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USABILITY ANALYSIS OF HUMAN COMPUTER INTERACTION IN GOOGLE CLASSROOM AND MICROSOFT TEAMS

HENOCH JULI CHRISTANTO[1], STEPHEN APRIUS SUTRESNO[2], ANDREW DENNY[3], CHRISTINE DEWI[4]

[1,2,3]Atma Jaya Catholic University of Indonesia, Information System Department, Faculty of Engineering, Jakarta, Indonesia

[4]Satya Wacana Christian University, Faculty of Information and Technology, Salatiga, Indonesia

E-mail: [1]henoch.christanto@atmajaya.ac.id, [2]stephen.sutresno@atmajaya.ac.id, [3]andrew.201804560012@student.atmajaya.ac.id, [4]christine.dewi@uksw.edu

ABSTRACT

As online learning continues to gain prominence, the usability and user satisfaction of digital platforms play a crucial role in facilitating effective and engaging learning experiences. This study focused on evaluating the usability and user satisfaction of two popular online learning platforms, Microsoft Teams and Google Classroom. By assessing various variables such as learnability, efficiency, memorability, errors, and satisfaction, the study aimed to provide valuable insights into the user experience of these platforms. The study employed a quantitative approach, gathering data through surveys and measurements from a sample of users who had experience with both Microsoft Teams and Google Classroom. The participants were asked to rate their satisfaction levels, provide feedback on usability aspects, and share their overall perceptions of the platforms. The results of the study indicated that both Microsoft Teams and Google Classroom received positive feedback, the consecutive values for Learnability, Efficiency, Memorability, Error, and Satisfaction in Microsoft Teams are 47.25%, 29.67%, 34.27%, 21.39%, and 25.20%, respectively. On the other hand, in Google Classroom, the values are 49.48%, 30.69%, 35.71%, 18.94%, and 26.45%, respectively. However, Google Classroom demonstrated higher satisfaction ratings compared to Microsoft Teams, suggesting a stronger preference among users. It excelled in user-friendliness, intuitive design, and navigation, while Microsoft Teams faced occasional usability challenges despite its collaborative features. This study highlights the importance of usability in online learning platforms and its impact on user satisfaction. Platforms like Google Classroom, with superior usability, tend to generate higher user satisfaction due to their intuitive interfaces and seamless interactions. Conversely, platforms like Microsoft Teams can enhance their usability to address user concerns and improve the overall user experience. The study provides valuable guidance for educators, developers, and designers, emphasizing the need for continuous user research, usability testing, and iterative design to enhance platform usability and create engaging learning environments.

Keywords: *Usability, HCI, online learning platforms, Google Classroom, Microsoft Teams*

1. INTRODUCTION

With the advent of the COVID-19 pandemic, educational institutions worldwide have faced the unprecedented challenge of transitioning from traditional face-to-face learning to online platforms [1]. In Jakarta, the capital city of Indonesia, the implementation of online learning platforms such as Google Classroom and Microsoft Teams has become increasingly prevalent [2]. These platforms have played a crucial role in facilitating remote learning and ensuring educational continuity amidst the pandemic [3].

However, the effectiveness of online learning platforms heavily relies on their usability and user experience [4]. Usability refers to the ease of use and efficiency of a system, while user experience encompasses the overall satisfaction and engagement of users with the system [5]. In this context, Human-Computer Interaction (HCI) and usability analysis have gained prominence as

essential tools for evaluating the performance and user-friendliness of these platforms [6].

Understanding the usability of online learning platforms is vital to address the challenges faced by students, teachers, and educational institutions in Jakarta. Poor usability can hinder students' learning experience, lead to frustration, and result in decreased engagement [7]. Similarly, educators require intuitive and efficient tools to deliver their lessons effectively and engage with students in a virtual environment [8].

Therefore, this study aims to conduct a comprehensive analysis of the usability of Google Classroom and Microsoft Teams in Jakarta. By assessing the HCI aspects of these platforms, including ease of navigation, clarity of instructions, and intuitiveness of features, we seek to identify potential issues, challenges, and areas for improvement.

The findings of this analysis can provide valuable insights to enhance the usability and user experience of these platforms, leading to more effective and engaging online learning experiences for students and educators in Jakarta. This research also aims to contribute to the broader field of educational technology and HCI by offering insights into the usability challenges specific to Jakarta's educational context.

Moreover, considering the ongoing nature of the COVID-19 pandemic and the possibility of prolonged reliance on online learning, it is crucial to address any usability shortcomings of these platforms [9]. Jakarta, as a densely populated city with diverse socio-economic backgrounds, presents unique challenges for online learning. Factors such as internet accessibility, device availability, and students digital literacy levels can significantly impact the usability and effectiveness of these platforms [10].

