UNIVERSITI TEKNOLOGI MARA

VISUAL ERGONOMICS AND USER PREFERENCE: A COMPREHENSIVE COMPARATIVE STUDY OF DARK MODE AND LIGHT MODE INTERFACES ON THE LEARNING EXPERIENCE OF HIGHER EDUCATION STUDENTS

AHMAD HAIKAL FIKRI BIN HAZADI

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AHMAD HAIKAL FIKRI BIN HAZADI

Thesis submitted in fulfilment
of the requirements for the degree of
Master (Arts and Design)

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 1 October 2025 to conduct the final examination of Ahmad Haikal Fikri bin Hazadi on his Masters of Arts thesis entitled "Visual Ergonomics And User Preference A Comprehensive Comparative Study Of Dark Mode And Light Mode Interfaces On The Learning Experience Of Higher Education Students" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The Panel of Examiners was as follows:

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I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

In the era of the Fourth Industrial Revolution (IR4.0), advances in digital technology have made interface design increasingly important in shaping the user experience. The usage of dark and bright modes in digital interfaces is one of the most often disputed topics, with claims that they impact readability, eye strain, user preferences, and general well-being. As a result, the purpose of this study is to look at the elements that determine user preferences for interface modes, as well as how they affect educational experiences and outcomes. This study takes a qualitative research strategy, collecting data through questionnaires and interviews. The poll included 30 students from Universiti Teknologi MARA (UiTM) Shah Alam, 15 males and 15 females, to guarantee a balanced perspective between genders. In addition, interviews with UI/UX professionals were performed to acquire a better understanding of the effectiveness of interfaces in real-world scenarios. This study is also consistent with SDG 4, which highlights the significance of excellent education and a suitable learning environment. The literature review focused on the physiological and psychological impacts of using dark and light modes, such as their influence on eye tiredness and cognitive function. The study's findings are intended to help designers and developers create digital interfaces that are more user-friendly, efficient, and promote long-term user well-being.

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Symbols

N	Sample size
%	Percentage

LIST OF ABBREVIATIONS

Abbreviations

GUI	Graphical User Interface
iOS	iPhone Operating System
OS	Operating System
UiTM	Universiti Teknologi MARA
UI	User Interface
UX	User Experience

CHAPTER 1
INTRODUCTION

1.1 Research Background

Dark mode and light mode are two prominent interface design options that have received a lot of attention in recent years, especially in the context of the Fourth Industrial Revolution (IR4.0), which focuses on the integration of digital technologies into various aspects of society. According to Schwab (2016) technology is radically changing all aspects of human existence, including education, employment, and everyday interactions. This digital revolution highlights the increasing need for intelligent and user-friendly interface design. Most devices default to light mode, which offers a light or white backdrop with black writing, whereas dark mode has a dark background with white or light-colored lettering (Kudlak, 2024). These two modes provide different experiences to users, influencing issues such as readability, eye strain, and energy consumption. Dark mode, also known as black mode, dark theme, night mode, or light-on-dark (Lunn, 2022), is especially commended for decreasing eye fatigue in low-light conditions and extending battery life on OLED screens. But the dark text on a light background became common when WYSIWYG (What You See Is What You Get) word processors were introduced (Ma et al., 2023). These are computer programs that let people edit and format text as if they were writing on paper. In contrast, light mode is commonly favored in brightly lit environments since it improves visibility and is the default setting for most programs. Both modes have distinct benefits and are preferred by different user groups based on personal preferences, device usage patterns, and ambient lighting conditions, making the decision between them an important factor in modern UI/UX design.

However, the choice between light and dark modes affects not only the device's visual appeal, but also readability, eye strain, and battery consumption, making it an important part of the total digital experience. Depending on how you use your smartphone and the model, moving from light to dark mode may help you preserve battery life, especially on OLED panels where dark pixels use less power (Dash et al.,

2021). Beyond energy efficiency, the decision between these modes is also influenced by health and environmental issues. This research is directly related to Sustainable Development Goals (SDGs) 4, which prioritize quality education, respectively. Addressing eye health and comfort while using digital devices in dark or light mode is critical, since extended screen exposure can have a substantial impact on visual well-being.

