than that of adults [Kerr (1975); Salmoni & McIlwain (1979); Wallace, Newell & Wade (1978)], suggesting that they require larger visual targets in graphical user interfaces.

High priority

- Some participants struggled to color or even notice states on the East coast because the shapes were too small.

Moderate priority

- One parent suggested that the younger and less advanced children will not be familiar with the state abbreviations.
- One parent explained to their child that DC was not the right size to make sure that they were not confused.
- This page was not thoroughly tested. With one user, however, we observed that child reading “Ill” as “M” because the serifs were too large, thus causing the letters to look combined.

Recommendations:

- Consider making the map and text larger to improve legibility.
- Wait for the results of testing with the older children.

Memory Game

High priority

- The speed for selecting cards is good; however the rate for resetting them is too slow. Some tried to flip to the side of the page or on another deselected card to try to speed things up.
- Children did not notice the message to the left of the picture before or after completing the puzzle.

Moderate priority

- Some younger children (1st graders) did not know how to play the game.
- Some cards are too alike in appearance. For example, several cards use similar color themes (Figure 5) that in turn make them harder to remember.
- Children did not like the black and white picture.
- Some of the words in the messages at the left are too complicated (for example, the word “participate” was difficult to sound out and understand.)

Low priority and other suggestions

- One parent suggested placing an animation on the page.



Figure 5: Illustrates graphics on memory game cards that have similar colors, making them trickier to remember.

Recommendations:

- Make the cards flip faster when they reset, or allow users to flip the cards back at their own pace.
- Highlight the message with a lighter background and bounded box around it.
- Consider adding a human voice over that reads the message once the game is complete.
- Lower the reading level for the messages.

- Use some alternative cards that have different color themes that make them easier to remember, and offer some variety.

Word Find

High priority

- Most children did not understand how to highlight words at first. They usually did not figure it out until they were instructed to read the instruction. They typically did not look to read the text though unless told to do so.³
- It is hard to find words because of the strikethrough.
- The younger children were not able to read the text and/or understand words in the messages about what the Census Bureau does. The older children (2nd graders) could read, but did not pay attention to the text.
- Children did not understand many of the words in the list and in the instructions (for example, geographic, suburban).

Moderate priority

- There was confusion selecting words that could be plural. For example, “Business” was a word in the list and it was displayed in the word find with as “Businesses.” The correct answer was to click only the first and last letters of “Business,” however children often would try to select the “Businesses.” This confusion carried over to other words that were found in both the singular and plural within the word find.
- There are extraneous words in some of the puzzles that are not in the list. For example, “Census,” “sky,” and “sun.”

Low priority and other suggestions

- Some younger children struggled with vertical words
- Some were confused and did not know if there would be diagonal words
- One child suggested that it would be helpful if there was a graphic associated with the word that would show up when you hover over the word.

Recommendations:

- It is good to include the text messages and explanations; however no reading should be required. Provide multiple ways to select to ensure that they can figure out how to select. For example, allow them to select letter by letter if they should choose to drag the cursor over the word. In addition, provide a visual cue that

³ Claude Steinberg of UserWorks recommends from experience that everything be done with animation and voice narration at a children’ site.

- indicates to them that they are selecting. For example, the letters might be highlighted as they are selecting.
- When a word is found it might be circled so that the letter can still be seen for future word searches.
 - In cases where a word is singular in the word find, avoid using plural endings in “s” or “es” at the end of the word.
 - Avoid instances where there are extra words that do not appear in the list.

3.3 Accessibility Findings

The usability group’s in-house accessibility specialist, Larry Malakhoff, reviewed the Census-in-the-Schools web pages with the use of special screen-reading software (Job Access With Speech or JAWS). A general comment that is global to the site has to do with the left-hand navigation: The current background is a shade of yellow that is not optimal for using the JAWS software. When the using the JAWS software, users navigate using the keyboard. While using this form of interaction, one can move from object to object using the arrow keys. When an item is selected or in focus, it is highlighted by a bright yellow bounding box. The yellow background is not optimal because it causes difficulty to the user in recognizing where the bounding box is located. Because this area is a primary area for navigation and selection, we recommend choosing another color as the background in this navigational panel.