By conducting this analysis specifically in Jakarta, we can gain insights into the usability challenges faced by students and educators in this particular context. This localized approach allows for targeted improvements and enhancements tailored to the specific needs and constraints of the Jakarta education system.

This interesting phenomenon serves as the basis for conducting this research. This research aims to contribute to the field of educational technology and HCI by providing actionable recommendations for optimizing the usability of Google Classroom and Microsoft Teams in Jakarta. By addressing usability issues, we can strive to create a more inclusive, engaging, and efficient online learning environment for students and educators in the capital city [11]. Ultimately, this study seeks to foster enhanced educational experiences in Jakarta and beyond, facilitating effective knowledge dissemination and academic growth in the face of challenging circumstances.

2. LITERATURE STUDIES

Previously, there have been several studies conducted on student satisfaction with online learning. The following are previous research studies that have been conducted.

A study conducted by Lia Ariska Rionga (2021) titled "Post-Pandemic Education Planning at MT's Jam'iyah Tanjung Pura [12]." This study discusses educational planning as a strategy to improve the quality of education in the post-pandemic era. The research findings indicate that the learning process is influenced by various factors, broadly divided into internal and external factors. The most significant determining factor is the influence coming from the students themselves, accounting for 70% of student achievement, including learning motivation, perseverance, interest and attention, attitudes and study habits, as well as physical and psychological health. As for the external factor, it is the quality of teaching management. Based on these findings, it can be concluded that the decline in quality during the COVID-19 pandemic is unavoidable. This situation necessitates planning stages such as problem diagnosis, plan formulation, and implementation of educational administration, facilities, and infrastructure aspects.

The second study, conducted by Aryuna Dini Rahayu (2021) titled "Facilities and Infrastructure Supporting Online Learning during the COVID-19 Pandemic [13]," discusses the facilities and infrastructure used to support online learning. The research method employed in this study is a qualitative approach through literature review or library research. This method refers to the content of literature studies obtained from books, journals, research reports, and articles from news websites. The study findings suggest that the implementation of online learning represents an innovative learning approach and a revolution in the era of Industry 4.0. However, the effectiveness of online learning depends on the synchronized functioning of supporting facilities. This includes the necessary hardware and proficiency in utilizing information technology.

The third study, conducted by Deli (2021) titled "The Impact of Online Learning Media Usage

on UIB Students during the COVID-19 Pandemic [14]," examines the impact of using online learning media during the COVID-19 pandemic. This study utilizes the Delone and McLean model, which measures the success of information systems by analyzing six variables. The research findings indicate that 352 students from the International University of Batam expressed their comfort in using online learning media, which depends on user satisfaction and the features provided by the media, enabling users to feel comfortable and engaged while utilizing the online learning platform.

The fourth study, conducted by Nugroho (2021) titled "Student Satisfaction with Online Learning Using Microsoft Teams and YouTube Videos on Linear Programming [15]," focuses on the satisfaction level of grade X students at SMK Negeri 2 Salatiga regarding the use of Microsoft Teams and YouTube videos as online learning media for linear programming subjects. This research employs questionnaire surveys and online interviews as research methods. The study concludes that, in general, students are satisfied with the use of the Microsoft Teams platform as an online learning medium, considering various aspects such as media usage, accessibility, interactive learning, understanding of the subject matter, learning outcomes, and remedial services.

The fifth study, conducted by Muhammad Ikhlash (2021) titled "Measuring Student Satisfaction with Teleconferencing in Learning [16]," explores the quality of information systems and the user-friendliness of teleconferencing tools employed by students during the COVID-19 pandemic. The research utilizes a quantitative approach to measure student satisfaction with teleconferencing and employs survey methods. The findings reveal that the quality of information provided by the teleconferencing system significantly affects student satisfaction, and the ease of use also plays a significant role in student satisfaction with the system.

The sixth study, conducted by Hari Wahyuni (2021) titled "Analysis of Google Classroom Usage during the COVID-19 Pandemic on Student Learning Effectiveness [17]," analyzes the usage of Google Classroom during the COVID-19 pandemic and its impact on student learning effectiveness. The research findings suggest that the quality of service in using Google Classroom significantly contributes to improving learning effectiveness in the Management program of the Faculty of Economics. Students can complete and submit assignments quickly and easily, and they gain a better understanding of applying technology in their learning process. By using Google Classroom, students can promptly receive information from their professors regarding the course materials.