The use of electronics in education, where children and students spend long periods of time in front of displays, exposes their eyes to blue light radiation. Blue light has been linked to a variety of eye health disorders, including nearsightedness, dry eyes, and myopia, as well as disrupted sleep cycles due to its effect on melatonin production (Nur Amirah, 2021). These detrimental impacts can have a significant impact on students' learning processes, particularly for those who do most of their educational activities on computers. By investigating the effects of dark and bright modes, this study hopes to highlight the necessity of designing digital interfaces that support not only aesthetic preferences and usability, but also users' long-term health and productivity, particularly among students.

This is aligned with SDG 4's goals of providing high-quality education to all and promoting opportunities for lifelong learning. Interface design provides a crucial lens through which to assess the impact on users' physical health and learning results. In educational situations where digital device usage is common, the design choices between dark mode and light mode can have a substantial impact on the user experience. As educational institutions incorporate more technology into their courses, understanding how these modalities affect students' comfort, eye health, and general learning efficiency becomes critical.

The major goal of this research is to investigate the impact of dark and light mode interfaces on user experience, with a focus on the implications for education (SDG 4). By concentrating on how these interface choices affect readability, eye strain, and cognitive load, this study hopes to give useful insights for designers and developers. The findings can help influence the design of digital learning environments that not only satisfy aesthetic and functional needs but also promote students' health and well-being. As the use of dark mode on different digital platforms expands in the era of IR4.0, understanding its implications on the user experience becomes increasingly crucial.

Furthermore, this study will look at how different user demographics, such as age and device usage habits, interact with dark and bright modes. Younger students, for example, may experience different amounts of eye strain than older users due to prolonged screen exposure throughout their formative years. Furthermore, the study will look at how ambient lighting conditions and individual preferences influence the efficacy of each mode. By tackling these issues, the study hopes to contribute to the larger objective of improving digital interfaces for educational purposes, ensuring that technology improves rather than degrades learning experiences. This study aims to help the development of user-centered design methods that are in line with the changing demands of the digital era through a thorough investigation.

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1.2 Problem Statement

The problem identification focuses on the selection factor of light mode and dark mode among everyday users, particularly students. Against the backdrop of the The Fourth Industrial Revolution (IR4.0) has fundamentally shifted the educational landscape, forcing higher education students to rely heavily on digital devices for academic survival. Consistent design principles establish the foundation for UX strategies that prioritize measurable user performance and systematic implementation(Tewari, 2025). While this digital integration offers convenience, it has introduced a critical challenge: "Digital Eye Strain" (DES) or Computer Vision Syndrome. As students spend increasing hours on screens for lectures, research, and assignments, the visual interface—specifically the choice between Dark Mode and Light Mode—becomes a matter of physiological health, not just aesthetics. Fourth Industrial Revolution (IR4.0), which is defined by the significant integration of digital

technology into every aspect of human existence, there is an urgent need to perform a thorough examination of the implications of choosing between dark mode and light mode. As higher education students grow more reliant on digital devices for academic purposes, understanding the effects of these interface choices on their user experience becomes critical. The expansion of digital learning environments, as well as the resulting increased screen time, necessitates a thorough analysis of how light and dark modes affect parameters such as eye strain, readability, cognitive load, and overall user happiness. This thesis seeks to investigate these factors, generating insights that may be used to improve design methods and students' educational experiences. By investigating the preferences and effects of light and dark modes, this study hopes to help to the creation of more user-friendly and health-conscious digital interfaces in the era of IR4.0.

According to Mantzios (2023), the text in dark mode is darker than in light mode, making it simpler for some people to read under certain settings. However, the light option might induce glare, which can make reading difficult and uncomfortable over time. While many users prefer black text to light backgrounds because it is more conventional and familiar, there is evidence that long-term usage of light mode may cause and worsen myopia and other vision disorders (Tammy, 2023). In contrast, some people find it difficult to see the screen or read text in dark mode, especially in well-lit locations or when dealing with certain sorts of information (Sprabary, 2023). These opposing experiences and preferences underscore the need for more detailed study to understand why people prefer light mode over dark mode, or vice versa. By analyzing these characteristics, this study hopes to guarantee that consumers make educated judgments based on both visual appeal and health considerations, rather than merely choosing what looks good. Such findings are critical for designing user-centered design standards that prioritize both usability and well-being, especially for higher education students who rely extensively on digital devices for academic purposes.

