Following the Signs: Children's Use of Visual Cues to Facilitate Website Evaluation

Valerie Nesset

Department of Library & Information Studies, University at Buffalo (SUNY),
544 Baldy Hall, New York 14260-1020 USA
vmnesset@buffalo.edu

Abstract. The paper discusses how research investigating reading strategies can inform web usability design for children by identifying visual cues or 'signposts' that facilitate reading and subsequent evaluation of websites. Using data obtained from a broader study of information-seeking behavior of third-grade students conducted in Montreal, Quebec, Canada the paper reports on the students' use of visual cues when reading and evaluating websites in their search for relevant information. It was discovered that such cues as bolded text, the chunking of textual passages, color, and the thoughtful placement of images all were factors that facilitated quick and efficient evaluation of websites.

1 Introduction

Over the past 15 years and especially with the ever-increasing accessibility and popularity of the Internet both at home and at school, research into online information-seeking behaviors has steadily risen. Yet, even with this increase of studies, the information-seeking behavior of younger children still remains a relatively understudied area. Research has shown that children comprise a user group that is unique in its information needs and information-seeking behavior [1], [2], [3] meaning that they likely do not employ the same strategies as adults when evaluating websites. Indeed, research into children's intellectual behavior has shown that younger elementary school-aged children rely heavily on visual cues [4], [5], [6]. While previous LIS research has also demonstrated the importance young children place on visuals to help them perform such tasks as searching an OPAC [7] or locating a book on a shelf [8] there is a conspicuous lack of research that explores how visual cues could help with website evaluation.

This paper will investigate how third-grade children (aged eight and nine years) can make use of visual cues or "signposts" in order to accelerate online reading and comprehension while at the same time reducing the amount of in-depth reading. Some of the findings arise from a broader dissertation study of the information-seeking behavior of third-grade students conducted in an elementary school located in a suburb of Montreal, Quebec, Canada [9].

J.A. Jacko (Ed.): Human-Computer Interaction, Part IV, HCII 2011, LNCS 6764, pp. 599–606, 2011.

1.2 Theoretical Frameworks

Since effective evaluation of websites is enhanced by knowledge of specific reading strategies on the part of the user (e.g. skimming), and is also impacted by the usability and/or design of the site (e.g. font style and size), it is appropriate to investigate studies in both areas. What reading strategies have been shown to be effective in reading online text? What website design features aid in improved usability for young students?

1.3 Reading Strategies

Elementary school students in the early grades (typically, grades one to three) are often termed "emergent" readers. An emergent reader can be defined as one who has some basic literacy skills but is not yet a fluent reader. Because of this lack of reading fluency, emergent readers often experience significant difficulties reading and comprehending text. While this is an issue with print materials, it can be an even larger challenge in the online environment. Usability research has shown that many people, whether children or adults, have difficulties reading large passages of online text (e.g. [10], [11], [12]). While there is a rich body of literature on reading instruction for emergent readers, there is little that focuses on online reading for this group. Fortunately, some of the studies that focus on reading instruction and the comprehension of text can be applied to the online environment.

Knafle [13] investigated several visual cues that could help young readers to detect and identify word structure. Using an experimental design in a print environment she examined 636 kindergarten to third-grade students to determine the efficacy of underlining and color as visual cues. She found that the use of color and underlining, in their enhancement of pattern similarities, did help with structure detection. By a small margin, underlining was found to be more effective than color. As a result of her findings, Knafle suggested using both color and underlining to help in reading instruction, especially with young readers. In a similar study, one group within a class of elementary school students received instruction in how to perform a "text feature walk" where they identified visual cues such as headings, bolded words, subtitles/headings, sidebars, pictures with accompanying captions, and labeled diagrams [14]. All of the students were then asked to read the text and answer review questions afterwards. The students who performed the text feature walk demonstrated a higher level of comprehension and learned more from the text compared to the students who did not receive the training. Although this was a small pilot study, it reinforces the idea that visual cues can help with reading comprehension.