These six studies have similarities with the present study, as they all examine user satisfaction. However, the difference lies in the timing of the research. This study focuses on user satisfaction in the post-pandemic period, whereas the aforementioned studies focus on the period during the pandemic.

Usability in human-computer interaction (HCI) is a fundamental concept that focuses on designing and evaluating systems to ensure they are effective, efficient, and satisfying for users [18]. It encompasses several key factors, including learnability, efficiency, memorability, errors, and satisfaction [19]. Let's explore each of these aspects in more detail:

1. Learnability: Learnability refers to how easily users can understand and use a system when encountering it for the first time. A highly learnable system has an intuitive and user-friendly interface that allows users to quickly grasp its functionalities. Clear and concise instructions, informative feedback, and interactive tutorials can aid in enhancing learnability. By minimizing the learning curve, users can efficiently adapt to the system and start tasks without significant barriers.
2. Efficiency: Efficiency relates to how quickly and easily users can accomplish their tasks within the system. An efficient system enables users to achieve their goals with minimal effort and time. Streamlined workflows, well-organized information, and intuitive navigation contribute to improving efficiency. Additionally, providing shortcuts, customizable interfaces, and automation features can further enhance user productivity.
3. Memorability: Memorability refers to how well users can remember how to use a system after a period of not interacting with it. A memorable system allows users to easily recall the system's functionalities and navigate through its interface, even after a break from usage. Consistency in design, clear visual cues, and familiar interaction patterns can aid in improving memorability. When users can quickly reorient themselves within the system, they can resume their tasks without significant loss of time or productivity.
4. Errors: Errors are an inevitable part of user interactions. However, a usable system aims to minimize errors and their impact on users.

Error prevention strategies, such as providing helpful prompts, validation checks, and guiding users through the correct input, can reduce the occurrence of errors. When errors do occur, clear and informative error messages, along with suggestions for recovery, can assist users in understanding and resolving the issues. By effectively handling errors, a system can maintain user confidence and minimize frustration.

5. Satisfaction: User satisfaction is a vital aspect of usability. It reflects the overall subjective experience and impression users have of the system. A satisfying system aligns with user expectations, meets their needs, and provides a pleasant and engaging user experience. This involves considering aesthetics, responsiveness, personalization, and addressing user feedback. By incorporating elements that delight and engage users, a system can foster positive emotions, encourage continued usage, and promote user loyalty.

To evaluate and improve usability, various methods such as usability testing, user feedback, and iterative design processes are employed [20]. Usability testing involves observing users' interactions with the system and gathering their feedback to identify areas for improvement. Iterative design ensures that usability issues are addressed throughout the development process, resulting in a system that is highly usable and meets user expectations [21].

By considering and optimizing these usability factors, designers and developers can create systems that are not only functional but also user-centered, enhancing user experiences, productivity, and overall satisfaction [10].

3. METHODS

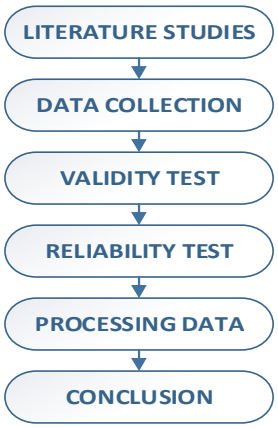

Figure 1: Research methodology

The research methodology shown as Figure 1 employed in this study was quantitative in nature, utilizing a descriptive analysis model. IBM SPSS 25 software was utilized as the primary tool for data analysis. The research process consisted of Strategy Determination, Data Collection, Validity Testing, Reliability Testing, Data Processing, and Conclusion. These stages were followed to ensure the validity and reliability of the findings.

3.1 Literature Studies

A literature review was conducted to gather relevant references supporting the current study. The research analyzes usability indicators, including learnability, memorability, efficiency, errors, and satisfaction [19]. Jakob Nielsen's usability indicators were used, as they account for errors. High user errors can indicate low usability. Applications with high usability have applied HCI well, reflecting the level of HCI concept implementation [22].

3.2 Data Collection

This research utilizes descriptive quantitative data analysis to examine and explain the variables in a specific situation [23]. Questionnaires were distributed and analyzed using techniques such as standard deviation, lowest score, and highest score. The population sample consists of students from educational institutions in the Greater Jakarta Area, with an estimated population size of 2,255,840 in 2021.

Purposive sampling was employed to ensure reliable information from respondents [24]. Purposive sampling allows for careful selection of individuals with relevant knowledge or experience [25]. The sample size was determined using Slovin's formula, which is suitable when the population size is known.

