

# Different Factors Affecting the Usability of Canvas

Emily Liu  
liu.emily@northeastern.edu  
Northeastern University  
Boston, Massachusetts

Harika Gundala  
gundala.h@northeastern.edu  
Northeastern University  
Boston, Massachusetts

Emaan Shah  
shah.em@northeastern.edu  
Northeastern University  
Boston, Massachusetts

## ABSTRACT

In today's world, e-learning is inevitable and an integral part of students' lives. After the recent pandemic, most educational institutions have equipped themselves with technologies so that the students can take classes online or in-person. With e-learning, even the Learning Management Systems(LMS) gain attraction. These applications help students in accessing course materials, complete their assignments, and track their grades. They also are very useful for instructors, who use them to manage the course, set deadlines, and grade assignments. Northeastern University makes use of Canvas for such academic activities. Studies have shown that visual design has an effect on users and likely to have better usability. We decided to conduct a survey across Northeastern University students to find out whether or not different visual design factors like font, color would affect the usability of Canvas. We had three groups, control group with the default Canvas page, experimental group 1, experimental group 2. The control group had the current version of Canvas without any modifications. For experimental group 2, we modified the color of Canvas, but kept the same font. And for experimental group 2, we modified both the color and font of the website. After performing the repeated measures test, we were able to reject the null hypothesis because the p-value is less than 0.05. Based on the results obtained, we were able to determine that there is a significant difference between control group and the other groups. We were able to conclude that the font and color do have a significant impact on usability.

## KEYWORDS

Learning Management System, Usability, Visual Design, Control group, Experimental group

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## 1 INTRODUCTION

The project aims to improve the usability of Canvas, a popular educational online resource, for Northeastern University students. Online learning is becoming more prevalent in our lives, especially after the emergence of COVID-19, so it is important for e-learning platforms to be effective, engaging, and easy to use. We believe that the current design of the Canvas website doesn't cater to the needs of the students in terms of functionality and is not as visually appealing as other online platforms we have come across. It is a challenge to introduce new design aspects to this specific platform due to the fact that there are thousands of students that use it everyday and each one has a different view on visual design. Since recent research indicates that visual design factors impact the usability of online resources, we conducted a study that measures whether or not certain factors affect usability in order to optimize Northeastern students' user experience with online learning. The study had two phases: firstly, we conducted a survey in which participants selected which version of specific design aspects they preferred, and the second phase was another survey that asked students to rate certain factors of the current Canvas page and one that we re-designed using feedback from the first survey.

We decided to focus on fonts and color for this study. Previous studies have had varying results when it comes to color. Some have found that color has no significant impact on the usability of online instructional platforms, while others have determined that there is. The same goes for fonts. Through this project, we hoped to find some clarity on this subject.

### 1.1 Review of Literature

Kahn's experiment, Using Visual Design to Improve Customer Perceptions of Online Assortments, discussed how visual design influences consumers' reactions to online assortment [4]. She spoke about how sophisticated eye-tracking can help understand what is the cause of consumers' attention and processing efficiency. Her work supported the idea that visual design does impact how users perceive material online. Additionally, in the study Impact of website visual design on user experience and website evaluation: the sequential mediating roles of usability and pleasure, conducted by Jongmans et al., researchers determine the likeability of various levels of visual web design [3]. The authors of the paper discussed how there is a positive correlation between visual design factors and the enjoyment level of participants. Furthermore, in their paper, Adams et al. talk about how different types of online instructional design has an effect on the knowledge and learning outcomes of future teachers [1]. The research focused on different types of online instructional interface design, specifically the pairing of various images and text. The work by Ghai and Tandon also covered the impact of factors such as typography, graphics, grid, and layout on the usability of e-learning technology [2]. They found that these

components significantly affected the usability of e-learning, while color and compositional guidelines did not. Another study, done by Pralle, covers the importance of using principles of good design in online courses while at the same time creating a design guide for online course developers [5]. They concluded that typography, color, image, and visual organization/layout are all related to usability.

