Analysis of Factors Affecting Screen Reading Efficiency and Countermeasures

Chang Wei

School of Foreign Languages and cultures, Panzhihua university, Sichuan, China

Abstract: Mobile learning has become the primary mode of learning in the internet era. However, many factors associated with screen reading on mobile devices are restricting the reading efficiency of learners. Based on a questionnaire survey, this paper analyzes the visual, psychological, and environmental factors that affect screen reading efficiency and offers suggestions for improving it, thereby providing scientific guidance for mobile learners.
Keywords: Screen Reading, Mobile Learning, Reading Efficiency

----

I. Introduction

With the further integration of information technology and education, the learning medium has rapidly shifted from paper books to electronic products. The "2020 China Digital Reading Report" shows that the scale of digital reading users in China has reached 494 million, with an average of 6.2 paper books read per person. Electronic reading, mainly through mobile phones, tablets, e-books, and other mediums, is becoming an increasingly important way of reading. Screen reading on mobile devices, with its convenience, rich content, and diverse forms, not only meets the fragmented learning needs of learners but is also closely integrated with current teaching reforms such as flipped classrooms and blended learning, becoming the main reading method for campus students' mobile learning. However, a random questionnaire survey of 200 students showed that 79% of students prefer paper reading, believing that screen reading has problems in terms of reading focus, depth, experience, and effect. The author believes that discussing the factors affecting reading efficiency in screen reading is not only of certain guidance to learners themselves but also has important guiding significance for teachers in scientific task allocation.

II. Screen Reading

Screen reading (Screen-reading) is a new type of learning method derived in the digital age, also known as digital reading (Digital-reading). Kevin Kelly believes that screen reading refers to the conveyance of text through pixels on media such as computers, mobile phones, televisions, electronic display screens, and tablets, and users can annotate, collect, link, and share reading behaviors on the display [1]. It is different in essence from traditional paper reading in terms of the reading carrier, content, method, and experience, and is a new type of reading behavior that includes multiple interactive elements.

Based on the strength of interaction between the screen reading platform and the reader, the screen reading platforms for campus learners can be roughly divided into three categories: The first category is represented by smartphones and tablet computers as strong interactive reading platforms. These platforms can realize rich content for screen reading, conveniently update content, have strong human-computer interaction, and the platforms have multiple functions such as communication, entertainment, and learning. The second category is represented by Kindle e-readers as single-function reading platforms. These platforms highlight the main function of text reading, pursue the sense of experience and convenience of reading, have relatively single screen reading content, and the content is conveniently updated with moderate human-computer interactivity. The third category is represented by television as a pure display-type reading carrier. These products focus on the display of information, with not high richness and selection of content, poor screen reading experience, and weak human-computer interactivity.

With regards to the debate on the advantages and disadvantages of screen reading versus print reading, there is no consensus yet. Supporters of screen reading argue that it has the following advantages: 1. Cost advantage in reading. Reading materials such as e-books are easier to access and update, making them more cost-effective than purchasing physical books. 2. Convenience in reading and sharing. Portable readers and various screen devices can serve as reading platforms, and internet-connected devices enable instant sharing of reading content, greatly enhancing the flexibility and interactivity of reading. 3. Information retrieval advantage.

For digital reading platforms, vast amounts of digitized information can be quickly located and accessed through search functions, significantly improving the efficiency of reading. However, opponents of screen reading argue that: 1. Screen reading is only suitable for superficial and browsing-style learning, not for in-depth learning. 2. Screen reading has a more severe impact on visual health. 3. The natural presence of disadvantages in screen reading affects the reading efficiency of learners [2].

In a questionnaire survey of 200 students, it was found that the daily screen reading of students is mainly completed on smartphones and tablets or iPad, followed by computers, and the proportion of reading on other readers such as e-readers and television is less than 10%.

III. Factors Affecting Screen Reading Efficiency

3.1 Visual Factors

Vision is the primary medium for humans to acquire external information. The transmission of visual information not only requires accurately and clearly conveying various types of information to the audience, but also aims to satisfy people's emotional and aesthetic needs. Considering the commonly used learning platforms among students currently, there are several factors that affect the quality of reading. First, font factors. The font and font size of the text displayed on the terminal devices have a significant impact on the effectiveness of information transmission. Selecting appropriate fonts and font sizes not only helps improve the efficiency of information transmission, but also prevents readers from experiencing visual fatigue due to prolonged reading. 86% of students indicated that they would adjust the font to a size and style that suited their preferences when reading on a screen, believing that this enhances their reading enjoyment and efficiency. Second, color and brightness factors. Classical color vision theory divides colors into cool and warm tones based on wavelength, which have different effects on vision and psychology. 94% of students believe that color has a clear visual and psychological cueing effect. Generally speaking, a combination of a light-colored background with dark-colored text or a dark-colored background with light-colored text works best. Appropriate screen brightness can reduce eye fatigue and discomfort, improving reading efficiency. Under screen reading conditions, due to the bright screen color scheme and brightness that exceeds the environment, college students' eyes tend to experience fatigue, leading to slower reading speeds and decreased comprehension ability [3].