3.3 Validity Test

Validity is assessed through the application of the Karl Pearson Product Moment correlation formula, which involves establishing correlations between individual item results and the total value of the item [26]. The formula for the Karl Pearson Product Moment correlation is utilized in this study can be seen in formula (1).

$$r = \frac{\sum[(x-\bar{x})(y-\bar{y})]}{\sqrt{\sum(x-\bar{x})^2 \sum(y-\bar{y})^2}} \quad (1)$$

Where:
r is Pearson correlation coefficient,
X and Y is variables being correlated, and
$\bar{X}$ and $\bar{Y}$ is means of variables X and Y.

3.4 Reliability Test

Reliability testing assesses the consistency and stability of measurements or instruments in research. It ensures that the measurements yield consistent results over time and under different conditions [27]. Statistical techniques, such as Cronbach's alpha or interclass correlation coefficients, are used to determine the reliability coefficient. A high reliability coefficient indicates dependable and consistent measurements, increasing confidence in the research findings. The formula for Cronbach's alpha is as follows in formula (2) [28].

$$\alpha = \left(\frac{k}{k-1}\right)\left(1-\left(\frac{\sum \sigma^2 i}{\sigma^2 X}\right)\right) \quad (2)$$

Where:
α is Cronbach's alpha coefficient,
k is the number of items in the scale,
$\sigma^2 i$ is the variance of each item, and
$\sigma^2 X$ is the variance of the total score.

Cronbach's alpha coefficient ranges between 0 and 1, with higher values indicating greater internal consistency reliability.

4. RESULT AND DISCUSSION

4.1 Validity Test and Reliability of Measurement Instrument

To determine the validity of this questionnaire, the correlation formula of Pearson's Product Moment was used with a significance level of 5% and a total of 494 respondents. This study is considered valid because the validity value based on the critical value of R is greater than 0.098.

While reliability measurement of measurement instrument uses alpha Cronbach technique. From 38 valid items, we got α = 0,938. Therefore, according to reliability standard it includes in reliable category.

4.2 Description of Research Measurement Result

To determine the high or low levels of measurement results for the five variables in the learnability of HCI in Microsoft Teams and Google Classroom applications, they are categorized into three categories: high, medium, and low. Based on these categories, the interval width for each variable needs to be determined based on the difference between the highest possible score and the lowest possible score obtained from users, divided by the number of categories which can be seen in the formula (3).

$$Interval = \frac{\text{Skor Maksimum} - \text{Skor Minimum}}{\text{Jumlah Kategori}} \quad (3)$$

The highest possible score for each item in the variable is 5, and the lowest possible score is 1. Therefore, the highest and lowest possible scores for each variable are as follows:

4.2.1 Learnability

Amount item valid of learnability is 11 items, then highest possible score is 5 x 11 = 55 and lowest possible score is 1 x 11 = 11. So, the width of the interval obtained is:

$$Interval = \frac{55-11}{3}$$

$$Interval = 14{,}67 \approx 15$$

Based on these results, the categories can be determined as follows:
11 ≤ x < 26 : low (difficult to use)
26 ≤ x < 41 : medium
41 ≤ x ≤ 55 : high (easy to use)
x = total score

4.2.2 Efficiency

Amount item valid of efficiency is 7 items, then highest possible score is 5 x 7 = 35 and lowest possible score is 1 x 7 = 7. So, the width of the interval obtained is:

$$Interval = \frac{35-7}{3}$$

$$Interval = 9{,}33 \approx 10$$

Based on these results, the categories can be determined as follows:
7 ≤ X < 17 : low (difficult to use)
17 ≤ X < 27 : medium
27 ≤ X ≤ 35 : high (easy to use)
x = total score

4.2.3 Memorability

Amount item valid of memorability is 8 items, then highest possible score is 5 x 8 = 40 and lowest possible score is 1 x 8 = 8. So, the width of the interval obtained is:

$$Interval = \frac{40-8}{3}$$

$$Interval = 10{,}67 \approx 11$$

Based on these results, the categories can be determined as follows:
8 ≤ X < 19 : low (difficult to use)
19 ≤ X < 30 : medium
30 ≤ X ≤ 40 : high (easy to use)
x = total score

4.2.4 Errors

Amount item valid of errors is 6 items, then highest possible score is 5 x 6 = 30 and lowest possible score is 1 x 6 = 6. So, the width of the interval obtained is:

$$Interval = \frac{30-6}{3}$$

$$Interval = 8$$

Based on these results, the categories can be determined as follows:
6 ≤ X < 14 : low (difficult to use)
14 ≤ X < 22 : medium
22 ≤ X ≤ 30 : high (easy to use)
x = total score

4.2.5 Satisfaction

Amount item valid of satisfaction is 6 items, then highest possible score is 5 x 6 = 30 and lowest possible score is 1 x 6 = 6. So, the width of the interval obtained is:

$$Interval = \frac{30-6}{3}$$

$$Interval = 8$$

Based on these results, the categories can be determined as follows:
6 ≤ X < 14 : low (difficult to use)
14 ≤ X < 22 : medium
22 ≤ X ≤ 30 : high (easy to use)
x = total score

4.3 Descriptive Analysis and Measurement Result

Descriptive analysis result from each of Google Classroom and Ms. Teams users on a whole can be seen on the Table 1 and Table 2.

