The Effect of Typography on Engagement

Bhagawat Chapagain

Department of Computer Science, Stevens Institute of Technology, bchapaga@stevens.edu

Samhita Chunduru

Department of Computer Science, Stevens Institute of Technology, schundur@stevens.edu

Konstantinos Mokos

Department of Computer Science, Stevens Institute of Technology, kmokos@stevens.edu

Divya Prahlad

Department of Computer Science, Stevens Institute of Technology, dprahlad@stevens.edu

1. MOTIVATION AND BACKGROUND

Typography is a fundamental component of design. It's essential in determining how users engage with technology. It is necessary to study Human-Computer Interaction (HCI), especially when it comes to user interface design. A user's experience can be greatly influenced by the employment of different fonts and typographic styles, which can elicit a variety of emotions, actions, and associations. An interface can feel friendlier and more approachable with a well-chosen font, which increases user engagement. This is particularly crucial in the age of digital communication, as typography provides a visual aid for communicating ideas. By creating a visual hierarchy, the usage of various typefaces, font sizes, weights, and styles can influence how quickly users can find important information on a screen. This is especially true in fields like programming, where code accessibility can affect maintainability. Code can be made more difficult to comprehend by using a poorly designed typeface or a cluttered layout, which could result in errors and decrease productivity. In this situation, typography functions as a useful tool that can have a big impact on the user's efficacy and productivity.

The Problem: Engagement and comprehension with academic texts often presents a challenge. This issue is caused by two main factors. Firstly, attention span becomes a challenge when engaging with academic texts. Extended paragraphs, small fonts sizes, and dull layouts that make the material seem intimidating and tiresome might worsen this difficulty. The challenge lies in presenting the information in a manner that is easy to digest and holds interest. Secondly, the capacity to take in and remember information is crucial to comprehension. By hiding important details and disrupting the text's flow and organization, badly designed typography can impede this process. Retention and comprehension suffer as a consequence. Improving reader engagement is the main issue that needs to be addressed. Enhancing the typographic design of academic texts makes the information more readable

and interesting, which increases comprehension and attention span. This entails giving considerable thought to elements like text structure, layout design, and font selection. These problems can be solved to greatly improve the reading experience and make academic texts easier to read and comprehend.

In light of these challenges, the focus shifts towards enhancing the typographic design of academic texts. This approach aims to make the content more accessible and engaging, thereby improving both attention span and comprehension. Factors such as font choice, layout design, and text structure are given careful consideration. The significance of typography in the communication of information is emphasized by this work. It also offers a road map for increasing academic texts' design, which will increase their readability and accessibility. This work advances the subject of HCI by highlighting the significance of typography in user experience and interaction. It creates new opportunities for study and creativity in UI design, especially when it comes to academic texts.

2. RELATED WORKS

2.1 Influence of Textual Attributes on Social Media Engagement

Previous studies have examined how textual characteristics affect users' interaction with posts on social media. For example, the research done in 2022[1] looks at how textual attributes like readability, length, and hashtag count affect user interaction and brand recognition in branded Facebook photo postings, with a specific emphasis on the setting of a clothing store. The study's conclusions highlight the beneficial relationships that have been found between lengthier texts, more hashtags, and greater engagement metrics, such as, likes, reach, and impressions. Interestingly, readability indices show significant relationships with engagement and awareness indicators, highlighting the strategic significance of readability and text complexity in social media content optimization for increased user engagement and brand recognition.
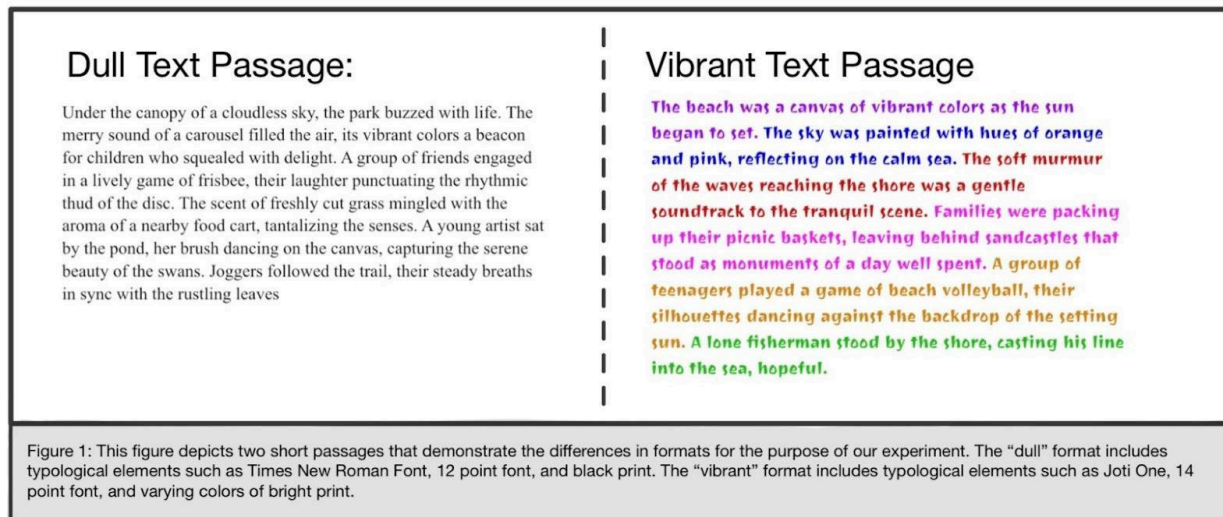
2.2 Inspiration from Theme Generation Models.