Another method used in reading instruction is mental imaging. Students are encouraged to create mental images in their minds of the text they are reading. This has been shown to improve comprehension [15]. A corollary to this is picture-naming. In this method, children are asked to identify and describe an image in preparation to reading text that is related to it. However, research has indicated that with certain topics children may describe and/or name images differently than adults [16]. Thus, if the accompanying text is chosen by an adult (which would be the case in the online environment) it could be that the interpretations of the image will differ, perhaps causing problems with reading comprehension.

The rapid expansion of the Internet, the proliferation of information, and the increased efficacy of search engines in retrieving vast amounts of potentially relevant information are just some of the reasons that have highlighted the value of being able to quickly and efficiently read text. Skimming of text is a reading strategy that has been taught for many years, especially in post-secondary academic institutions where students and scholars are required to read, comprehend and evaluate large amounts of information. Yet, while recognized as beneficial, effective skimming was not considered an essential literacy skill. However, the Internet, in its offering of a plethora of information has changed the situation, making skimming a critical information literacy skill, not only for upper-level students and scholars but for others as well. Thus, instruction in how to effectively skim and comprehend text is becoming more prevalent in reading instruction in the latter grades of elementary school and onwards.

There are several strategies used in skimming text which are similar to those mentioned above. In a study investigating the practices of 11 high-level readers from the sixth grade as they searched the Internet [17], it was noted that the students made use of headings and the identification of familiar words to facilitate skimming of the text. Reading the first line of each paragraph was also a common occurrence. The latter method reinforces Pryke's [18] strategy of the "broken read" which encourages students to mentally delineate text into manageable chunks. Research into website usability has also shown the benefits of chunking text for easier reading [10], [11], [12].

2 Website Design and Usability

The increasing size and accessibility of the Internet has resulted in a proliferation of research studies examining website usability. Most of these studies are user-specific, that is, each one concentrates on a particular user group. The exception to this is the work of Jakob Nielsen who has been conducting usability studies with many different user groups for well over a decade. While much of his work concentrates on e-commerce and other adult-oriented sites, he has conducted numerous research studies with children. Recently, he has revisited some of his previous work with children [12] to see what (if anything) has changed. He found that children are still unable to differentiate between advertising features and actual content and have difficulty reading large pieces of text. He recommends use of bolded font, variations in colors or types of fonts, meaningful sub-headings, bulleted lists, and one idea per paragraph to facilitate skimming [11], [12].

According to a government report that pulls together research on website usability in order to provide a comprehensive list of design guidelines [10], important text on the screen should be emphasized. Furthermore, for faster reading, the report strongly encourages the use of black font on a white screen. The report cites evidence that the greater the contrast between text and background, the easier and quicker it is for people to read. The report provides several design guidelines to help address the readability issue. Some of these recommendations include: bolded font to delineate important concepts, bulleted lists, prioritizing content (i.e. important information first), and the use of color.

Color can be used to differentiate texts and to enhance website aesthetics [10], [12]. One innovative study [19] took this notion even farther; the study sought to discover if color was a factor in the establishment of trust and user satisfaction (both of which have been shown to influence e-loyalty) among three different cultures (Canadian, German, and Japanese). While the study was conducted with adults (90 people in their mid-twenties – 30 per country) using an experimental design, its results are relevant. The study found that color did have an impact on levels of trust and user satisfaction and furthermore, that certain colors were better than others, depending on the culture. These findings indicate that color can play a significant role in the evaluation of websites by influencing affective behavior.

Scrolling was a usability concern for all users in the mid-1990s, and especially for children who at that time had little to no computer experience. Nielsen's early research indicated that users were often unwilling to scroll "below the fold" (Nielsen defines the 'fold' as the webpage's initial viewing area) to view more content [20]. Over the past decade, however, access to computers and the Internet has increased dramatically. As a result, scrolling has become a common navigational technique with which users of all ages are more familiar and comfortable. Nielsen [21] cautions, however, that even though users are more comfortable with scrolling, it is still good practice to place the most important information in the initial viewing area.

