

**AN ACCESSIBILITY AND USABILITY REVIEW
OF THE CENSUS-IN-the-SCHOOLS APPLICATION**

Human-Computer Interaction Memorandum Series # TBD

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Note: The information in this report is proprietary to the U. S. Census Bureau Usability Laboratory. It may be used only to communicate findings to the organizational unit requesting the study and for professional research purposes.

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INTRODUCTION

Since June 2001, Federal regulations have required that U. S. government Web sites and other software developed by or for the U.S. Government provide comparable access to the information for all users³. Computer users who have visual and or other disabilities are entitled to have the same access as users who do not currently have any disabilities

Some practitioners consider accessibility to be a subset of usability, while others think of accessibility as related to but separate from usability. The Census Bureau's Usability staff considers accessibility to encompass usability for users with disabilities.

Accessibility guidelines have several checkpoints that address more general usability, such as a logical tab order, the division of large information blocks into more manageable groups, and use of the clearest and simplest language appropriate. Even if the application complies with the regulation, it still may not be usable, as the Census Bureau's Usability Lab has found in other testing. Both usability and accessibility testing need to be done to identify problems that actual users may have.

BACKGROUND

This accessibility evaluation was performed on the Census In-the-Schools application. Systems Support Division (SSD), for the Management Services Office (MSO), requested that the Statistical Research Division (SRD) use its expertise to verify and/or identify accessibility problems with this application in the SRD accessibility lab. Children in grades K-5 would use this application to learn about what information the Census Bureau collects and how it is used, through a quiz, a word find, and picture matching activities.

SCOPE AND METHOD

This evaluation is primarily focused on testing accessibility for computer users with visual disabilities. Accessibility testing is performed using the Job Access With Speech (JAWS) 9 screen reader software⁴. For the purpose of this report, an item is judged to be accessible (compliant with the regulations) if its screen text is read out loud in a coherent order by JAWS. Usability problems are detected by listening to the content vocalized by the screen reader and by a visual inspection by an analyst with experience in usability. These problems are included in this report as issues to evaluate in formal usability testing if resources are available.

³ <http://www.section508.gov/index.cfm?FuseAction=Content&ID=3>

⁴ <http://www.freedomscientific.com>

FINDINGS

Findings are summarized below and details are given in Figures 1-10.

Accessibility

- Status of the audio button (sound off or on) is not accessible to screen-reader users, as shown in Figure 1.
- A link to the Flash player is missing, as shown in Figure 1.
- A link to Adobe Reader is missing, as shown in Figure 2.
- Images on the Coloring Pages screen lack ALT text, as shown in Figure 2.
- Tab order does not follow the visual order, as shown in Figure 3.
- The keyboard icon on the Word Find puzzle pages is inaccessible, as shown in Figure 5.
- Cards are incorrectly tagged with ALT text on the Memory Game screen, as shown in Figure 6.
- The image revealed at the end of the Memory Game lacks ALT text, as shown in Figure 6.
- A Quiz character cannot be selected by keyboard commands, as shown in Figure 7.
- Status (selected, not selected) of a Quiz response is inaccessible, as shown in Figure 8.
- ALT text for the “X” and checkmark graphics on the Quiz feedback screens is not meaningful, as shown in Figure 9.

Usability Review

- Tab navigation is not fully functional (Figure 1).
- The audio toggle button is too small to tell if it’s turned on or off (Figure 1).
- The graphics above the signposts shown (Figure 1) are not clickable on the left navigation bar.
- There is a need for printable answer sheets in the Counting Way and Word Find screens in Figures 1 and 4.
- Numbering responses in the Quiz adds no value (Figure 8).
- The number 360 is vocalized on the Quiz feedback screen (Figure 9).
- The feedback from Quiz question 7 is poorly worded (Figure 10).



Figure 1. The Counting Way screen keyboard navigation is not ideal and the audio button on/off status is not accessible.

Finding 1.1. This screen does not inform users how to navigate after leaving the Web browser area and entering the Flash section, which begins with a vertical navigation bar. This omission violates 1194.22 paragraph N of the Section 508 regulation.