Malakhoff’s review of specific pages follows:

Counting Way- This page is graphic-intensive and will not be usable by blind children. In order to improve the site so it is easier to use with JAWS, we recommend that the objects that get counted (e.g., children, adults, houses) be assigned more meaningful names. As is, when JAWS reads the page, the objects that are counted only have a number assigned. Therefore, the visually impaired user hears a number but does not know what the object is.

Child’s coloring page- Similar to Counting Way, the objects that can be selected in this site do not all have meaningful names. Specifically, when the user tabs through the facial features, JAWS does not provide a description of the feature. It would be helpful to modify the text to say, for example, “hair with two pig tails,” “boy’s hair,” and so forth.

Word find- This site is not accessible to blind children. One recommendation is to develop an alternative that can be used by blind children using the JAWS software.

Memory game- The tab order does not follow a natural reading order. It currently goes from left to right and does not follow the order of columns on the page (Figure 6). The correct tab ordering is illustrated in Figure 7.

Easy quiz-

- The characters names on the selector page for the easy quiz should be vocalized.

- In addition, the characters were not selectable by keyboard. It is a high priority that the characters should be selectable by keyboard. Otherwise some students will not be able to enter the site.
- “Begin quiz” on the selector page is currently not vocalized and should be.
- There is an extra hidden button on the selector page that is to the far right, which JAWS’ tab detector picks up.
- While the user is working through the quiz using JAWS, some questions are not read aloud. This was a problem that occurred inconsistently throughout the quiz.
- The focus was not placed in the right position when advancing to “Submit answer” and/or “Next question.”

State Facts for Students

- Make the asterisk next to the “I never knew that” box a link to a pop-up of the information that is currently at the bottom of the page. Otherwise, the user listening to JAWS has to wait for a long time to hear what the notation is about because it is located so far down.

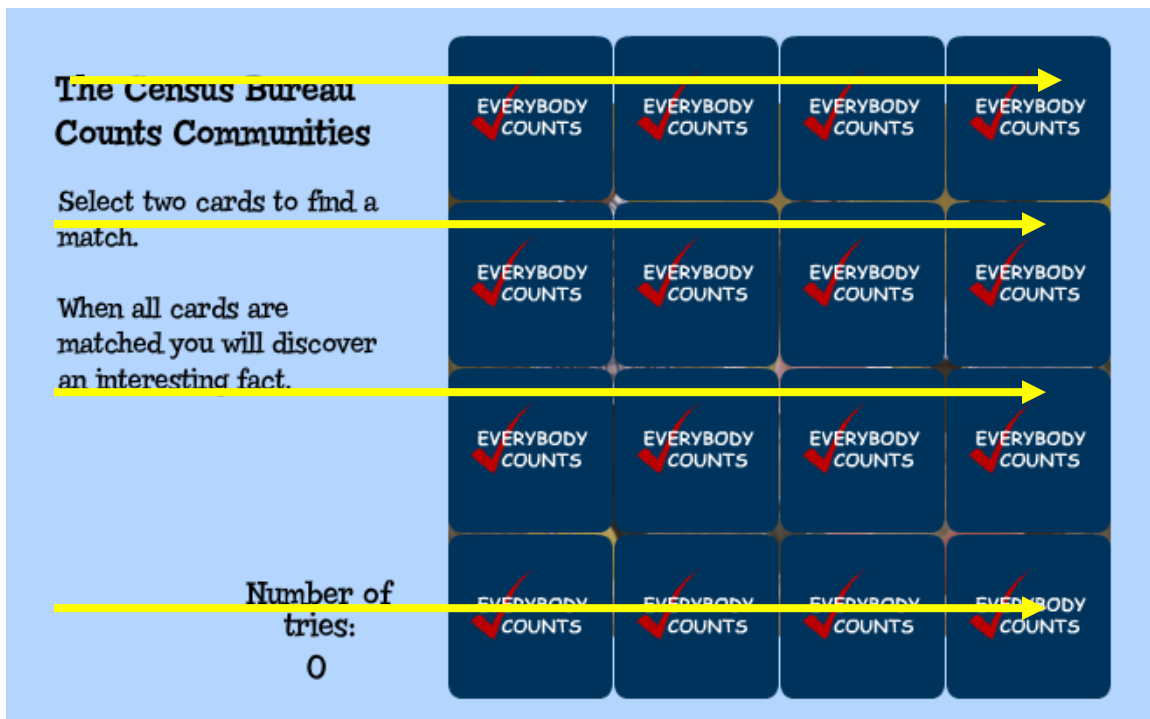


Figure 6: Jaws reads the memory game from left to right.