Table 1: Descriptive analysis result of Teams

Ms. Teams		Learnability	Efficiency	Memorability	Errors	Satisfication
N	Valid	100	100	100	100	100
	Missing	0	0	0	0	0
Mean		47,25	29,67	34,27	21,39	25,20
Median		43,00	26,00	39,00	19,00	21,00
Std. Deviation		5,88	3,72	4,48	5,57	3,63
Minimum		11,00	7,00	8,00	6,00	6,00
Maximum		55,00	35,00	40,00	30,00	30,00

Table 2: Descriptive analysis result of Classroom

Classroom		Learnability	Efficiency	Memorability	Errors	Satisfication
N	Valid	100	100	100	100	100
	Missing	0	0	0	0	0
Mean		49,48	30,69	35,71	18,94	26,45
Median		49,00	28,00	39,00	16,00	24,00
Std. Deviation		5,34	3,71	4,31	5,62	3,26
Minimum		11,00	7,00	8,00	6,00	6,00
Maximum		55,00	35,00	40,00	30,00	30,00

From the Table 1 and Table 2, relatively there is not any difference between users of each application. However, when we see it from 5 criteria of Nielson (2003) then the difference between these two applications can be seen, especially for users of those applications. The following is the discussion which is based on 5 criteria of Nielson (2003):

4.3.1 Measurement Results Learnability

Calculation result of Learnability is presented on Table 3 and Table 4.

Table 3: Learnability of Teams

Learnability Teams					
Category	Interval	Freq	%	Mean	Std
Low	11≤x<26	2	0,8	47,25	5,88
Medium	26≤x<41	102	42,5		
High	41≤x≤55	136	56,66		

Table 4: Learnability of Classroom

Learnability Classroom					
Category	Interval	Freq	%	Mean	Std
Low	11≤x<26	0	0	49,48	5,34
Medium	26≤x<41	71	29,58		
High	41≤x≤55	169	70,41		

The study's results show that many users find Microsoft Teams and Google Classroom relatively easy to learn. Around 56.66% of respondents found Microsoft Teams easy to learn, while 70.41% found Google Classroom easy to learn. In terms of the moderate category, 42.5% of users considered Microsoft Teams to have an acceptable learning curve, compared to 29.58% for Google Classroom. Despite both platforms receiving positive ratings, a higher percentage of users considered Google Classroom to be more user-friendly. It is noteworthy that only 0.8% of users encountered difficulties when learning Microsoft Teams.

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When examining the ease of learning in Google Classroom, it achieved a high score, averaging 49.48% among users in tasks completion and overall usage. This can be attributed to various factors, such as providing a straightforward method for submitting assignments through a user-friendly interface. The user-friendliness aspect can be evaluated by considering principles like Fitts's Law, which encompasses factors like information placement and layout. Furthermore, Google Classroom's ease of mastery and integration with commonly used Google applications contribute to its reputation as an accessible and efficient learning platform.

4.3.2 Measurement Results Efficiency

Calculation result of Efficiency is presented on Table 5 and Table 6.

Table 5: Efficiency of Teams

Efficiency Teams					
Category	Interval	Freq	%	Mean	Std
Low	7≤x<17	2	0,8	29,67	3,72
Medium	17≤x<27	126	52,5		
High	27≤x≤35	112	46,66		

Table 6: Efficiency of Classroom

Efficiency Classroom					
Category	Interval	Freq	%	Mean	Std
Low	7≤x<17	1	0,4	30,69	3,71
Medium	17≤x<27	105	43,75		
High	27≤x≤35	134	55,83		

Based on the measurement results of the Efficiency variable in Microsoft Teams and Google Classroom, it was found that a considerable number of users perceive both applications as efficient. Specifically, 112 users or 46.66% stated that Microsoft Teams is highly efficient, while 134 users or 55.83% expressed that Google Classroom is highly efficient. In the moderate category, 126 users or 52.5% found Microsoft Teams to have satisfactory efficiency, while 105 users or 43.75% felt the same about Google Classroom. However, only 2 users or 0.8% considered Microsoft Teams to be inefficient, and only 1 user or 0.4% expressed the same sentiment about Google Classroom.