Priority: High

Recommendation: Browser navigation is done through the tab key. The tab key does not function within the Flash application when the screen reader is running: so navigation through the Flash portion of the screen is done by arrow keys. The best design would use only the tab key for navigation. This change should be considered since the users are children, and a goal of screen design should be to keep interaction with the user interface as simple as possible.

Alternatively, an instruction to use arrow keys could be used preceding the left navigation bar. The contractor can use their existing Flash text for this instruction. Suggested placement for this instruction is shown above in Figure 1. The instruction needs to be ALT text in a small transparent image (GIF) so it will not be viewed by users with normal vision.

Finding 1.2. The status of the audio button is not revealed to screen-reader software when accessed. Furthermore, audio cannot be turned off or on by keyboard commands.

These omissions violate 1194.21 paragraph D and 1194.22 paragraph N of the Section 508 regulation.

Priority: High

Recommendation: Enable keyboard access to the audio button. When the sound is on, the screen-reader should detect “sound on” and it should detect “sound off” otherwise. We suggest a red circle with a diagonal line over the audio button when sound is turned off for improved visibility for users who do not use screen readers. In addition to the Counting Way song, all sound effects on that screen should be turned off when audio is toggled off.

Usability Notes

1. The graphics above the signposts should be clickable also. (Global)
2. The page should be printable as a worksheet that public school teachers can use.
3. Where are the answers? Can the answers be printed by teachers?

Next, we present findings for the Coloring Pages.

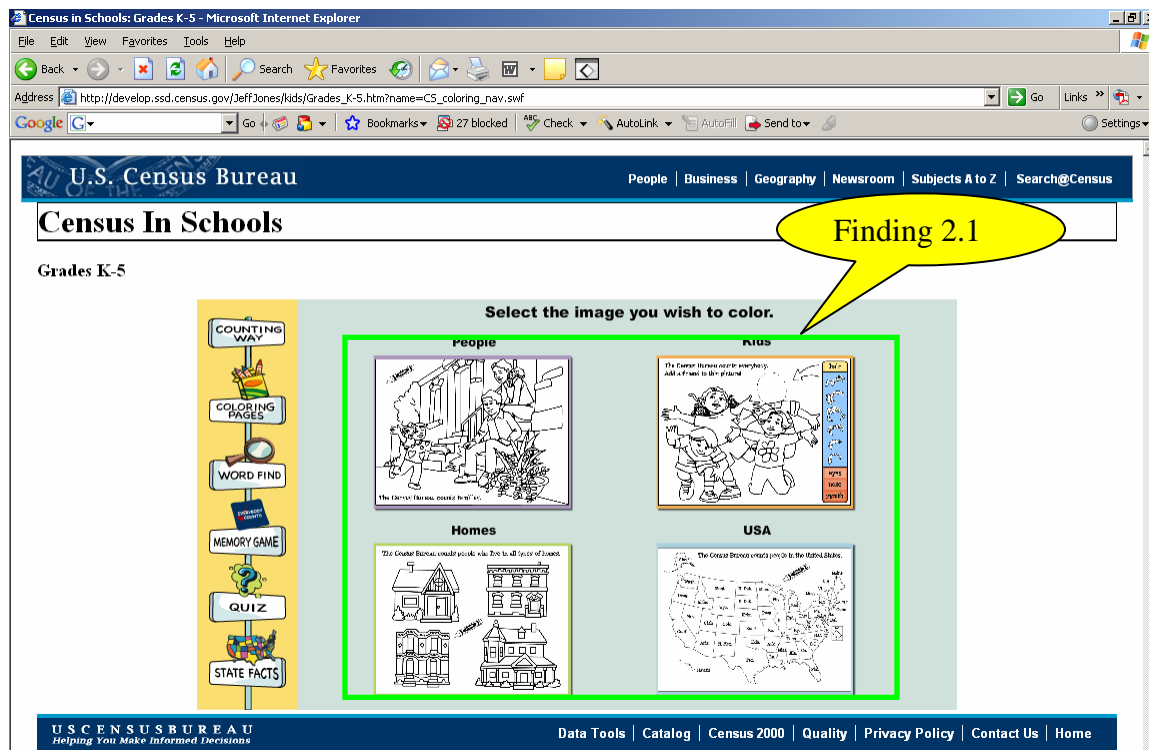


Figure 2. The Coloring Page images do not have a logical tabbing sequence and they are not tagged with ALT text.