The Census Bureau Counts Communities

Select two cards to find a match.

When all cards are matched you will discover an interesting fact.

Number of tries:
0

EVERYBODY COUNTS	EVERYBODY COUNTS	EVERYBODY COUNTS	EVERYBODY COUNTS
EVERYBODY COUNTS	EVERYBODY COUNTS	EVERYBODY COUNTS	EVERYBODY COUNTS
EVERYBODY COUNTS	EVERYBODY COUNTS	EVERYBODY COUNTS	EVERYBODY COUNTS
EVERYBODY COUNTS	EVERYBODY COUNTS	EVERYBODY COUNTS	EVERYBODY COUNTS

Figure 7: Jaws should read the memory game by following the columns.

IV. References

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V. Appendices

Appendix A – Usability and Accessibility Goals

Grades K-2 Usability Goals

- Interacting with the Counting Way home page
 - Goal: The students will like the page
 - Goal: The students will understand how and what to do on the page
 - Goal: The students will be satisfied with the counting experience
 - Goal: The students should take away the message that the Census Bureau counts people
- Using the family coloring page
 - Goal: The students will like the page
 - Goal: The students will understand how to use the virtual crayons
 - Goal: The students should take away the message that the Census Bureau counts families
- Using the Kids' coloring page
 - Goal: The students will like the page
 - Goal: The students will understand how to use the virtual crayons
 - Goal: The students will understand how to change hair/eyes/nose features
 - Goal: The students were satisfied with the choices for hair/eyes/nose features
 - Goal: The students should take away the message that the Census Bureau counts everybody
- Using the houses coloring page
 - Goal: The students will like the page
 - Goal: The students will understand how to use the virtual crayons
 - Goal: Be able to color small shapes without problems
 - Goal: The students should take away the message that the Census Bureau counts people who live in all types of homes
- Using the US map coloring page
 - Goal: The students will like the page
 - Goal: The students will understand how to use the virtual crayons
 - Goal: The students should take away the message that the Census Bureau counts people in the United States
- Playing the memory game
 - Goal: The students will like the page
 - Goal: The students will understand how and what to do on the page
 - Goal: The students should take away the message that the Census Bureau counts you, children, families, communities (depending on which memory game is open)
- Using the word find (for children in grades 1-2)
 - Goal: The students will like the page

- Goal: The students should take away the message that the Census Bureau collects data on business, building, cars, etc. (depending on the list in the word find)

Grades 3-6 Usability Goals

- Selecting an avatar that will serve as a buddy and guide during the quiz
 - Goal: The students will like the avatars
 - Goal: The student will successfully be able to select a buddy
- Taking the quiz
 - Goal: The students will like the page
 - Goal: For the easy quiz, questions should not be too hard
 - Goal: For the hard quiz, questions should not be too hard
 - Goal: The students should take away the message that the Census Bureau counts people.
- Using the Kids' coloring page
 - Goal: The students will like the page
 - Goal: The students will understand how to use the virtual crayons
 - Goal: The students will understand how to change hair/eyes/nose features
 - Goal: The students were satisfied with the choices for hair/eyes/nose features
 - Goal: The students should take away the message that the Census Bureau counts everybody
- Using the houses coloring page
 - Goal: The students will like the page
 - Goal: The students will understand how to use the virtual crayons
 - Goal: Be able to color small shapes without problems
 - Goal: The students should take away the message that the Census Bureau counts people who live in all types of homes
- Using the US map coloring page
 - Goal: The students will like the page
 - Goal: The students will understand how to use the virtual crayons
 - Goal: The students should take away the message that the Census Bureau counts people in the United States
- Using the State Facts for Students
 - Goal: The students will like the page
 - Goal: Students will be able to draw a bar chart using population data for a specific state
 - Goal: Students will be able to locate population data for a specific state during a specific year
 - Goal: Students will be able to use the collapse table function successfully
 - Goal: Students will be able to report specific results about geography and businesses correctly
 - Goal: The students should take away the message that the Census Bureau counts people.
- Playing the memory game
 - Goal: The students will like the page
 - Goal: Students should be able to easily locate the fun fact
 - Goal: Students should be able to report the total tries