Currently, there is a lack of consensus on which display mode effectively mitigates visual fatigue in an academic context. While dark mode is often marketed as a solution for battery saving and eye comfort (Eisfeld & Kristallovich, 2020), empirical evidence regarding its efficacy for long-duration reading—a typical student activity—remains conflicting. Some users report that light text on dark backgrounds causes "halation" (blurring), making reading difficult in well-lit environments (Sprabary, 2023). Conversely, prolonged exposure to the white background of light mode is

frequently linked to myopia progression and circadian rhythm disruption due to blue light emission (Nur Amirah, 2021). Given the commercial objectives at stake, it is crucial to critically evaluate the implications of dark mode's growing popularity, ensuring that its adoption is informed by empirical data and positively contributes to user well-being rather than being an unwanted consequence of commercial strategies or visual preferences. In order to reach their full potential, industry players must keep up with the pace and be well-prepared for IR 4.0 (Saleh et al., 2023). Navigating these interface design options requires industry leaders to establish a culture of user-centric innovation. Collaboration among designers, developers, and end users, along with regular usability testing, will not only improve interface decisions but also ensure that user experiences grow in unison with the changing requirements of the digital realm. Embracing this iterative strategy is critical for being at the forefront of customer happiness and technical breakthroughs in the ever-expanding digital realm.

The world of Graphical User Interfaces (GUIs) is changing dramatically, with user display mode preferences playing a crucial role. The type of display technology used, and factors related to the user's surroundings frequently decide the best option between dark mode and light mode displays (Erickson et al., 2020). This emphasizes the difficulties of choosing the proper display mode, highlighting that the optimum option is determined by not just human preference, but also technological and environmental considerations. According to Erickson et al. (2020), the illumination emitted by different types of displays can have an impact on human physiology, cognitive performance, and brain function. Light from digital device screens, particularly blue light, has the potential to disturb circadian cycles, affecting a person's sleep quality and attention levels. User preferences are important in this circumstance, with about 95% of users choosing dark mode, indicating that it is more relaxing for the eyes than light mode (Kudriashova, 2023). However, this overwhelming preference for dark mode presents a challenge for designers and developers because it contradicts research indicating that chromatic aberration can cause color distortion, making dark mode less desirable for long reading sessions and less effective in well-lit environments (Kudriashova, 2023). These contrasting viewpoints highlight a gap in knowing the best settings for dark mode use.

The desire for dark mode extends to certain apps, such as email, yet it brings significant obstacles. According to a study, 43% of respondents found it difficult to

optimize logos and images for dark mode emails (Steinbrinck, 2021), underlining the practical challenges of adapting visual material for this display mode. Beyond aesthetic preferences, display mode selection influences user engagement and operational efficiency, with demographic considerations playing an important role. According to research, gender variations in performance exist women learn faster in brighter environments, whilst males do better in darker conditions (Chen et al., 2023). This raises questions about whether men would have more difficulty with dark mode and whether light mode could potentially cause eye damage, given that women are more prone to serious eye disorders such as AMD. (Dr. Pilyugina, 2023). These considerations highlight the need for better knowledge of how display styles influence various users and circumstances.

Furthermore, a "Preference Paradox" exists where user behavior does not always align with optimal ergonomic guidelines. Students may choose a mode based on trend or habit rather than visual comfort, potentially exacerbating eye strain without realizing it. This study addresses this gap by investigating the specific factors driving mode selection among university students and analyzing whether their choices align with visual comfort and learning focus. By understanding these dynamics, this research aims to provide evidence-based recommendations for UI design in educational platforms, ensuring they support student well-being rather than diminishing it.

Finally, while comparing numerous display modalities, text readability is a crucial aspect of relevance that must be thoroughly examined. The current study, as indicated, indicates an evident trend: text readability is higher when presented as dark text on a light backdrop, known as Light Mode, as opposed to the contrary, Dark Mode (Palmén et al., 2023). These empirical findings highlight the need for a more comprehensive understanding of the complex interplay between font typology and display mode configuration, as these elements contribute to the creation of multifaceted readability, an important consideration in the field of graphical user interface (GUI) design.

1.3 Research Objectives

Two objectives have been set to help achieve the study's purpose. This study focuses on end users, which are higher education students, who are more exposed to the user interface and user experience in their everyday activities.

i) Investigate the dark and light mode interfaces based on user preferences.

ii) Analyze the user preferences of dark and light mode interface.

The objective is to uncover variances in user preferences for the preferred interface modality. This study will be undertaken at a university to collect information from higher education students.