Finding 2.1. The coloring page images are not tagged with ALT text and do not follow the State Facts icon in tab order. These omissions violate 1194.22 paragraphs A and N of the Section 508 regulation.

Priority: High

Recommendation: Images must follow “State Facts” in sequence. Use the text within the image for the ALT text.

Usability Notes

1. Links to PDFs of the images are needed so they can be printed out for sighted children who cannot use the mouse.

2. A link to download the Adobe Reader is needed.

Next, we have findings for the Coloring pages – Homes screen:

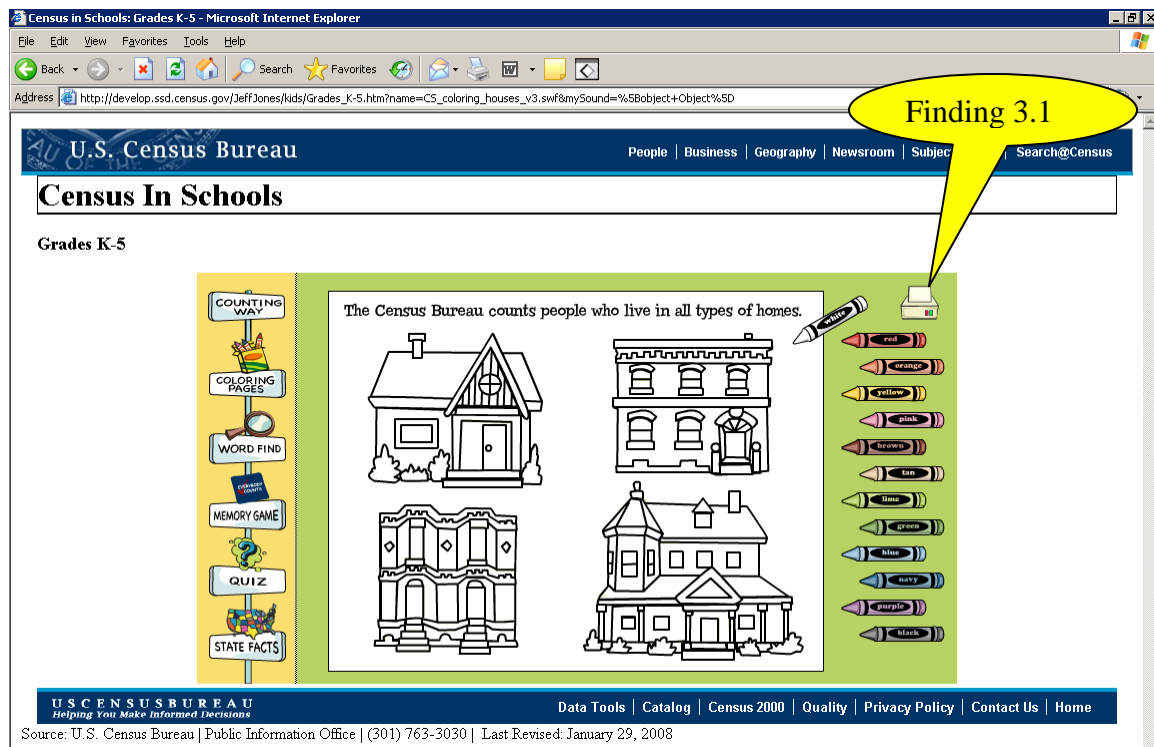


Figure 3. The tab position of the printer icon does not match the visual order on the Coloring pages – Homes screen.