- Goal: The students should take away the message that the Census Bureau counts you, children, families, communities (depending on which memory game is open)
- Using the word find
 - Goal: The students will like the page
 - Goal: The students should take away the message that the Census Bureau collects data on business, building, cars, etc. (depending on the list in the word find)

Accessibility goals

Goal: The Web site is 508 compliant [no violations of Section 508, paragraphs a through p].

Appendix B – Parent/Guardian Consent Form and Child Assent Form

For Minors



Consent Form

Usability of Census-in-the-Schools Web site

Each year the Census Bureau conducts many different usability studies of its public Web sites. For example, the Census Bureau routinely tests the wording, layout and behavior of online sites in order to provide the best possible experience for visitors.

_____ [CHILD'S NAME] has my permission to take part in a study to improve the design of the Web site for Census in the Schools. In order to have a complete record of your child's comments, his/her usability session will be videotaped. We plan to use the tapes to improve the design of the Web site. Staff directly involved in the research project will have access to the tapes. Video clips may be used for the purpose of illustration, however confidentiality will be maintained if the information is published or shared during a presentation. Your child's participation is voluntary, and his/her comments will remain strictly confidential.

This study is being conducted under the authority of Title 13 USC. You will receive \$40 today for your child's participation.

I have agreed to allow my child to participate in this Census Bureau Web site design study, and I give permission for his/her tapes to be used for the purposes stated above.

<hr/> Parent's Signature <hr/>		<hr/> Researcher's Signature <hr/>
Printed Name		Printed Name
<hr/> Date		<hr/> Date

For Minors



Child Assent Form

Usability of Census-in-the-Schools Web site

You are here today because you can help us understand how well some of our computer programs work for children your age.

You will be asked to use these computer programs to do play games and do activities. We will keep track of what you do with the computer.

This study will be very similar to using other computer software that you use at home or school. This study is not dangerous, however if you begin to feel uncomfortable in any way please tell me or your parent/guardian. By joining us, you can help us design better computer programs.

This will take less than one hour and you will get a small prize at the end of our time together.

You may change your mind at any time and stop working with us, or you can ask any questions you like. You also can choose to not do any activity if you wish. If you have problems, again, please let your parent or guardian or myself know.

Check this box if you agree to participate

Name (PRINT) _____

DATE _____

If the subject cannot read, then this assent form was read to the child and the child understands its contents:

INVESTIGATOR _____

DATE _____

Appendix C – Questions on Computer Use and Internet Experience

Questions will be asked verbally.

1. What do you use the computer for?
Wait for their response and then provide examples:

- e-mail
- Internet
- Games for fun
- Learning activities
- Drawing activities
- Other applications, please specify

The children will be presented with a set of cards that they will be able to use to answer questions 2-3. Card selections for will be as follows:

- a. Green card with smiley face sticker: "I like it"
- b. Yellow card with no expression face sticker: "It's ok"
- c. Red card with sad/frustrated face sticker: "I don't like it"

2. How do you like or dislike doing things on the computer?
3. How do you like or dislike using the Internet?
4. Tell use something fun that you like to use the computer for.

Appendix D – General Introduction

Script for Census-in-the-Schools

Thank you for your time today. Before we get started, I want to make sure you and your parent/guardian agree with everything involved in the test.

To the parent or guardian: I would like to video tape your child during the study. I will use the video mainly because we cannot remember everything. Will this be all right?

Give parent/guardian consent form and child assent form

We will be looking at a Census Web site. Before we begin looking at the Web sites we are going to get started by talking about some of your favorite things to do.