Both applications demonstrate a satisfactory level of efficiency, although Google Classroom outperforms Microsoft Teams with an average score of 30.69% in terms of efficiency. The efficiency of Google Classroom includes aspects such as easy navigation within the application and a simple user interface. The simplicity of the interface can be observed through task analysis, where users efficiently complete tasks, such as submitting assignments in Google Classroom. Users can quickly access the classes with assigned tasks and submit their work effortlessly. The comparison of steps can be observed through the hierarchy of task analysis in Figure 2 and Figure 3.

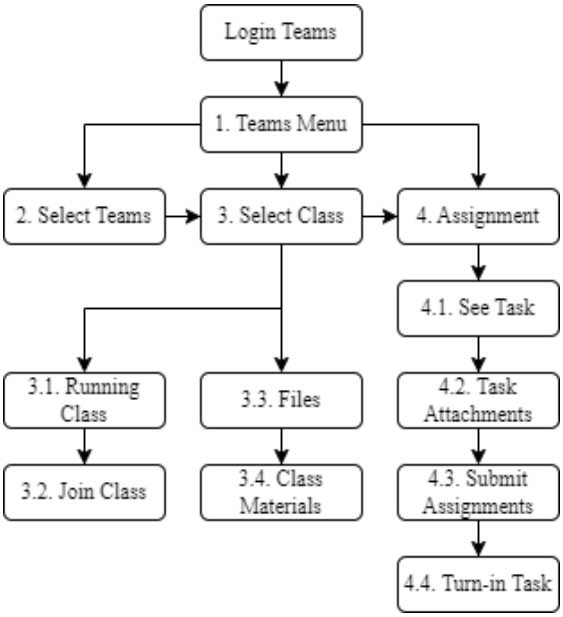

Figure 2: Hierarchy Task Analysis of Ms. Teams

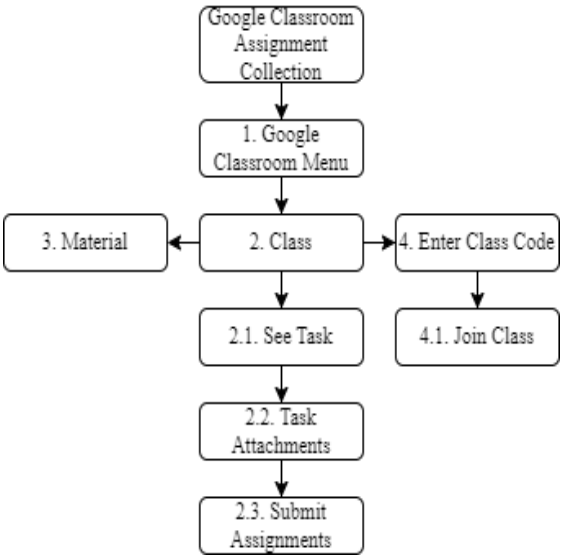

Figure 3: Hierarchy Task Analysis of Google Classroom

Task analysis for Microsoft Teams involves navigating through the Teams menu upon entering the application. Users are presented with the main Teams page, which includes sections such as activity, chat, teams, assignments, calendar, calls, and files.

In the given example of task analysis, the process of submitting assignments in Microsoft Teams can be carried out in two ways. Firstly, users can access the "Assignments" tab located on the left

side of the Teams menu, where they can select the specific assignment they wish to submit. After selecting the assignment, users have the option to attach the relevant file and submit it. Once the file is successfully uploaded, users can confirm their submission by clicking the "Turn In" button.

On the other hand, task analysis for Google Classroom emphasizes a simplified interface. In the case of submitting assignments in Google Classroom, users can enter the class, view the assignment, attach files either directly or through Google Drive, and ultimately submit the attached assignment.

4.3.3 Measurement Results Memorability

Calculation result of Memmorability is presented on Table 7 and Table 8.

Table 7: Memmorability of Teams

Memmorability Teams					
Category	Interval	Freq	%	Mean	Std
Low	8≤x<19	1	92,08	34,27	4,48
Medium	19≤x<30	18	7,5		
High	30≤x≤40	221	0,4		

Table 8: Memmorability of Classroom

Memmorability Classroom					
Category	Interval	Freq	%	Mean	Std
Low	8≤x<19	0	0	35,71	4,31
Medium	19≤x<30	9	3,75		
High	30≤x≤40	231	96,25		

Based on the measurement results of the Memorability variable for Microsoft Teams and Google Classroom, the findings indicate that a significant majority of users find both applications easy to remember and recall. Specifically, 221 users, accounting for 92.08% of respondents, expressed that Microsoft Teams has a high level of memorability. Similarly, 231 users, representing 96.25% of respondents, stated that Google Classroom is also highly memorable.