Finding 3.1. Given the visual layout, screen-reader users should expect keyboard access to the printer icon to precede the first crayon selection. This finding applies to all coloring pages. This inconsistency violates 1194.22 paragraph N of the Section 508 Regulations.

Priority: High

Recommendation: The printer icon should precede the first crayon in tab order.

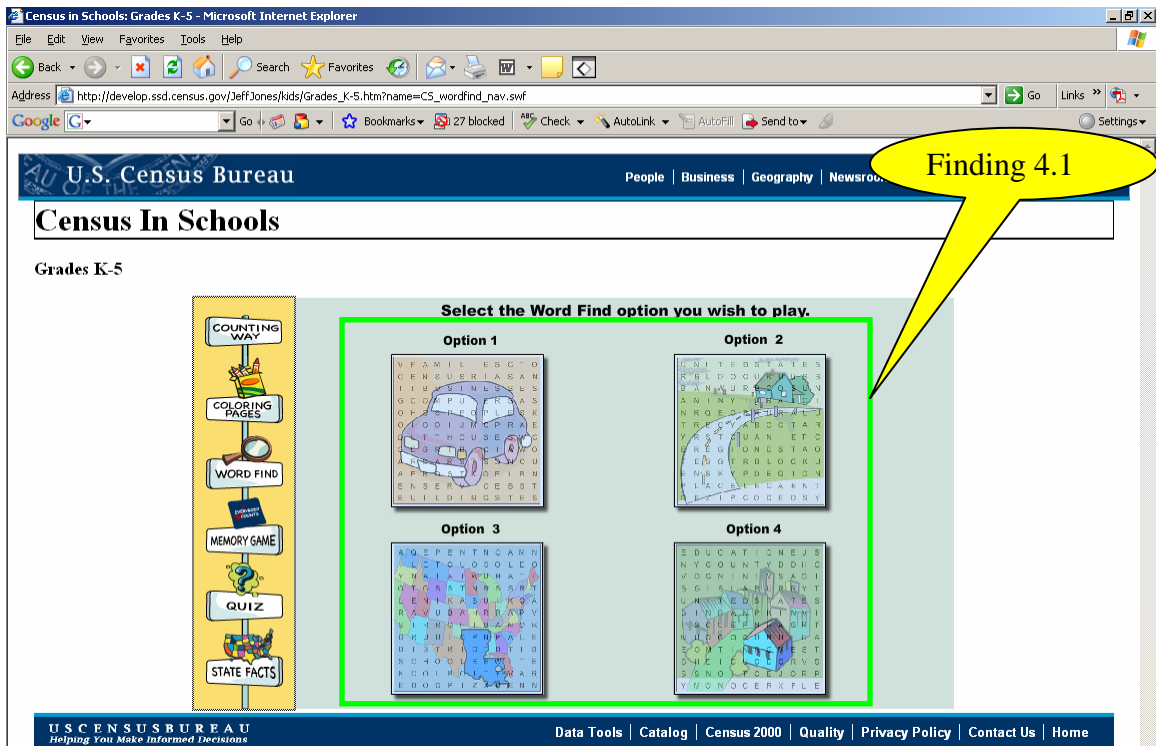


Figure 4. An accessible and usable alternative to the Word Find activity is needed.

Finding 4.1. The four Word Find activities are accessible, but they are too difficult to use due to the memory burden of needing to memorize the positions of many letters. Children with visual disabilities should be offered an activity that will be as much fun for them as the Word Find is for children with normal vision.

Priority: High

Recommendation: The Word Find activities are accessible but not usable. As an alternative, questions need to be created to simulate a word find task structured as an accessible quiz with radio buttons as response options.

Usability Notes

1. Links to PDFs of the word find puzzles are needed so they may be printed out for sighted children who cannot use the mouse.
2. A link to download the Adobe Reader is needed.
3. A printable answer sheet should be available to teachers.

