The Importance of Choice Design for Low Literate User Experience

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Abstract. This research addresses a significant gap in our understanding of low literate behavior in online search. We explore how both low- and high-literate online consumers make decisions at the point of purchase in an online shopping task. We measured percentage fixation duration of AOIs during decision-making on four search engine results page (SERP) tasks. Qualitative and quantitative results combined suggest that tabular SERP may contribute to the success of low literate consumers making sophisticated trade-off decisions. Furthermore, we propose that tabular SERP choice design may improve low literate user experience for more general SERP choice design.

1 Introduction

Literacy involves a range of cognitive skill including discourse understanding, inferential reasoning, and numerical calculation. Low literacy may also negatively impact memory processes [1] and be associated with reduced working memory. The 2003 National Assessment of Adult Literacy (NAAL) indicates that 14% of adult Americans have no more than the most basic and concrete literacy (below basic), while an additional 29% can perform only basic every day literacy activities.[1]

Viswanathan, Rosa, and Harris [2] find that functionally illiterate consumers exhibit cognitive challenges and coping behaviors that differ markedly from literate consumers. Low literate consumers tend toward **concrete reasoning**, basing decisions on the concrete meaning of single pieces of information without regard to other product attributes or information [2]. This manifests during decision-making and analysis of trade-offs. Low literate consumers may focus exclusively on one dimension — such as price — without regard to size, number, quality, or other attributes.

Another common tendency is toward **pictographic thinking**. Low literate consumers may visualize verbal information in a scene (such as brand, price, store sign, etc.) as an image rather than actual text [2]. Low literate consumers may also make trade-offs between price and size using physical package size rather than unit or volume price information [2].

[1] http://nces.ed.gov/naal/kf_demographics.asp

Finally, Jae and Delveccio [3] find that low literate consumers may be influenced by **peripheral cues** such as stylistic attributes of packaging over more central information such as written attributes. They suggest that visual decision aids may help low-literacy consumers reach more normative decisions: for example, by depicting a count attribute visually rather than textually.

While Russo and Leclerc [4] studied consumer behavior in eye fixations in a laboratory simulation of supermarket shelves, to our knowledge there exist no comparable studies of low literate consumer behavior in an online shopping environment.

2 Procedure and Measures

This experiment required two groups of native English (low and high literate) subjects to interact with search engine results pages (SERP) from Walmart.com (fig 1). 30 low and 15 high literate participants were recruited in the Baltimore, MD area. They were screened using the Rapid Estimate of Adult Literacy in Medicine (REALM) test. Potential low literate subjects were recruited only if they scored 60 or less on the REALM test and also self-reported as having basic computer skills (use of a mouse, typing, scrolling, navigating to a web page, and click on a link).

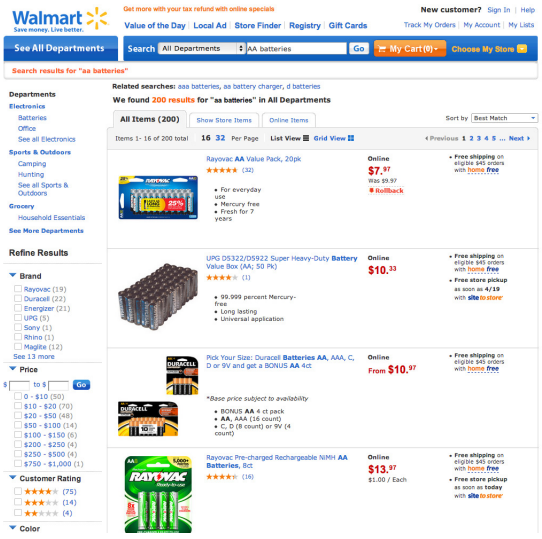

Fig. 1. Walmart.com search results

Eye-tracking was accomplished using the Tobii T60 eye-tracker on a 17" TFT monitor set at a resolution of 1024x768 sampling at the rate of 60 Hz. We used the I-VT Fixation filter from which fixations of less than 60 ms were discarded.

By marking search results with rectangular areas of interest (AOIs), we were able to examine behavior such as fixation counts and duration in AOIs.

At the start of each session, the eye tracker was calibrated. Each subject was given the same set of four tasks in the same order (table 1). Subjects were directed to search for a particular item using the search bar. In order to make SERP comparable across participants, we generated a static SERP for each search query. Participants were later asked questions about the tasks presented.

Table 1 illustrates information available to the user per column (AOI).[2] Though the columnar format provides the means to organize comparable data, some fields contain more than one piece of information. For example, users can see count and type information for AA batteries both visually (in the image column) and textually (in the description column). This made the use of post-task questions that much more important for understanding what subjects were thinking.

For our analysis, we were concerned with difference in choice behavior between high literate and low literate subjects in terms of percentage fixation duration for an AOI relative to all four AOIs. We did not have time to complete a scan path analysis, which might have revealed patterns such as co-variance between specific columns as well as phases of behavior such as orientation, evaluation, and verification [4].