We took inspiration from Adobe's "Themes for Readability with Iterative Feedback" (THERIF)[2] generative model to investigate various aesthetics and how they affect user engagement in our project. The researchers at Adobe, under the direction of Tianyuan Cai, a research engineer with expertise in human-computer interaction, developed a model for producing "final reading themes" that indicate how engaged readers are with written material. The graphic depicting the THERIF model highlights the significance of utilizing crowdsourcing platforms like Prolific to capture a range of preferences. This method asks a broad range of users for feedback to ensure accurate depiction of various reading themes. Notably, the model's iterative pipeline takes user feedback into account at several points, from crowdworkers' initial preferences for text themes to designers' iterative design improvements. The goals of our proposed initiative closely coincide with this community-driven process, which not only promotes various text themes but also produces results on awareness and engagement that have been scientifically confirmed.

3. RESEARCH QUESTION AND METHOD

Our research question: How will varying typological elements affect a reader's engagement while reading text?

In our research, we will specifically investigate how factors like font, color, and size work together to impact a reader's attention span and understanding while reading passages of about 100 words. Our proposed solution is a chrome extension that will take text as input and convert it to a more readable format. This extension will be built through coding in HTML, CSS, and JavaScript. To test this solution, we will conduct a study in which participants will be presented with two passages; One in a standard, dull format and the other in a more vibrant format, created by our extension. As shown below, Figure 1 depicts example passages of texts in the different formats we will be utilizing. While the participants read each passage, they will be timed by the experiment

conductor in order to measure and assess attention span later on. The participants will not be informed that they will be timed, to ensure that they don't attempt to rush through the text and we can get an accurate estimate of the time taken.

Figure 1: This figure depicts two short passages that demonstrate the differences in formats for the purpose of our experiment. The "dull" format includes typological elements such as Times New Roman Font, 12 point font, and black print. The "vibrant" format includes typological elements such as Joti One, 14 point font, and varying colors of bright print.
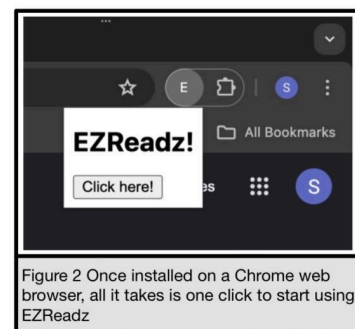
After reading these two passages, the participant will take quizzes corresponding to the two passages. The participants won't be informed that there will be a quiz prior to taking them so as to make sure that the information they memorized was purely a result of their engagement with the reading and not because they knew they were going to be tested. The quizzes will consist of 5 unambiguous short-answer questions, meaning there will only be 1 possible correct solution to each question (ex: What game was the group of friends playing at the park?).

There will be two main metrics used to assess engagement in our study: time and accuracy. Time refers to the time it takes for the participants to read each passage, with the shorter of the two being considered the more engaging one, and accuracy will be the percentage of questions answered correctly in the quizzes. While these metrics will attempt to serve as a more objective measure of engagement, the questionnaire after the study will serve as a way to gather the participants' subjective opinions of the two fonts and their thoughts on the implementation of the extension. The first part of the questionnaire, we will ask the participants likert scale questions gauging the aesthetic appeal, clarity, and personal preference of the two fonts. Then the participants will be asked questions on how they perceived the implementation of the extension, as well as a text prompt to provide overall thoughts/feedback that they could not have expressed within the constraints of the survey questions.