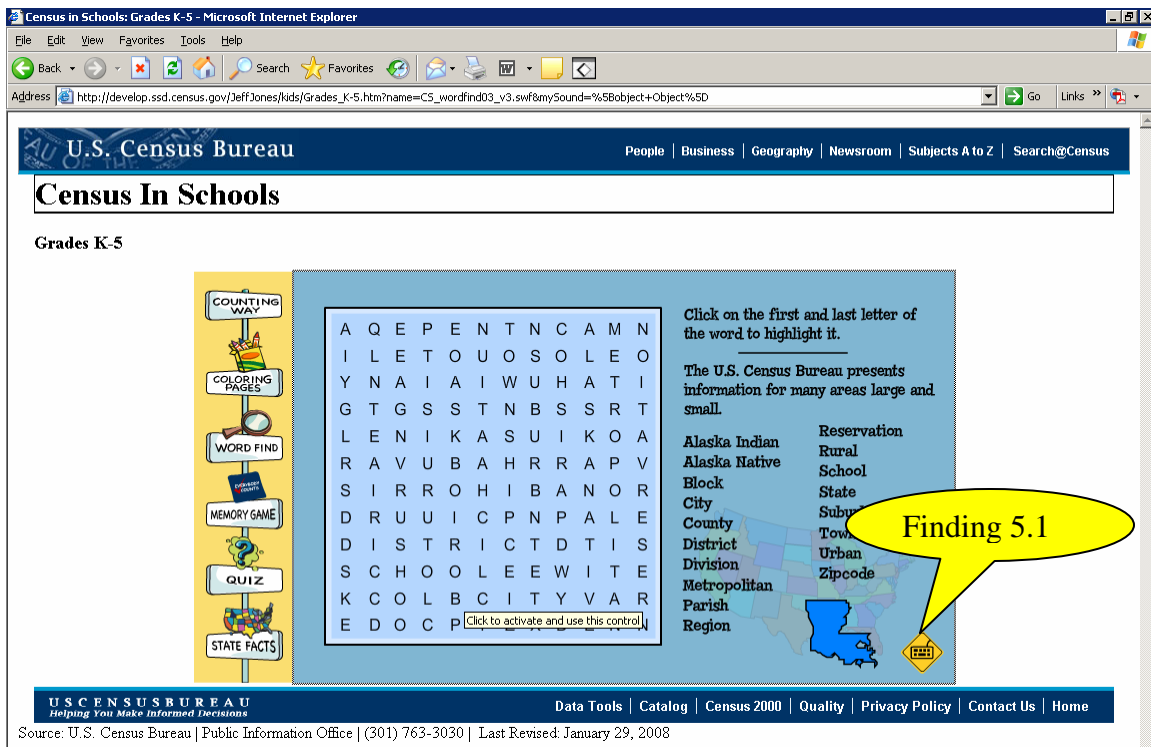


Figure 5. The keyboard icon in the lower right corner is not accessible.

Finding 5.1. The purpose of the keyboard icon is to turn on highlighting of characters to assist low-vision users as they press arrow keys on the Word Find screens. There is no label informing users of the function of the icon. This omission violates 1194.22 paragraph N of the Section 508 Regulations.

Priority: High

Recommendation: The keyboard icon in the lower right corner must have a label. Otherwise, the user will not know its purpose.



Figure 6. Memory Game cards are not labeled properly and the image underneath is not tagged with ALT text.

Finding 6.1. Tabbing does work on this screen but the last two cards are not labeled correctly. Instead, focus is first put on the grid of 16 cards, then on the card-1 button. The 15th and 16th cards are vocalized as card 16 button and 18 button, respectively. When two cards have been selected, the numbers on the remaining cards change. For example, when two cards are matched, such as 5 and 10, a user would expect the remaining cards to keep their starting numbers. However, cards 15 and 16 are announced as “card 16 button and 16 button.” When the last pair of images vanishes, and the screen-reader user hits the down-arrow key or tab key, no text for the background image is detected by the screen-reader software.

These omissions violate 1194.22 paragraph A of the Section 508 Regulations.