Ice breaker

We have two choices to get started. I would like to either look at a Web site that you like a lot, or draw a picture of some things that you like. What would you like to do?

If the child would like to look at Web pages but cannot think of any, present the following as options:

- PBS Kids: Clifford- Puppy puzzles
http://pbskids.org/clifford/games/index_puppypuzzles.html
- PBS Kids Sesame Street- Check out Cookie
<http://www.sesameworkshop.org/sesamestreet/games/flash.php?contentId=110880>
- PBS Kids: Curious George- Big picture
http://pbskids.org/curiousgeorge/games/big_picture/big_picture.html

I have one last question for you before we start looking at our special game pages. Which Web sites do you go to if you want to find out more about the people that live in the United States?

Introduction

I have invited you here today to work on online activities that students like yourself would be interested in doing. Your feelings about the activities are important to our work. We are going to use your comments to give feedback to the Web site creators. Your thoughts will help them make changes to improve the site.

I want you to keep in mind that whatever you say today is good. If you say “I like it” that is good and if you say “I don’t like it” that is also good. Tell us all of your feelings about the site and remember, there is no right or wrong answer. We aren’t testing you but rather we are checking to see how the site works, or doesn’t work.

Ask user computer experience questions—introduce satisfaction cards

Now we are going to look at a Web site on the computer. As we look at the computer I want you to tell me what you think by showing me a card like we just used, or by drawing a picture on paper, or by writing your feelings on a sticky note.

As we begin the next activity remember that I want you to keep telling me about your thoughts and feelings.

Do you have any questions before we start?

For grades 3-5: I am going to go into another room now and I’ll be able to see and hear you on the television monitor, so if you have any questions during the session please just ask.

Give user the first activity

When ready to begin the first activity:

For grades K-2: Read the first activity to them aloud.

For grades 3-5: Begin by reading the first card out loud.

Remember if you like or dislike something tell us out loud.

Appendix E – Questions for User Interaction Satisfaction

The following questions will be asked after each activity has been attempted. We propose having colored markers and paper available to them to draw out their ideas throughout the session.

General questions

1. Did you think the Web site was easy or hard?
2. Did you think the Web site was fun or boring?
3. What did you like most about the Web page that you just used?
4. What did you dislike most about the Web page that you just used?
5. What do you think about the colors on this page?
6. What is the main thing that you would take away from this page?
7. If you had a magic wand and could use it to change anything on the Web site page that you just used what would you change?

Is there anything else?

Page specific questions

1. Counting way
What do you think about the objects that moved around on this page?
2. Coloring pages
How do you like or dislike the crayon colors?
How do you like or dislike the features on the people?

Appendix F – Debriefing Questions

General:

1. What was the hardest thing on the site?
2. What was the easiest thing to do on the site?
3. What would you do if you could add anything to the site or change it?
4. Take notes on the activities throughout the session. Bring up things that were mentioned earlier and ask specific questions about why they did or felt certain things, etc.

Final questions:

1. How would you describe the Census site to their best friend? What would they say about it? Would they recommend this site to their friend? Why or why not?
2. Are there any other things that you would like to share that have not already been talked about?

Appendix G – Grades K-2 Tasks

Usability Tasks—Census-in-the-Schools

User study one: First week in July

User audience: Children in grades K-2

Applications: Counting Way, Coloring pages, Memory game, Word find (for children in grades 1-2)

Counting Way

1. We're going to pretend that one of your friends told you about a Web site that you would like to see. The Web site is open on the computer in front of you. Spend the next couple of minutes exploring the page and let us know what you think.
2. Now I would like you to use the Web site for counting. Count the number of houses in the picture.
3. So how many children do you see?
4. And how many adults do you see?

Coloring pages

5. You remember a friend telling you something about a web page where you can color pictures of a family coloring online. The page is open on the computer. Spend some time coloring the picture.
6. You remember a friend telling you something about a web page where you can color pictures of children and change things like their hair and eyes. You would like to try it out.
7. Your teacher told you about a web page that you can use to color houses and buildings. You would like to use this Web site.
8. You have a school project that requires you to color a map of the United States. Your teacher tells you that you have the option to use a web page that has a coloring option to do the project. You would like to use the online map.