3 The Study

The broader research study, conducted in winter 2006, was a phenomenological case study in a naturalistic setting—the third-grade classroom. The study explored the information-seeking behavior of two classes (52 students in total) of third-grade students in an English-language (French Immersion) suburban public school in Montreal as they looked for and used information for a class project on how Canadian animals survive in winter [9]. Of the 52 students, 12 (six in each of the two classes) were studied in-depth. Of the six data collection techniques that were used with the 12 sample-group students participating in the study, two have informed this paper: semi-structured interviews (transcribed) and participant observation (field notes in addition to screen and voice captures of 12 Internet search sessions (done in pairs during the allotted class computer time of a maximum of 45 minutes per week) through the use of Camtasia™ software). These data collection methods are similar to those used by Coiro and Dobler [17] in their investigation of the practices of advanced sixth-grade readers when searching the Internet, except they had the children perform a talk-aloud protocol while they searched. The advantage to using a screen and voice-capturing software, however, is that the participants do not have to painstakingly describe what they are doing, which can often slow them down and cause them to lose their focus as they strive to explain all of their moves instead of concentrating fully on the task at hand. The software records all of the participants' screen maneuvers along with their conversations, allowing them to focus on the search; in fact, after the first few minutes the children forgot that they were being recorded as they discussed with their partners their various search strategies and opinions on the information they retrieved. This allowed for a very natural and realistic process resulting in a rich data set. Analysis of the data followed a Grounded Theory approach using the Constant Comparison method which involves extensive coding of the data [22]. Coding was performed using NVIVO™ software.

4 Findings

The 12 study participants (five boys and seven girls) could all be described as emergent readers in English, mainly due to the fact that they were receiving instruction in two languages, English and French. They were unwilling to read for long periods of time on the Web and often jumped from website to website in their search for "good information". They tended to get distracted easily and did not have a long attention-span. Since the amount of time they had to search the Web was very short (usually only about 30 minutes) and their reading abilities limited, they were unable (or unwilling) to spend long periods of time carefully scrutinizing and reading large passages of text to find a few relevant pieces of information. Thus, they relied on the presence of visual signposts in order to accelerate the evaluation process while at the same time reducing the amount of in-depth reading.

One of the signposts that students found helpful was the use of bolded font to visually delineate relevant terms. Most often these terms appeared within section headings on a website and the children were able to quickly and easily match the words with their search terms. As Mary (all the names are pseudonyms) stated, "Well, I go to the website and read…like, if I'm looking for the habitat I look under the habitat and see which habitat describes most of it." Gertie was more precise in her articulation of her strategy; she relied first on the title of the website and if it looked promising, she would use other signposts, "…maybe its title is pretty good. Like, the title, I look at the title first, then I click on that and if I see, like, a lot of good things like habitat, where it lives, what it looks like, pictures, I'll probably stay on that website for quite awhile and pick out a lot of information and I'll go on another website." These two quotes reinforce the idea that while this matching process was somewhat useful, the students still had to read at least some of the body of text within the section to determine whether or not the information was useful. As for focusing her attention on key concept words that were bolded or in different font within the body of the text, Gertie was clear that she did not find this a useful strategy since she found many of the words "hard" and difficult to understand.

The students all used the presence of images as an indicator of a "good" site, likely because the images tended to be far more eye-catching than text. Often, they were disappointed. As Amy reflected, "Cause first like, I saw good pictures, I thought it would be like good ones so I went on the first page and it wasn't very good so I went on the second page and I went down and if I saw like, it looked good then I'd click on it…if it wasn't good then I wouldn't." Upon analysis of the Camtasia™ data, it is clear that while the students frequently retrieved and examined images of the particular animal they were investigating, often the subsequent textual description was not relevant to their needs. This was usually because the site being looked at was commercial (one girl spent several minutes thoroughly but unsuccessfully investigating a pet-food site for information on the Arctic fox). It should be noted, however, that the most efficient evaluations happened when an image was located close to brief passages of relevant textual information. Conversely, if there were no images accompanying the text, or if the accompanying text was not chunked in some way, the students often quickly left the page. Sometimes, even though an image was unrelated to the child's animal the student would become distracted and spend precious time looking at it. This behavior happened more often with the boys than the

girls. An example of the lure of images was Bill who, when searching for information on the cougar, became distracted by a site full of images of the car with the same name. Bill and his partner spent most of the search session examining the car site rather than moving on to find information about the animal.