Priority: High

Recommendation: Card-button numbers need to stay constant as the game progresses. There are eight pairs of images to make up 16 cards. Each image needs to be assigned unique ALT text that the screen-reader user will hear when he or she clicks on the card buttons. When the last pair of images vanishes, and the screen-reader user hits the down-arrow key or tab key, the ALT text for the background image must be available to the screen-reader software. Some kind of event should occur when the memory game is solved, such as playing a short music clip or sound cue as feedback for the accomplishment. This should be considered since the users are children.



Figure 7. A Quiz character cannot be selected by keyboard commands.

Finding 7.1. While focus is shown by the yellow box around “Alex”, the user is not able to select this option by keyboard commands. A user must select a character to go on to the quiz. This lack of keyboard access violates 1194.22 paragraph N of the Section 508 Regulations.

Priority: High

Recommendation: Assign the spacebar key to perform a left click on any Quiz character button so the user can proceed to the first Quiz screen.

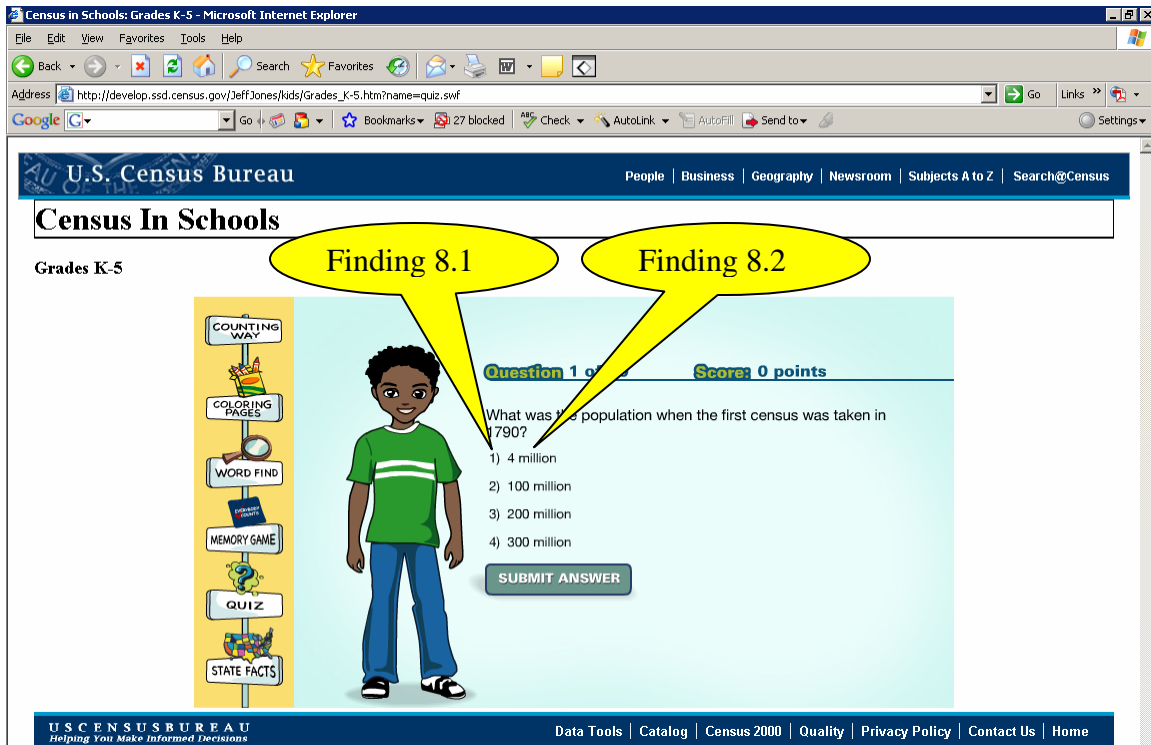


Figure 8. Response options for quiz questions have unnecessary numbering, and information about an option being selected is inaccessible.

Finding 8.1. Numbering the response options adds no value to understanding them.

Priority: Medium

Recommendation: Remove the numbers. (Global)

Finding 8.2. While it is possible to select a single item by the spacebar, the selection status is not available because the current focus is not shown. This omission violates 1194.21 paragraph C of the Section 508 Regulations.