Memory game

9. You would like to play a memory game. Explore the memory game page in front of you for the next couple of minutes and then let us know what you think.

Word find

10. You would like to do a word find. Explore the word find page in front of you for the next couple of minutes and then let us know what you think.

Task Analysis: Grades K-2

Following is a complete list of tasks related to the Census-in-the-Schools Web site. Please note that some of the tasks overlap.

Task 1: One of your friends told you about a Web site that you would like to see. The Web site is open on the computer in front of you. Spend the next couple of minutes **exploring** the page and let us know what you think.

Test inputs: 1) Hover cursor over objects in page 2) turn sound on or off

Task 2: Now I would like you to use the Web site for counting. Count the number of **houses** in the picture.

Test inputs: 1) Hover cursor over house one 2) Hover cursor over house two 3) Hover cursor over house three 4) Hover cursor over house four 5) Hover cursor over house five

Task 3: So how many **children** do you see?

Test inputs: 1) Hover cursor over child one 2) Hover cursor over child two 3) Hover cursor over child three 4) Hover cursor over child four 5) Hover cursor over child five 6) Hover cursor over child six

Task 4: And how many **adults** do you see?

Test inputs: 1) Hover cursor over adult one 2) Hover cursor over adult two 3) Hover cursor over adult three 4) Hover cursor over adult four 5) Hover cursor over adult five 6) Hover cursor over adult six

Task 5: One of your friends told you about a Web site that they found online where you can color pictures. You would like to check it out. Spend the next couple of minutes **exploring** the coloring pages and let us know what you think.

Test inputs: 1) Click on coloring pages link 2) Select coloring book for children 3) Select coloring book houses 4) Select coloring book family 5) Select coloring book US map

Task 6: Now you would like to take a closer look at the family coloring page. The page is open on the computer. Spend some time coloring the picture.

Test inputs: 1) Twelve crayon options

Task 7: You remember another friend telling you something about a web page where you can color pictures of children and change things like their hair and eyes. You would like to try it out.

Test inputs: 1) Select one out of six hair options 2) Select one out of four eyes options 3)

Select one out of three nose options 4) Select one out of three mouth options 5) Twelve crayon options

Task 8: Your teacher told you about a web page that you can use to color houses and buildings. You would like to use this Web site.

Test inputs: 1) Twelve crayon options

Task 9: You have a school project that requires you to color a map of the United States. Your teacher tells you that you have the option to use a web page that has a coloring option to do the project. You would like to use the online map.

Test inputs: 1) Twelve crayon options

Task 10: You would like to play a memory game. Explore the memory game page in front of you for the next couple of minutes and then let us know what you think.

Test inputs: 1) Click on two out of sixteen memory cards to locate a match.

Task 11: Now that you have explored the page you would like to play a complete game. Use the page in front of you to play a game and remember to keep telling us what you are thinking about.

Test inputs: 1) Click on two out of sixteen memory cards to locate a match. Keep doing this until a match is found; then look for another match until all the cards are paired.

Task 12: You would like to do a word find. Explore the word find page in front of you for the next couple of minutes and then let us know what you think.

Test inputs: Click on the first and last letter of words to highlight them

Task 13: Now that you have explored the page you would like to do a whole word find on your own. Use the page in front of you to do a word find and remember to keep telling us what you are thinking about.

Test inputs: Click on the first and last letter of words to highlight them

Variations of usability tasks
Grades: K-2

Treatment A (younger students)

1. Counting way (same for both treatments)
2. Coloring pages
 - Kids' coloring page
 - Family coloring page
 - Houses coloring page
3. Memory game

Treatment B (older students)

1. Counting way (same for both treatments)
2. Coloring pages
 - Kids' coloring page
 - Houses coloring page
 - US map coloring page
3. Word find

Appendix G – Grades 3-5 Tasks

Usability Tasks—Census-in-the-Schools

User study two: First week in August

User audience: Children in grades 3-5

Applications: State Facts, Coloring pages, Memory game, Quiz, Word find

State Facts

1. Your teacher has asked your class to look into a Web site that will help you with your homework. Use the computer in front of you to explore the Web site that your teacher has told you about.
2. You have been given an assignment to write a report about toy stores in the Midwest. Look up the number of toy stores in Iowa, Illinois, and Nebraska in 2004. Use the grid on the paper that is available to draw a bar graph that compares the number of toy stores in each state.
3. You have found a page that has information about your home state that you would like to share with your class as part of a presentation. You would like to print a page that only includes information about Geography and Business. Try to find a way that you can print the page without the Population information.