4. DESIGN (USER INTERFACE)

When installed onto a chrome browser, the extension adds a little circular icon containing the Letter "E" onto the top left corner of the browser (fig 2). Upon selecting the little icon, the extension transforms the font type, font color, and font size of all of the text on the current webpage under the "paragraph" tag in HTML. For font type, we decided to go with Joti One for its more bouncy look and kid friendly aesthetic would stand apart from the fonts that are standard for academic papers, while also being inviting to those that do not actively engage in reading. The extension supports multiple colors that it applies to the text on a webpage, as depicted in fig 1. Selected colors were put into an array. The color used for each

Figure 2 Once installed on a Chrome web browser, all it takes is one click to start using EZReadz

sentence was determined by the first item in this array. The colors we choose were purposefully bright as to stand out and the hex values for them are as follows: #9900ff, #0000ff, #cc0000, #ff00ff, #da8300, and #00bd00. After a color is used it is then stored separately before it is added back to the end of the same array to ensure the same two colors cannot be used consecutively. The extension changes colors every time a period is present so as to make it so that color changes occur at the end of every sentence. The order the colors are presented in is decided randomly by the extension, but colors are not reused until each has been used at least once in that current cycle. Each sentence was also put into an array by searching for a paragraph tag within a given webpage. We decided that this approach for colors would be best because it makes it easier to identify the end of every sentence from a glance, and also makes it easier to remember the sentence you last read based on color alone, if you happen to lose track of what you were reading. Lastly, the extension changes make the font to be size 14 since it is easier to read than 12 pt font while also not being so big as to be confused for a header or require more scrolling. With these modifications, we believe that it is possible to increase engagement and focus of readers who would have struggled otherwise.
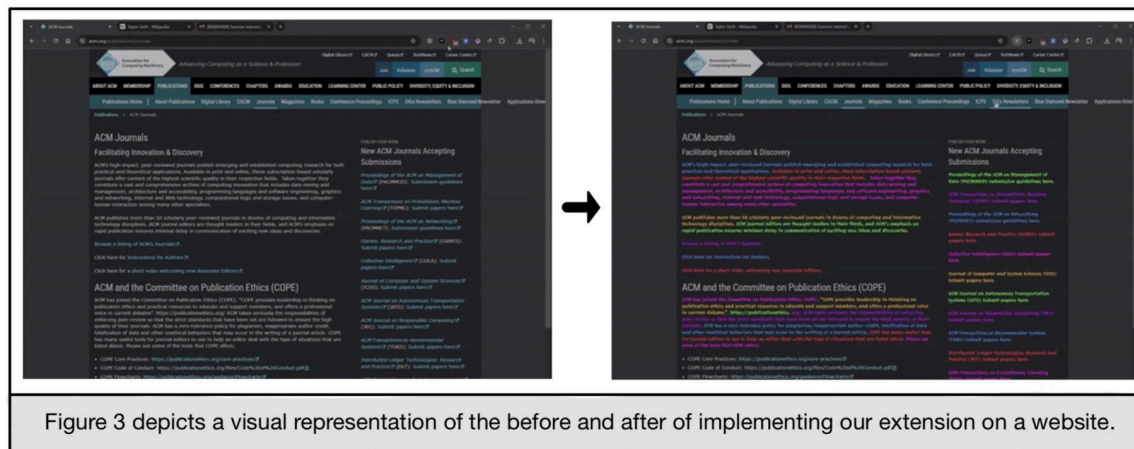

Figure 3 depicts a visual representation of the before and after of implementing our extension on a website.

5. USER STUDY

5.1 Participant Demographics

In order to evaluate the effectiveness of our extension, a user study was conducted with a total of 11 participants, composed of 5 males and 6 females, aged 19 to 20 years old. The participants were all students enrolled in Stevens Institute of Technology, and came from a variety of academic majors, including Biomedical Engineering (2 participants), Computer Science (3 participants), Quantitative Finance (2 participants), Business Technology (2 participants), Civil Engineering (1 participant), and Mechanical Engineering (1 participant).