Priority: High

Recommendation: We recommend using radio buttons to provide all users with status on the selected item (selected or not). Screen-reader users will also get information about the position in the list and the number of response options. The clickable area should include the radio button and text to the right. (Global)



Figure 9. Sometimes screen-reader users must navigate backwards to hear the feedback and the ALT text for the checkmark is not meaningful.

Finding 9.1. The problem with this screen is intermittent, possibly due to the timing of when the screen is loaded. When the problem occurs, initial focus is on the “next question” button. The user must navigate backwards to hear the correct answer. This omission violates 1194.22 paragraph N of the Section 508 Regulations.

Priority: High

Recommendation: We recommend when the screen-reader user presses the down-arrow key screen-reader users should hear all text read from the top of the screen and hear “next question button” last. (Global)

Finding 9.2. The current ALT text for the checkmark and “X”, which indicate whether or not an answer is correct, are not meaningful. The screenreader vocalizes a variable name in both instances. This labeling violates 1194.22 paragraph A of the Section 508 Regulations.

Priority: High

Recommendation: We recommend using ALT = “correct” for the checkmark and ALT= “incorrect” for the X. (Global)

Usability Note The number “360” is vocalized for some reason on this screen. (Global)

The screenshot shows a web browser window titled "Census in Schools: Grades K-5 - Microsoft Internet Explorer". The address bar shows the URL: http://develop.ssd.census.gov/jeffjones/kids/grades_k-5.htm?name=quiz.swf. The page header includes the U.S. Census Bureau logo and navigation links: People | Business | Geography | Newsroom | Subjects A to Z | Search@Census.

Census In Schools

Grades K-5

On the left, there is a vertical menu with icons and labels: COUNTING WAY, COLORING PAGES, WORD FIND, MEMORY GAME, QUIZ, and STATE FACTS. A cartoon girl character stands next to the menu.

Question 7 of 10

What was the median family income in 2005?

a) \$51,742

Sorry! The median family income in 2002 was \$51,742. The median family income in 2005 was \$55,832.

A yellow speech bubble points to the feedback text, containing the revised sentence: "Rewrite this sentence as 'The median family income was \$55,832 in 2005, an increase from the 2002 figure of \$51,472.'"

At the bottom, the footer contains: U.S. CENSUS BUREAU | Data Tools | Catalog | Census 2000 | Quality | Privacy Policy | Contact Us | Home. Below this, it says: Source: U.S. Census Bureau | Public Information Office | (301) 763-3030 | Last Revised: January 29, 2008.

Figure 10. Feedback for question 7 is poorly worded.

The feedback is confusing when the wrong answer is selected. The original sentence structure is so similar that it is difficult to comprehend. The revised feedback sentence is shown above in Figure 10.

Summary

Accessibility

This application will need a moderate effort to resolve the accessibility violations identified in this evaluation. Three main types of issues need remediation.

- **Accessibility of controls:** Status of the audio button used to toggle the sound off and on, selection of the quiz character and status (selected or not selected) of a quiz response option, and the keyboard icon on the Word Find activity.
- **Links to plug-in programs:** Links are needed to the Flash player and Adobe Reader.
- **ALT text:** ALT text is needed for the coloring pages, the checkmark and “X” graphics on the quiz feedback screens, and the cards and the hidden image in the Memory Game.

Usability Review

During accessibility testing, some usability issues were revealed. Screen-reader users needed to switch from tab keys to arrow keys to navigate through the Flash portion of the application. We recommend tab navigation be enabled for the Flash application. The audio toggle button on the starting screen needs to be enlarged. The graphic above each signpost on the left navigation bar should be clickable. There is a need for printable answer sheets in the Counting Way and Word Find screens. Numbering responses in the Quiz adds no value and the numbers should be removed. The number 360 is vocalized on the Quiz feedback screens and should be removed. The feedback from Quiz question 7 should be revised for better comprehension.

If the recommendations from the accessibility evaluation and the usability review are implemented, then all young users will be able to enjoy these games and come away with a positive impression of the Census Bureau.