Coloring pages

4. One of your friends told you about a Web site that they found online where you can color different pictures. You would like to check it out. Spend the next couple of minutes exploring the coloring pages and let us know what you think.
5. You remember another friend telling you something about a web page where you can color pictures of children and change things like their hair and eyes. You would like to try it out.
6. Your teacher told you about a web page that you can use to color houses and buildings. You would like to use the Web site so you can talk more about the site with your teacher.
7. You have a school project that requires you to color a map of the United States. Your teacher tells you that you have the option to use a web page that has a coloring option to do the project. You would like to use the online map.

Memory game

8. You would like to play a memory game. Explore the memory game page in front of you for the next couple of minutes and then let us know what you think.
9. Now that you have explored the page you would like to play a complete game. Use the page in front of you to play a game and remember to keep telling us what you are thinking about.

Quiz

10. You heard about a quiz online through your friends and you would like to check it out. Explore the quiz page in front of you for the next couple of minutes and then let us know what you think.
11. Your friends described unique buddies on the quiz page that work together with you during the quiz. Select a “friend” to take the quiz with you.
12. So now pretend you want to take easy quiz. Go ahead and try that.
13. And now pretend you want to try the hard quiz.

Word find

14. You would like to do a word find. Explore the word find page in front of you for the next couple of minutes and then let us know what you think.
15. Now that you have explored the page you would like to do a whole word find on your own. Use the page in front of you to do a word find and remember to keep telling us what you are thinking about.

Task Analysis: Grades 3-5

Following is a complete list of tasks related to the Census-in-the-Schools Web site. Please note that some of the tasks overlap.

Task 1: Your teacher has asked your class to look into a Web site that will help you with your homework. Use the computer in front of you to explore the Web site that your teacher has told you about.

Test inputs: 1) Use drop down menu or click state on map

Task 2: You have been given an assignment to write a report about toy stores in the Midwest. Look up the number of toy stores in Iowa, Illinois, and Nebraska in 2004. Use the grid on the paper that is available to draw a bar graph that compares the number of toy stores in each state.

Test inputs: 1) Use drop down menu or click state on map to select Iowa, Illinois, and Nebraska 2) Draw chart on paper

Task 3: You have found a page that has information about your home state that you would like to share with your class as part of a presentation. You would like to print a page that only includes information about Geography and Business. Try to find a way that you can print the page without the Population information.

Test inputs: 1) Use drop down menu or click state on map to select home state 2) Click on "Collapse this table" icon in the Population table

Task 4: One of your friends told you about a Web site that they found online where you can color different pictures. You would like to check it out. Spend the next couple of minutes exploring the coloring pages and let us know what you think.

Test inputs: 1) Click on coloring pages link 2) Select coloring book for children 3) Select coloring book houses 4) Select coloring book family 5) Select coloring book US map

Task 5: You remember another friend telling you something about a web page where you can color pictures of children and change things like their hair and eyes. You would like to try it out.

Test inputs: 1) Select one out of six hair options 2) Select one out of four eyes options 3) Select one out of three nose options 4) Select one out of three mouth options 5) Twelve crayon options

Task 6: Your teacher told you about a web page that you can use to color houses and buildings. You would like to use the Web site so you can talk more about the site with your teacher.

Test inputs: 1) Twelve crayon options

Task 7: You have a school project that requires you to color a map of the United States. Your teacher tells you that you have the option to use a web page that has a coloring option to do the project. You would like to use the online map.

Test inputs: 1) Twelve crayon options

Task 8: You would like to play a memory game. Explore the memory game page in front of you for the next couple of minutes and then let us know what you think.