5.2 Study Conditions

This study was conducted in a lounge in Harries Tower on campus, in order to maintain a comfortable and natural environment for our participants. Our study implemented a within-subjects design, so all participants performed under all conditions. Since our study involved two conditions, we presented two passages to each participant, where one of the passages was read with our extension, while the other was read without it. The order of passages read was randomized to minimize order effects like learning and fatigue. Additionally, participants were taught how to implement EZReads on a web browser beforehand to avoid confusion. This tutorial as well as the rest of the experiment was performed on the same Macbook Air for all participants to ensure consistency.

5.3 Data Collection

The reading time for each text was manually recorded by the researchers while the participants read each passage. After reading, the participants were asked to fill out a questionnaire through google forms on the content of the two passages. The questionnaire consisted of objective short answer questions, which relied on reading comprehension and recall. There were 5 questions for each text. Following this, the participants were asked to answer questions about their experience and opinions on the implementation of the extension itself. These questions implemented the Likert-Scale format to measure opinions, as well as an open ended section for participants to freely add any other thoughts they may have had.

6. RESULTS

To determine whether EzReadz had a statistically significant effect on the time to read dull and vibrant passages and the response accuracy of our 11 participants, we conducted an F-test with premises H_a and H_a within two different contexts.

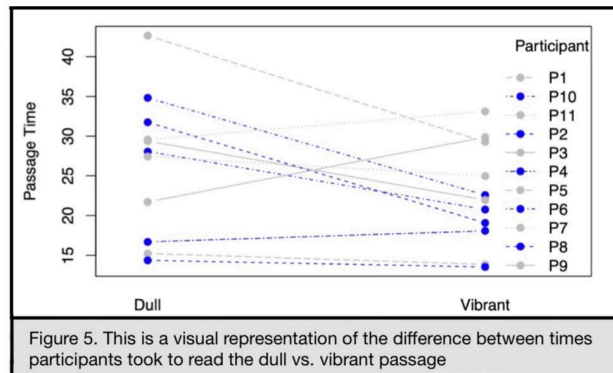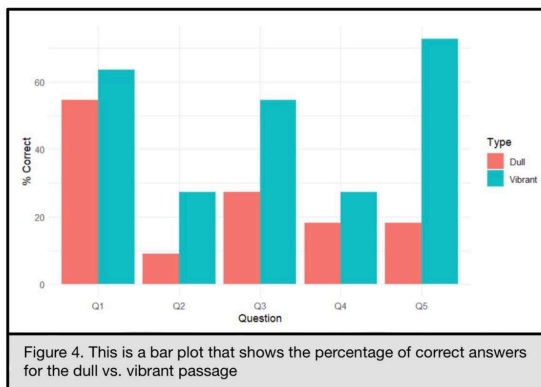Under a 95% confidence interval, we presume:

$H_0 := \mu_1 = \mu_2$: The EZReadz extension has no significant effect on the time a user takes to read dull and vibrant passages.

$H_a := \mu_1 \neq \mu_2$: The EZReadz extension has a statistically significant effect on the time a user takes to read dull and vibrant passages.Similarly, we repeated the F-test with these hypotheses:

$H_0 := \mu_1 = \mu_2$: The EZReadz extension has no significant effect on a user's response accuracy when asked to recall information about the passage.

$H_a := \mu_1 \neq \mu_2$: The EZReadz extension has a statistically significant effect on a user's response accuracy when asked to recall information about the passage.

Both tests found a p-score that is higher than the alpha level for a population of $n = 11$, which suggests statistical significance. These results agree with the average decrease in the time to read (21.57 seconds for vibrant passage vs 27.41 seconds for dull) and response accuracy (25% accuracy in the dull passage vs 49% in vibrant passage). These results are visualized below.

Figure 4. This is a bar plot that shows the percentage of correct answers for the dull vs. vibrant passage

Figure 5. This is a visual representation of the difference between times participants took to read the dull vs. vibrant passage