In summary, the previously conducted experiments have shown the importance of visual design and user experience aspects in terms of usability and likeability, especially for e-learning. They also show how the visual design and the type of instructional design can have an impact on the learning outcomes.

## 1.2 Problem

Previous studies have had contradicting results when it comes to the relevance of certain visual design components in the usability of an online platform. For example, in one study [2], it was found that color did not significantly affect the usability of e-learning. However, another one came to the opposite conclusion, claiming that color does play a significant role in the usability of a website [5]. We wanted to get to the bottom of this difference and determine if it truly has an impact, and more specifically, if it has an impact within the student population of Northeastern University. We hypothesized that changes in visual design factors do have a significant impact on the usability of Canvas. The factors that we are testing for this project are color and font. The existing literature surrounding this topic of research supports the hypothesis of this study as there is evidence pointing towards a positive relationship between the independent and dependent variables.

## 2 METHODOLOGY

The study was divided into two phases. The first phase consisted of a survey that analyzed how Northeastern students felt about the current Canvas design. The survey results were then used to design a modified Canvas. A second survey analyzed how students felt about the modified Canvas design compared to the original Canvas design.

### 2.1 Part 1 Survey

The first survey was distributed through Google Forms and gathered feedback about how Northeastern students felt about the visual design and general usage of Canvas. Information involving specific variables, namely the font and color theme utilized by Canvas, was gathered to help develop the modified Canvas for the second survey. The survey took approximately five minutes for the participants to complete and responses were collected over a one-week period.

**2.1.1 Survey Content.** The first survey was split into 3 sections: general usage of Canvas, visual design and functionality, and demographics. Questions about the general usage of Canvas and demographic were asked to collect basic information about participants and to ensure they were in the target population. The questions about visual design and functionality were asked to obtain the participants' opinions on the current Canvas. The survey specifically asked what font and color palette students would prefer for the modified Canvas in the form of multiple choice questions, and why they felt this way, which was open-ended. These answers were all

used to redesign Canvas to cater to student needs more. Based on the results the current Canvas was modified and two experimental groups were formed. Apart from the default options, we took the font and color palette that was preferred next.

### 2.2 Part 2 Survey

The second survey was also distributed through Google Forms and collected the opinions of Northeastern students on the modified Canvas compared to the original Canvas. The survey took approximately ten minutes for the participants to complete and responses were collected over a one-week period.

**2.2.1 Survey Content.** The second survey was split into 5 sections: general usage of Canvas, current Canvas, Canvas with a different color palette and the default font, Canvas with a different color palette and different font, and demographics. Similar to the first survey, questions about the general usage of Canvas and demographic were asked to collect basic information about participants and to ensure they were in the target population. The second section represented the control group and the third and fourth sections represented the two experimental groups. For each version of Canvas, participants were asked various questions rating its usability. The data collected from this survey was used to determine if various visual design factors, in this case, font and color palette, have an effect on the usability of Canvas. A usability score was calculated for each control/experimental group for each participant.

### 2.3 Participants

Both surveys were distributed through social media platforms, such as Reddit and Discord, so we were able to collect data from a mix of undergraduate and graduate Northeastern students that were students at various schools while maintaining anonymity. The first survey received 39 responses (20 females, 18 males, and 1 prefer not to say). The second survey received 42 responses (22 females, 16 males and 4 prefer not to say).

### 2.4 Informed Consent and Possible Risks/Discomforts

For both surveys circulated, participants were given a summary of the purpose of the survey and directions on how to complete the survey. Since this was a study done for an academic course and there were minimal to no potential risks, it was unnecessary to go through the standard consent process.

## 3 RESULTS

This section is organized into 2 section. The first section talks about the study demographics and the second section is analysis of the results.

### 3.1 Study Demographics

The total number of participants that were part of the study is 42. We were only able to use the data from 37 of them as a few of the participants did not answer all the questions. Since this would change the scores, we dropped the participants with missing values. Among the 37 participants, 19 were female, 15 were male and 3 of them opted to not answer (Fig 1).