Table 1. User choice tasks

Item	Image	Description	Price	Shipping
Broom	Style, Options (e.g., dustpan)	x	x	x
Laundry Soap	Brand, Type (e.g., cubes, liquid)	x	x	x
AA Batteries	Count, Type (e.g., re-chargeable)	x	x	x
Walking Shoes	Colors, Style, Brand	x	x	x

3 Results

Collecting quality eye-tracking data for low literate users is challenging. A substantial proportion of our low literate data was of very poor quality: we were able to use data from only 11 subjects. From prior experience, we find this is

[2] An "x" simply indicates that the element was present.

not uncommon for eye-tracking studies of low literate users. And, though the high literate data was generally good, we were able to use data from only five subjects.[3]

Though video, gaze plots, and questionnaire results were informative, fixation data was particularly helpful for comparing low and high literate behavior within and across trials. It is difficult for researchers to visually gauge behavioral changes that occur on the scale of milliseconds. The graphs below illustrate percentage of fixations across the four AOIs for each trial. Blue bars represent low literate subjects, while pink bars represent high literate subjects. Vertical black lines within blue and pink bars indicate standard deviation at 95% confidence. The sample size was too small to draw conclusions from eye-tracking data alone.

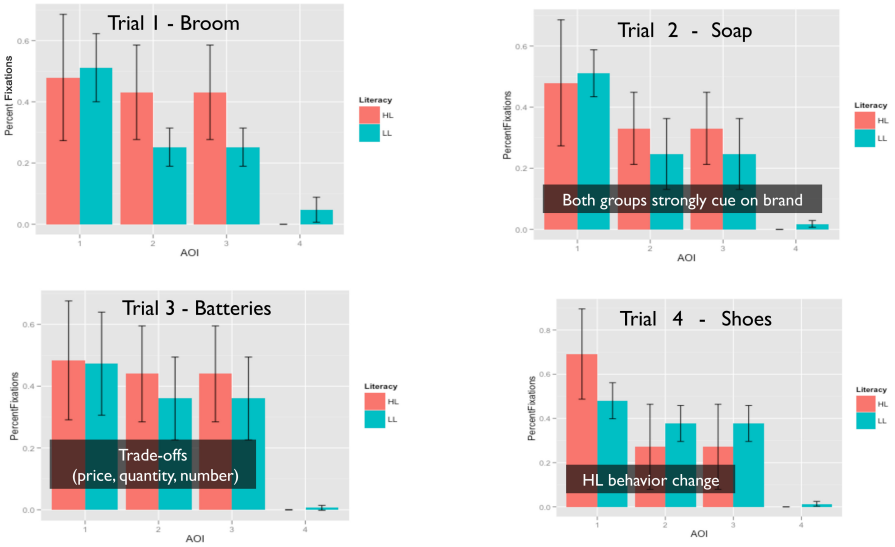

Fig. 2. Percent fixation duration for each task

However, we observed in task 3 (batteries), low literate behavior very closely resembles high literate behavior. **For the AA battery condition, low literate subjects were able to make decisions of comparable complexity and sophistication to high literate users**. Even in post-task questions, both populations indicated very similar choice decisions based on trade-offs of price, quantity, and number of batteries. In task 2 (laundry soap), both groups strongly identified with a brand choice. Considering both eye fixation duration and answers to post-task questions, it seems high and low literate subjects both cue

[3] 7 sessions were eliminated due to a discrepancy in the collection procedure and 3 were of poor quality.

strongly on brand. Finally, in task 4 (shoes), we observed that high literate subjects more strongly cued on visual attributes than they had in previous tasks.

4 Discussion and Conclusion

In a study of low literate consumer behavior in an online shopping point-of-purchase task, we did not see the sorts of behaviors described by Viswanathan, Rosa, and Harris [2]. We found that **low literate users were able to make successful complex trade-off decisions**. Though some high literate subjects seemed bored with the task, low literate subjects were engaged and reportedly enjoyed the tasks. Most had never done online shopping before and left feeling confident and interested in trying this on their own. We believe this is largely attributable to the information organization of the columnar SERP product data that made it easier to make choice comparisons across a range of product attributes.

Our pilot study supports Thaler, Sunstein, and Balz [5]: a good choice architecture helps people improve their ability to map and therefore select better options. In other words, when complex information is teased apart into distinct semantic attributes, it becomes easier to distinguish information and make better comparisons, and therefore, more informed choices.

Results from this study suggest that a **tabular SERP choice design may improve low literate user experience for other purposes (e.g., medical or financial decisions)**. Our findings are compatible with similar conclusions drawn by Kammerer and Gerjets [6] in a study of search result trustworthiness on medical topics. In fact, we suspect that a good choice design for low literate users may lead to learning about how make better choices on their own [5].

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