3.2 Psychological Factors

In the context of digital reading, reading psychology tends to exhibit some unfavorable tendencies towards deep reading in terms of motivation, choice, attitude, and cognition[4]. When reading on screens, students tend to prefer quick browsing and scanning rather than systematic and in-depth reading. This browsing mode makes it difficult to establish a complete and accurate understanding, easily leading to information overload, difficulty in effectively identifying and memorizing important information, and superficial information retention. Compared to paper reading, the text displayed on screens is limited by screen size and resolution, unable to fully reproduce the texture and tactile sensation of paper books, and unable to create certain tactile experiences of reading on paper. Some students may feel uneasy when lacking these experiences. Due to long-term habits of printed reading, the human brain prefers linear and coherent reading experiences. However, screen reading is more fragmented and scattered, resulting in differences in brain processing methods and affecting comprehension. The survey found that 78.6% of students believe that paper reading enables a more accurate understanding of the content. Meanwhile, 84.3% of students believe that the tactile sensation of paper reading can deepen the understanding of reading.

3.3 Environmental Factors

Most screen reading devices are connected to the internet, and readers often encounter interference from other concurrent programs on the device during the reading process, which affects the effectiveness of screen reading[5]. Reading requires concentration. During screen reading, distractions such as flashing notifications, frequently popping-up advertisements, and hyperlinks of media content often create an unpredictable and diverse reading environment that is more likely to distract readers, thereby affecting reading efficiency. Screen reading often relies on internet connectivity, which inevitably exposes readers to such distracting environments. The survey found that 92.3% of students believe that the likelihood of screen reading being interrupted by other information is far greater than that of paper reading. Additionally, 81.8% of students tend to immediately check and deal with other information that suddenly appears during screen reading. This behavior often interrupts the reading process and disrupts the thinking process formed during reading, which is not conducive to knowledge construction and the formation of in-depth thinking.

IV.   Countermeasures

Based on the above factors affecting screen reading efficiency, the following measures should be considered by the creators of reading materials and readers to minimize the impact on the reading quality of readers as much as possible, thereby achieving the goal of improving reading efficiency.

4.1 Adjust screen settings.

When reading long-form content, adjust the font size to a suitable size for yourself, and properly adjust the screen brightness, contrast, and color temperature to ensure a comfortable reading environment. Ensure that the text is clearly visible to reduce eye strain. Additionally, set the font to a style you are familiar with to adapt to your reading preferences, reducing the reading burden caused by unfamiliar fonts and improving reading efficiency.

4.2 Adjust reading duration.

Staring at the screen for a long time can cause eye fatigue and dryness, which reduces the willingness to continue reading and diminishes reading interest. Therefore, readers should limit the time spent reading on screens and ensure sufficient rest and recovery time between each reading session. Avoid reading continuously on screens for long periods, control the frequency of reading appropriately, give your eyes a break, and minimize the decline in reading efficiency caused by discomfort.

4.3 Cultivate concentration.

It's best to read in a quiet environment, turning off other applications or notifications that may distract your attention. Create a focused reading space to concentrate and improve your reading effectiveness.

4.4 Reasonable use of auxiliary software.

Screen reading often has auxiliary software available, such as bookmarks, highlighting, screenshot capturing, and information extraction functions. When reading long articles or e-books, using these functions can effectively mark important information, extract and save key information, making it convenient for quick retrieval and review later on. This significantly improves reading efficiency. Meanwhile, some reading applications and browsers offer a column view feature that splits the text into narrower columns, which helps with focusing one's attention. Additionally, reading tools like screen readers can also provide better reading assistance and enhance reading efficiency.

V.   Conclusion

Screen reading and paper reading have their respective advantages, suitable for different reading scenarios and personal preferences. Screen reading excels in portability, search capabilities, and adjustability, making it suitable for quickly accessing information and for long-duration reading sessions. Paper reading, on the other hand, offers greater comfort for the eyes, ease of navigation, and the convenience of not requiring electricity, making it ideal for in-depth reading and academic research. Ultimately, the choice of reading method depends on individual needs, preferences, and reading purposes. As technology advances, the boundary between the two becomes increasingly blurred. For example, augmented reality (AR) and e-ink technology may combine the convenience of screen reading with the comfort of paper reading.

REFERENCES

[1].   Kevin Kelly (US), "The Digital Age: A New Way of Reading" [A]. Chinese Reading: National Reading Blue Book (Volume 2) [C]. Beijing: China Book Publishing House, 2011: 322-324.
[2].   Li Wenye and Yao Jijun, "An Empirical Study on the Impact of Electronic Reading on Reading Literacy." Open Education Research, 2021, 27(02): Pages 110-120.
[3].   Yang Shengyuan et al., "A Study on the Differences between Paper Reading and Electronic Screen Reading." Science Education Guide (Early Edition), 2018(28): Pages 63-66.
[4].   Li Ying and Liu Huayu, "A Study on the Visual Communication Modes and Effects of Screen Reading." Publishing Science, 2019, 27(4): Pages 63-69.
[5].   [5]. Are Screen Reading and Paper Reading Equivalent? --- A Meta-analysis based on 43 experimental and quasi-experimental studies. Chinese Journal Of Distance Education, 2023, NO.8:Pages 25-34