Test inputs: 1) Click on two out of sixteen memory cards to locate a match.

Task 9: Now that you have explored the page you would like to play a complete game. Use the page in front of you to play a game and remember to keep telling us what you are thinking about.

Test inputs: 1) Click on two out of sixteen memory cards to locate a match. Keep doing this until a match is found; then look for another match until all the cards are paired.

Task 10: You heard about a quiz online through your friends and you would like to check it out. Explore the quiz page in front of you for the next couple of minutes and then let us know what you think.

Test inputs: Free exploration of page

Task 11: Your friends described unique buddies on the quiz page that work together with you during the quiz. Select a “friend” to take the quiz with you.

Test inputs: Select a buddy avatar.

Task 12: So now pretend you want to take easy quiz. Go ahead and try that.

Test inputs: Talk through the quiz questions.

Task 13: And now pretend you want to try the hard quiz.

Test inputs: Talk through the quiz questions.

Task 14: You would like to do a word find. Explore the word find page in front of you for the next couple of minutes and then let us know what you think.

Test inputs: 1) Click on the first and last letter of the word to highlight it

Task 15: Now that you have explored the page you would like to do a whole word find on your own. Use the page in front of you to do a word find and remember to keep telling us what you are thinking about.

Test inputs: 1) Click on the first and last letter of the word to highlight it

Variations of usability tasks

Grades: 3-5

Treatment C

1. State facts for children (same for both treatments)
2. Coloring pages
 - Explore
 - Kids' coloring page
 - Houses and buildings coloring page
3. Memory game (same for both treatments)
4. Word find (same for both treatments)
5. Quiz (same for both treatments)

Treatment D

1. State facts for children (same for both treatments)
2. Coloring pages
 - Explore
 - Kids' coloring page
 - US map coloring page
3. Memory game (same for both treatments)
4. Word find (same for both treatments)
5. Quiz (same for both treatments)

Appendix H – Alternative study formats

1. Large group participatory design

Description: Researchers from the University of Iowa and UMD have found that children are more comfortable if you test them in pairs or in large groups (J.P. Hourcade, personal communication, May 23, 2007; Druin, 1999). They recommend conducting this type of testing in a room outside of a controlled lab like a focus group room. The typical procedure practiced at UMD is to bring together 6-8 children into a room and start out with an ice breaker to make them comfortable. As an introduction they tell the children that they are going to be helping to evaluate the given Web site as experts. The children then get involved on laptops. While they are looking through the site the researchers have them indicate: 1) “what they like” 2) “what they don’t like” and 3) “what they would change” on post-it notes. After they collect the notes, the researchers group them on a white board. Afterwards, the whole group has a general conversation.

Benefits: The benefit of using the large group format is that 1) you can get it all done at once; 2) designers can be involved; and 3) you can go for a longer time period (otherwise you are limited to 15 to 30 minutes maximum when working with children individually). Getting feedback in the large group format is helpful in recognizing the magnitude of the problem.

Disadvantages and reasons that this format was not selected: There are three disadvantages of using this type of format. First, the usability lab is not equipped for the set up. Second, UMD and Hourcade recommend that the children in the group should know each other in advance. Recruiting a group of 6-8 children who know each other would be challenging for our lab. More than likely, to satisfy the condition that they all know one another, they would be coming from the same location or school. In this case, we would lose the diversity that is desired for the study. Third, the large group format is often subject to polarization where one or two persons dominate the group. In this case, their ideas and opinions influence others within the group and bias the results.

2. Testing children in pairs of two

Description: When conducting a large group participatory design is not a feasible option, another alternative is to use pairs of children who know one another.

Benefits: Increases the comfort level of the children; thus they might talk more.

Disadvantages and reasons that this format was not selected: There are two disadvantages to this format. First, there is a similar problem to recruiting as found with the large group because the children should know one another in advance (resulting in less diversity). Second, there would be problems related to getting consent from both parents. For example, if one parent brought both children to the lab, we would have to rely on the second child bringing a consent form that was signed in advance. We are very concerned that this would commonly be forgotten and, in that case, we could not include them in the test along with the other child.