In the moderate memorability category, 18 users (7.5% of respondents) perceived Microsoft Teams to have a moderate level of memorability, while 9 users (3.75% of respondents) expressed the same for Google Classroom. This suggests that both applications exhibit a reasonable level of memorability, albeit to a lesser degree compared to the high memorability category.

Furthermore, it is worth noting that Google Classroom demonstrates a higher memorability rate compared to Microsoft Teams, with an average score of 35.71%. This implies that Google Classroom's interface, functions, and overall user experience are more easily remembered by users. This higher memorability can be attributed to various factors, such as the intuitive placement of buttons and menus, clear and meaningful symbols used within the application, and the overall simplicity of the user interface.

The ability to recall and remember the features and functions of an application plays a crucial role in enhancing user experience and productivity. With a higher level of memorability, users can navigate the application more efficiently, locate desired features quickly, and perform tasks with ease. This aspect contributes to a positive user perception, as users feel more confident and comfortable while using the application.

The measurement results indicate that both Microsoft Teams and Google Classroom have favorable levels of memorability. However, Google Classroom surpasses Microsoft Teams in terms of memorability, offering a more memorable and user-friendly experience from the update in every version.

4.3.4 Measurement Results Errors

Calculation result of Errors is presented on Table 9 and Table 10.

Table 9: Errors of Teams

Errors Teams					
Category	Interval	Freq	%	Mean	Std
Low	6≤x<14	47	19,58	21,39	5,57
Medium	14≤x<22	102	42,5		
High	22≤x≤30	73	30,41		

Table 10: Errors of Classroom

Errors Classroom					
Category	Interval	Freq	%	Mean	Std
Low	6≤x<14	71	29,58	18,94	5,62
Medium	14≤x<22	139	57,91		
High	22≤x≤30	30	12,5		

Based on the measurement results for the Errors variable in Microsoft Teams and Google Classroom, it was found that a significant number of users reported encountering errors in both applications. In the high category, 73 users or 30.41% of Microsoft Teams users and 30 users or 12.5% of Google Classroom users expressed that these applications have a high error rate. Additionally, 139 users (57.91%) of Microsoft Teams users and 71 users (29.58%) of Google Classroom users stated that both applications experience moderate levels of errors. On the other hand, only 47 users or 19.58% mentioned that Microsoft Teams has a low error rate, while 71 users or 29.58% reported that Google Classroom demonstrates lower levels of errors.

Although users generally claimed that they rarely encounter difficulties when using Google Classroom and Microsoft Teams, some issues persist within both applications. For instance, Google Classroom still faces challenges in terms of accessing classes, with users experiencing difficulties joining their designated courses. Another common concern mentioned by users of both platforms is the delayed notification of assignment submissions. This problem affects both Google Classroom and Microsoft Teams users, causing inconvenience and potential delays in their workflow. Furthermore, Microsoft Teams has also been criticized for its error handling. For example, when a user encounters network problems during a voice call, the system displays an alert stating the issue and waits for the network to stabilize. Similarly, users have reported delays in receiving notifications within the Microsoft Teams application. To mitigate these issues, Microsoft Teams provides a refresh button on the activity tab to address any notification-related problems.

Overall, while the average user experience with Google Classroom and Microsoft Teams indicates relatively smooth usage, it is important to acknowledge the existence of these lingering problems. Developers and providers of these applications should focus on addressing these errors to enhance the overall user experience and ensure seamless usage for all users

4.3.5 Measurement Results Satisfaction

Calculation result of Satisfaction is presented on Table 11 and Table 12.

Table 11: Satisfaction of Teams

Satisfaction Teams					
Category	Interval	Freq	%	Mean	Std
Low	6≤x<14	3	1,2	25,20	3,63
Medium	14≤x<22	118	49,16		
High	22≤x≤30	119	49,58		

Table 12: Satisfaction of Classroom

Satisfaction Classroom					
Category	Interval	Freq	%	Mean	Std
Low	6≤x<14	0	0	26,45	3,26
Medium	14≤x<22	99	41,25		
High	22≤x≤30	141	58,75		

Based on the measurement results obtained for the Satisfaction variable in Microsoft Teams and Google Classroom, it is evident that these online learning platforms have garnered varying levels of user satisfaction. Among the respondents, 119 users, accounting for 49.58% of the total, expressed their satisfaction with Microsoft Teams as a reliable and efficient medium for online education. On the other hand, Google Classroom received satisfaction ratings from 141 users, representing 58.75% of the respondents, indicating their contentment with its effectiveness as an e-learning tool.