Text that was divided into chunks provided a broad signpost that helped the children to more easily detect relevant information. If the chunks were preceded by headings that included search terms and/or placed next to relevant images they were scrutinized even more carefully. Conversely, if a site contained long uninterrupted passages of text, even if accompanied by an image, the students would often abruptly leave it before they had read a word.

In the interviews and in the search sessions, although the children did not explicitly mention color it did appear to have at least some influence on their information-seeking behavior. Review of the search sessions revealed that different colored text was considered in the same way as bolded font; that is, the children seemed to perceive it to be of greater importance and were drawn to it first. The same can be said about the use of different fonts to delineate concepts—although the children did not explicitly talk about them, they did seem to notice them. Sometimes, however, the font style was difficult for the children to read and hindered rather then helped them.

In terms of scrolling, the children did not seem to mind scrolling up and down pages although they sometimes ran into mechanical difficulties when there was more than one scrollbar on the screen. Despite these difficulties, they quite happily scrolled through pages of search results and websites. Indeed, the downside was that they typically scrolled (using the scrollbars provided) up and down a site much too quickly, often overlooking signposts that potentially could have led them to relevant information.

5 Discussion

The findings of the study reinforce many of the results of previous research into reading and web usability. The students made use of visual signposts such as bolded font in titles and subheadings, chunked text, images, and color to facilitate and accelerate their reading and subsequent evaluation of website content. Bolded font facilitated the students' searches by delineating important concepts. This feature was even more useful when the bolded words were a direct match to the search terms used. Due to lack of empirical evidence, it cannot be said with certainty that the use of color or different fonts to delineate concepts was as effective although they did appear to draw the students' attention. Some fonts (e.g. cursive script), however, were difficult for the children to read as they had no prior experience with them.

The placement of images was an important factor that influenced the children's efficiency and speed when evaluating a site. A well-placed image would immediately draw a student's attention and if it was accompanied by manageable chunks of relevant text, the student was able to extract information quickly and easily. More typical situations, however, included sites that contained images that drew the student's attention even though they were unrelated to the intended search and/or sites that contained relevant images but were quickly passed over due to the daunting presence of long passages of text.

The chunking of text was an effective visual tool. Its most useful feature was that text presented in this manner appeared to be perceived by the children to be easier and more interesting to read than did long un-demarcated passages of text. The latter, when viewed, usually prompted the child to leave the page in search of more accessible information.

Color, although it appeared to be less of a factor than some of the other visual signposts, still wielded some influence on the students' perceptions of a site. They were drawn to differently colored text, although they did not always equate it with importance ('good information') as they did with bolded font. Differently sized and shaped fonts also would draw their attention but more for their aesthetics than content.

Scrolling, although not a navigational impediment as shown in earlier research, sometimes hindered the students' awareness of visual signposts. Often the students would scroll so quickly up and down the pages that they missed visual cues that indicated potentially valuable information. This indicates that web designers, in order to attract and keep the attention of young users, should try to include the most important content above the fold, perhaps in summary form accompanied by images.

6 Conclusions

Thanks to increased access, today's young students are becoming more and more web-savvy in terms of basic navigation and other computer skills. This increased access to the Web, however, does not seem to translate into improved online reading skills. This study investigated 12 third-grade students to discover how they made use of visual cues to help them to more quickly and efficiently evaluate website content without having to engage in in-depth reading. It was determined that bolding font and using color to delineate important concepts, chunking text through the use of headings and white space, embedding images within shorter passages of text, and ensuring that important information is presented in the initial viewing area to discourage indiscriminate scrolling, were all effective signposts that facilitated quick reading and evaluation of potentially useful sites. Conversely, sites that contained elaborate scripts, long passages of uninterrupted text, headings that did not contain familiar search terms, and sites that required extensive scrolling were shown to be detrimental to successful reading and evaluation. Web designers, especially those who are creating websites for children, would be well advised to take these things into consideration when presenting content. The inclusion into webpages of meaningful visual cues that will encourage children to "follow the signs" will make for satisfying and successful information search sessions.