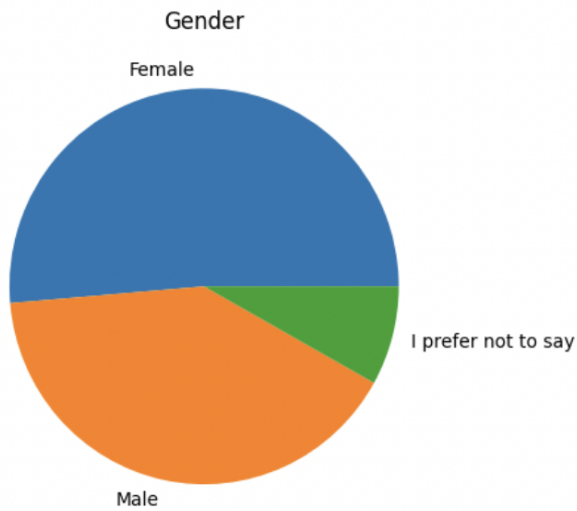


Figure 1: Percentage of participants based on their Gender

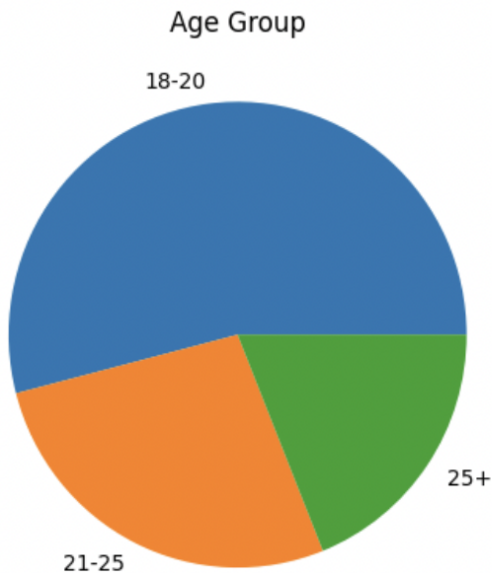


Figure 2: Percentage of participants based on their Age Group

20 participants were in the age group of 18-20, 10 were in 21-25, and 7 of them were above 25 years (Fig 2). 24 of these participants are pursuing Bachelors and 13 of them are pursuing Masters (Fig 3).

### 3.2 Analysis

Based on the scores calculated for each of the three groups, we performed a Shapiro-Wilk normality test.

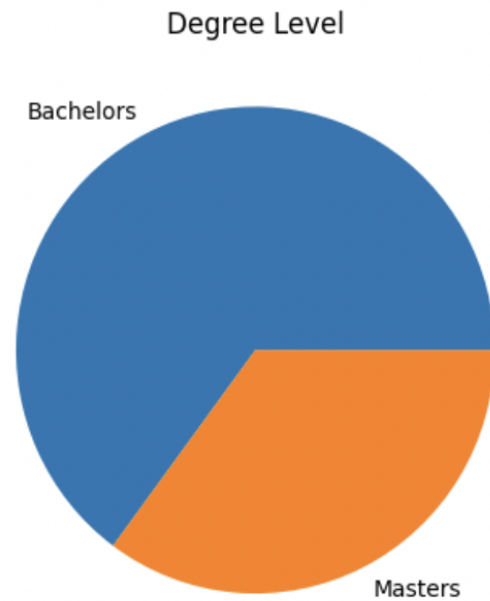


Figure 3: Percentage of participants based on their Degree Level

Table 1: Shapiro - Wilk Normality test scores

group	<i>p</i> -value
control	0.27636794
experimental 1	0.03855587
experimental 2	0.01642479

Based on the results from the test (Table 1), we were able to determine that the experimental groups did not have normal distributions. To be certain we also plotted QQ plots to have a better understanding (Fig 4) and we were certain that the distribution was not normal and we performed a non parametric version of repeated measures ANOVA, Friedman test. Just like repeated measures ANOVA, the Friedman test aims at detecting differences across multiple test attempts. The dependent variable has to be continuous and within the span of our study, it is scores. The independent variable is categorical, which is our three different groups. Since the samples need not be normally distributed, we meet all the assumptions for the test.