Subjective User Preferences

- Among the 11 participants, utility (i.e How useful do you find the extension?) was rated an average of 3.27.
- Among the 11 participants, difficulty (i.e How difficult do you find the extension?) was rated 2.09
- Among the 11 participants, prospective use (i.e How often would you see yourself using this extension?) was rated 2.55
- Participant 1 said "I would want the fonts to be customizable"
- Participant 7 said "The colors threw me off a lot. Especially when I was trying to depict the imagery in my head, the only thing I could think of were the colors and font throwing me off"
- Participant 11 said "The extension helped me better understand the passage."
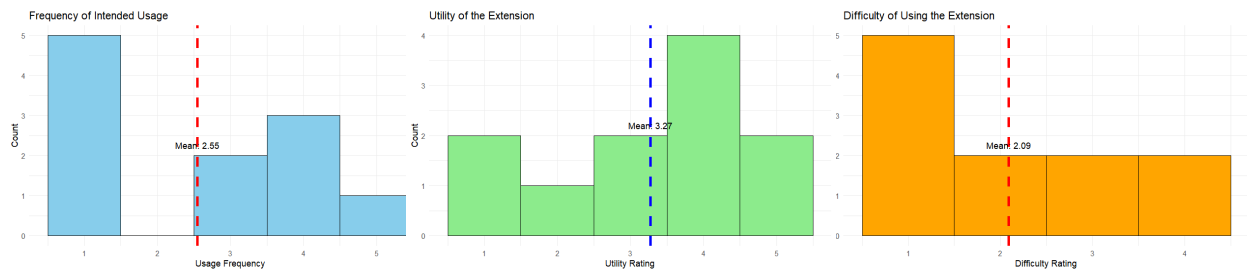
7. DISCUSSION AND CONCLUSION

7.1 Limitations And Future Work

The design limitations are evident, especially in the intensity of the colors used, which may have been uncomfortable or distracting. Furthermore, people who are color-blind are not taken into account, which is important for inclusive design. By neglecting the needs of color-blind users, the design inadvertently excludes a portion of the population, undermining the principle of inclusivity. Accessibility and usability for all users can be greatly enhanced by incorporating features that accommodate color-blindness, such as offering other color schemes or using patterns and textures in addition to colors for difference. Another problem with the system is that it isn't customizable, as it could benefit from features allowing users to modify font, size, and color according to their preferences. Giving users the option to alter text sizes, typefaces, and color schemes is a useful tool that not only accommodates a variety of aesthetic tastes but also takes practical factors like legibility and visual comfort into account. Furthermore, the possibility of converting text passages in a targeted manner also offers prospects for knowledge retrieval and focus learning. In essence, the direction of future versions of the extension goes beyond merely improving its functionality; rather, it represents a dedication to using technology to enable people to further their education and understanding. The extension's development has the potential to completely transform how people engage with text and, in the process, promote a society that is more enlightened, connected, and intellectually lively.

7.2 Conclusion

The user study explored the significant influence of fonts on user interaction, especially in the context of academic texts. We have shown the instant benefits of our Chrome extension in improving reading comprehension and textual content interaction through its development and evaluation. We presented the results of our user study and found that our extension significantly increased reading speed and comprehension accuracy. When participants engaged with texts structured utilizing our extension, they demonstrated considerably faster reading times and higher understanding rates, highlighting the efficacy of typographical interventions in optimizing learning outcomes. Our findings have implications that go beyond the field of user interface design. Specifically, they highlight the

critical role that typography plays in supporting cognitive processes, such as reading comprehension. We have opened up new possibilities for increasing the readability and accessibility of academic texts by utilizing technology to improve typographic design. Our research does, however, also point out several limitations, most notably with regard to color intensity and customization, which call for additional investigation and improvement of the extension. Through the adoption of inclusive design principles, we can guarantee that our technology accommodates a wide range of user preferences and demands, hence enhancing accessibility and usability for all. All things considered, our work is a critical first step in utilizing typography's capacity to transform the way people interact with text in both academic and non-academic contexts. We envision a future where technology plays a crucial role in building a more enlightened, connected, and intellectually dynamic society as we continue to enhance and expand upon our research.

REFERENCES

[1] Gkikas, D. C., Tzafilkou, K., Theodoridis, P. K., & Garmpis, A. (2022). How do text characteristics impact user engagement in social media posts: Modeling content readability, length, and hashtags number in Facebook. International Journal of Information Management Data Insights, 2(100067). https://doi.org/10.1016/j.jjimei.2022.100067

[2] Cai, T., Niklaus, A. G., Kraley, M., Kerr, B., & Bylinskii, Z. (2023). THERIF: Themes for Readability from Iterative Feedback. In Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems (CHI EA '23), April 23–28, 2023, Hamburg, Germany. ACM. https://doi.org/10.1145/3544549.3585679