References

1. Walter, V.A.: The Information Needs of Children. Advances in Librarianship 18, 111–129 (1994)
2. Shenton, A.K.: Children's Information Needs: Why do we Know so Little? Library and Information Update 3, 30–31 (2004)

3. Shenton, A.K., Dixon, P.: Issues Arising from Youngsters' Information-Seeking Behavior. Library and Information Science Research 26, 177–200 (2004)
4. Kail, R.V.: Children and their Development, 3rd edn. Pearson Education, Upper Saddle River (2004)
5. Piaget, J., Inhelder, B.: The Psychology of the Child. Basic Books, New York (1969)
6. Siegler, R.S.: Children's Thinking, 3rd edn. Prentice Hall, Upper Saddle River (1998)
7. Borgman, C., Hirsh, S., Walter, V., Gallagher, A.L.: Children's Searching Behavior on Browsing and Keyword Online Catalogs: The Science Library Catalog Project. Journal of the American Society for Information Science 46, 663–684 (1995)
8. Cooper, L.Z.: A Case Study of Information Seeking Behavior in 7-Year-Old Children in a Semistructured Situation. Journal of the American Society for Information Science and Technology 53, 904–922 (2002)
9. Nesset, V.: The Information-Seeking Behavior of Grade-Three Students in the Context of a Class Project. Unpublished Dissertation, McGill University, Montreal, Quebec, Canada (2009)
10. U. S. General Services Administration. Research-Based Web Design & Usability Guidelines. U.S. Dept. of Health and Human Services: U.S. General Services Administration, Washington, D.C (2006)
11. Nielsen, J.: How Users Read on the Web. useit.com-Alertbox (1997), http://www.useit.com/alertbox/9710a.html
12. Budiu, R., Nielsen, J.: Usability of Websites for Children: Design Guidelines for Targeting Users Aged 3 – 12 Years, 2nd edn. Nielsen Norman Group, Fremont (2010), http://www.nngroup.com/reports/kids/
13. Knafle, J.D.: Cues Aiding Structure Detection. Reading Research Quarterly 8, 502–523 (1973)
14. Kelley, M.J., Clausen-Grace, N.: Guiding Students Through Expository Text with Text Feature Walks. The Reading Teacher 64(2010), 191–195 (2010)
15. Olson, M.W., Gee, T.C.: Content Reading Instruction in the Primary Grades: Perceptions and Strategies. The Reading Teacher 45, 298–307 (1991)
16. Cycowicz, Y.M., Friedman, D., Rothstein, M., Snodgrass, J.G.: Picture-Naming by Young Children: Norms for Name Agreement, Familiarity, and Visual Complexity. Journal of Experimental Child Psychology 65, 171–237 (1997)
17. Coiro, J., Dobler, E.: Exploring the Online Reading Comprehension Strategies Used by Sixth-Grade Skilled Readers to Search for and Locate Information on the Internet. Reading Research Quarterly 42, 214–257 (2007)
18. Pryke, D.: Primary School Study Reading. Reading 26, 30–36 (1992)
19. Cyr, D., Head, M., Larios, H.: Colour Appeal in Website Design within and across Cultures: A Multi-Method Evaluation. International Journal of Human-Computer Studies 68, 1–21 (2010)
20. Nielsen, J.: Original Top Ten Mistakes in Web Design. useit.com-Alertbox (1996), http://www.useit.com/alertbox/9605a.html
21. Nielsen, J.: Scrolling and Attention. useit.com-Alertbox (2010), http://www.useit.com/alertbox/scrolling-attention.html
22. Glaser, B.G., Strauss, A.L.: The Discovery of Grounded Theory: Strategies for Qualitative Research. Aldine Publishing, Chicago (1967)