The test resulted in a *p*-value of (0.0000172), so we concluded that there is a significant difference between the groups. In order to be certain of which groups show the differences we performed the post-hoc test (pairwise wilcoxon). The results (Table 2) show the *p*-values, and we find a significant difference between experimental and control group. We conclude based on our results that color and font do have a significant impact on the Usability scores. However, the effect size is small for the test.

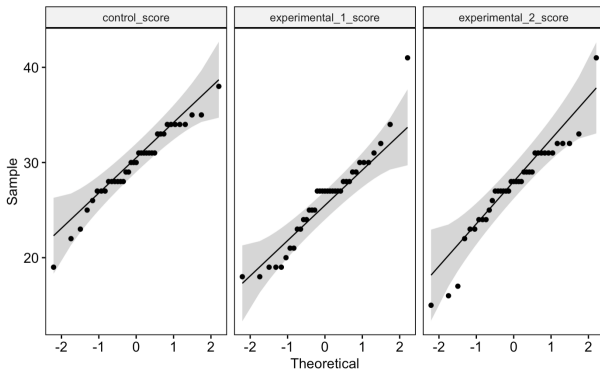


Figure 4: QQ plots of usability scores

Table 2: Results of Post-hoc test

	Control Score	Experimental 1
Experimental 1	0.00027	-
Experimental 2	0.01915	0.10958

## 4 DISCUSSION

### 4.1 Survey

Based on the survey data, our finding that font and color do have a significant impact on the usability of Canvas is consistent with the findings of some previous studies. The majority of participants responded positively to the current font and color scheme of Canvas while rating the proposed changes significantly lower, indicating that these two visual design factors do in fact play into the platform's usability. Additionally, these results suggest that the current design of Canvas serves Northeastern students well and changes to the two factors that we tested are not necessary.

### 4.2 Limitations

Our first limitation is our lack of data. To start off, we only had 41 participants. Additionally, a few participants were missing data, so we had to drop them completely and were left with the data from 37 participants to use in our calculations. However, there are over 40,000 students at Northeastern. Therefore, our sample size is not large enough to accurately represent all the different opinions that students at Northeastern may hold.

Another limitation that we faced is low diversity among our participants. Due to the fact that we did not have any funds for this project, we could not provide incentives for a completely random group of people to complete our survey. Our survey was posted to online spaces for Northeastern students, but did not receive a great amount of interaction due to no motivation to complete it. Therefore, we had to collect the majority of our data from our peers and friends. Since our majors are computer science and data science, most of the people that we interact with also fall under those majors and those were the people that completed our surveys. However, when looking at the amounts of students within each major at Northeastern, we see that the ratio of different majors

represented in our survey does not match the ratio of students in different majors at Northeastern. We're not sure if major has an impact on how students perceive the different elements within our survey. However, in the case that there is a correlation between the two elements, it would have been better if other majors were represented more in our survey results. Additionally, we received responses from mostly undergraduate students. However, the amount of undergraduate and graduate students at Northeastern is closer to a 50/50 split, so graduate students were also underrepresented in our survey. Once again, we're not sure whether or not the level of education that someone is pursuing correlates to their responses on our surveys, but in the case that it does, it would have been better to have gathered responses from a more even amount of undergraduate and graduate students in order to make sure our findings accurately represent the attitudes of all Northeastern students.