When examining the moderate satisfaction category, it was found that 118 users (49.16%) expressed their contentment with Google Classroom, while 99 users (41.25%) reported being moderately satisfied with Microsoft Teams. These findings suggest that both platforms have succeeded in meeting the expectations and requirements of a significant portion of their user base, offering them a satisfactory online learning experience.

In terms of dissatisfaction, only a small number of users, specifically 3 individuals (1.2%), expressed their discontent with the utilization of Microsoft Teams. It is worth noting that user satisfaction is influenced by various factors, including the functionality, user interface, ease of use, reliability, and overall experience provided by the platforms. These factors contribute to shaping users' perceptions and evaluations of the platforms' effectiveness in facilitating their educational journey.

Although both applications received favorable satisfaction scores, it is noteworthy that a larger proportion of users expressed their satisfaction with Google Classroom. This preference could be attributed to several factors, including the intuitive nature of Google Classroom's features, ease of navigation, seamless integration with other Google applications, and the overall user-friendly experience it offers. These aspects have contributed to a positive perception among users, instilling a sense of confidence and satisfaction in utilizing Google Classroom as their preferred online learning platform.

The varying levels of user satisfaction between Microsoft Teams and Google Classroom highlight the importance of understanding users' preferences and requirements in the design and development of online learning platforms. By catering to users' needs, offering intuitive features, and ensuring a seamless and enjoyable learning experience, educational platforms can enhance user satisfaction and ultimately contribute to the effectiveness of online education.

5. CONCLUSION

In conclusion, the findings from the analysis of user satisfaction and usability in Microsoft Teams and Google Classroom highlight

important considerations for the design and functionality of online learning platforms. Both platforms have demonstrated their efficacy in facilitating remote education, but there are notable differences in terms of user satisfaction and usability.

Google Classroom emerged as the preferred platform among users, with higher satisfaction ratings and commendations for its user-friendly interface and intuitive design. The platform's usability, characterized by easy navigation, clear instructions, and seamless integration with other Google tools, has contributed to a positive user experience. Users appreciated the platform's simplicity, as it allowed them to focus on the learning content rather than struggling with complex features or workflows.

While Microsoft Teams received positive feedback for its collaborative features and communication tools, some users reported occasional usability issues, such as difficulty in finding specific functions or challenges in adapting to the platform's interface. These observations indicate that there is room for improvement in terms of usability, ensuring that users can navigate the platform effortlessly and efficiently access the desired features and resources.

To enhance usability, Microsoft Teams should focus on refining the platform's interface, streamlining workflows, and providing clear and concise instructions for users. Improving the discoverability of features, simplifying complex processes, and offering customizable options can further enhance the platform's usability and user satisfaction.

Google Classroom can build upon its existing strengths in usability by continuously improving the platform's navigation, integrating additional customization options, and optimizing the user interface based on user feedback. These efforts can enhance user engagement, simplify tasks, and ultimately contribute to a more efficient and enjoyable learning experience.

Both Microsoft Teams and Google Classroom should prioritize ongoing user research and usability testing to identify pain points and areas for improvement. By gathering feedback, conducting user studies, and implementing iterative design processes, these platforms can continuously evolve to meet the changing needs and preferences of educators and students.

In the broader context of online education, the usability of learning platforms plays a pivotal role in ensuring effective and enjoyable learning experiences. Intuitive interfaces, clear workflows, and seamless interactions empower educators and students to focus on learning rather than struggling with technical complexities. By prioritizing usability alongside user satisfaction, Microsoft Teams and Google Classroom can foster a positive learning environment that maximizes engagement, knowledge retention, and academic success.

Ultimately, the success of online learning platforms hinges on their ability to balance functionality, user satisfaction, and usability. By addressing user feedback, refining interfaces, and incorporating best practices in user-centered design, Microsoft Teams, Google Classroom, and other platforms can continue to enhance the online learning landscape and empower learners worldwide.

There is potential for further enhancement in this research by incorporating a more extensive range of respondents. Additionally, the study can be expanded to encompass various online learning platforms beyond just Microsoft Teams and Google Classroom. By broadening the participant pool and exploring alternative online learning platforms, the research can benefit from a more comprehensive understanding of the subject matter. This approach would enable researchers to gather diverse perspectives and insights, leading to a richer and more nuanced analysis of the topic at hand.

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