In addition, looking back on our surveys, we realized that our method of selecting different colors for our redesigned Canvas page was not well thought out. We used a random color generator to pick out a few palettes to present to participants. However, we did not consider whether or not those colors fit into the context of our project. A better way to approach this would have been to re-design Canvas with the colors right after we picked them. This way, we would be able to see whether or not the colors were visually appealing and practical to use for an educational platform. If we did not think the colors were, we should have picked new ones until all of our options were reasonable and then presented them to participants. However, since we did not do it like this originally, we ended up with a rather unappealing and distracting redesign in our second survey that led most participants to favor the original Canvas color scheme.

When we calculated a Cronbach's alpha value for our data, we got 0.463, which is very low. We aim to improve this for further research by increasing the number of questions for each construct (e.g. font, color). The lower value for Cronbach's alpha could also have been due to a misinterpretation of our questions. In order to avoid this in the future, we should ensure that questions are framed in a better way.

### 4.3 Future Research

In the future, survey participant diversity should be increased as mentioned in the previous section. This can be done so by distributing surveys through a different channel, as well as incentivizing it for greater feedback. More fonts and color combinations should also be tested. Although our results indicated that Helvetica and the red-black-white color scheme were the most beneficial for students, we only tested them against a handful of other fonts and colors. There are many other fonts and color combinations in existence that may potentially improve the usability of Canvas further than the ones in place now.

Other visual design components can also be tested in the future. One such example would be the position of the navigation bar. Currently, Canvas has a vertical navigation bar on the left side of the screen. However, a horizontal navigation bar may result in a significant increase in the usability of the platform. Another thing that can be researched in the future is how the size of text impacts usability. The alignment of text is also another factor that may have

an effect. As of now, the text on Canvas is aligned to the left. However, a different type of alignment may increase readability. There are a countless number of visual factors that can be tested besides the ones mentioned. Continuing to do research on this topic is important because the optimization Canvas will facilitate students learning and performing to the best of their ability.

Lastly, a study should be done where students utilize a re-designed Canvas platform for an entire semester. Our survey was hypothetical and based on the opinions of participants. However, in order to gauge the true impact of visual design, the performance of students should be tracked over a semester. One group would utilize the current Canvas website, while another group would utilize a website with the exact same functionality, but certain changed visual components, such as color and font. These students would all be from the same class and be randomly split into those two groups. They would all have the same professor, attend the same lectures, and get assigned the same material; the only difference between them would be the version of Canvas that they use. Based on the average course grade of each group, you would be able to draw a conclusion of whether or not changes in visual design had a significant impact on the usability.

## 5 CONCLUSIONS

Our study was split into two phases. The first phase was a survey with 39 participants that determined how Northeastern University students felt about the current Canvas and what visual designs they would prefer for a modified version. The data in this survey successfully provided details about the visual design preferences of Northeastern students, specifically what font and color palette they would prefer. These results influenced the design of the modified Canvas in the second phase of the study.

Based on the first survey results, the Poppins font and Palette 1, which was a combination of blues and purple, were chosen for the modified versions of Canvas that were created in the second phase of the study. The second survey was split into 3 sections: current Canvas, Canvas with a different color palette and the default font, and Canvas with a different color palette and different font. The current Canvas is the control group and the two modified Canvases are the experimental groups. Participants were asked to rate the usability of each Canvas by answering various rating questions. A usability score was computed for each version of Canvas for each participant. The second survey completed the objective of determining if visual design changes had an impact on the usability of Canvas.

The second survey results supported the hypothesis that the usability of Canvas is affected by color palette and font. For future research, a more diverse sample size that is a better representation of the population should be utilized and more visual factors can be studied.

## 6 CONTRIBUTION STATEMENT

**Emily Liu:** Methodology, Conclusion - original draft, Drafted and distributed survey, Prepared presentation, Cleaned and processed data.

**Emaan Shah:** Introduction, Discussion - original draft, Drafted and distributed survey, Prepared final presentation.

**Harika:** Abstract, Results - original draft, Modified Prototype of Canvas, Distributed Survey, Performed statistical tests, formatted final paper

We feel each of us contributed equally and put in an equal share of effort in order for this project to come to fruition. Each of us contributed 33.3% to the completion of this project.

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