1.4 Research Question

To accomplish the objectives of this study, questions were devised to dig deeper into the research subject. There are two research questions listed below.

i) What factors influence users' choices between dark and light mode interfaces?

ii) How do dark and light mode interfaces affect users' preferences?

1.5 Significance of Study

Its significance of this study stems from its ability to improve knowledge of how dark mode and light mode interfaces affect higher education students' academic performance and user experience.

By researching the impact of several display modalities on attention, focus, reading comprehension, and information retention, this study hopes to give useful insights into enhancing digital environments for educational purposes. The findings can help to produce user-friendly and successful UI/UX designs, resulting in more efficient and tailored learning experiences. Furthermore, the study's findings might help educational institutions develop guidelines and policies to encourage academic performance and pleasure in increasing digital learning settings.

The investigation of user choice and satisfaction with dark mode and light mode interfaces among higher education students is an important component of this research. This study examines students' comfort levels, aesthetic preferences, and general happiness with several display modes to determine which interface best optimizes the digital learning experience. By methodically examining these preferences, this study hopes to help design more tailored and accessible instructional technology. Such technologies would be more adapted to meeting a wide range of user demands, resulting in increased satisfaction and engagement. Furthermore, the findings

of this study can help UI/UX designers and developers create more intuitive and appealing digital environments that promote greater levels of student engagement and productivity in their academic endeavors.

Finally, the study's findings have important implications for policy and implementation within educational institutions, particularly in light of Sustainable Development Goal 4 (SDG 4), which seeks to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. This study, by giving empirical data on the impact of dark mode and light mode interfaces on academic achievement and user happiness, can help to shape institutional standards and policies that improve digital learning environments. These findings can aid in the development of best practices for screen use in educational settings, guaranteeing the appropriate use of digital resources to promote learning outcomes. Furthermore, the study's findings may persuade producers of educational gadgets and software to choose default settings that promote a more positive learning environment, so helping to the larger goal of attaining high-quality education for all children.

1.6 Scope of Study

This research is meticulously designed to focus on the user experience (UX) and interface preferences of higher education students regarding Graphical User Interfaces (GUI). To ensure the feasibility and validity of the study, the scope is defined by the following specific boundaries:

i) **Population and Location:** The primary population for this study is strictly limited to postgraduate and undergraduate students currently enrolled at Universiti Teknologi MARA (UiTM), specifically within the Shah Alam campus ecosystem. This demographic was strategically selected because university students represent a class of "digital natives" who are required to engage in high-intensity screen usage for academic purposes, making them the ideal subjects for investigating digital eye strain and interface preferences.

ii) **Technological Scope**: Technologically, the study examines user interactions with the two dominant display modes—Dark Mode and Light Mode—across the devices most commonly utilized for academic work: mobile devices (Smartphones) and personal computers (Laptops/Desktops). The research covers major operating systems, including iOS, Android, and Windows, while specifically focusing on standard educational and communication applications used in a university setting. This ensures that the findings are relevant to the actual digital environment that students navigate daily.

iii) **Thematic Scope:** Thematically, the investigation is limited to four key variables: user preference, perceived visual comfort (eye strain), text readability, and perceived focus during learning sessions. It is important to note that this study approaches the problem from a design and user experience perspective; it does not conduct clinical ophthalmological trials to measure physical eye damage. Instead, it relies on self-reported physiological experiences from students and technical validation from qualified UI/UX industry experts.

1.7 Thesis Outline

This study is separated into two parts: theoretical research and survey. Theoretical research seeks to structure the work by a thorough review of the existing literature, which will then be used to the survey component.

Chapter One. Introduction. This chapter begins by providing an overview of the study, creating the problem statement, identifying the research objectives, and outlining the research goals and questions. It describes the study's breadth and context, emphasizing its significance, particularly in terms of higher education students' experiences with dark and light modes. The chapter ends with an outline of the thesis.

Chapter Two. Literature Review. This chapter gives a thorough overview of past research on the topic of the study. This tries to identify research gaps and provide new techniques based on literature findings.

Chapter Three. Research Methodology. This chapter describes the research methods used to answer research questions. It explains the research methodology, which includes preliminary research to gain early thoughts. The chapter discusses data collection methods, participant selection, and the procedures used to evaluate survey results. Validation strategies for data analysis are also covered.

Chapter Four. Findings and Analysis. This chapter analyses survey data and presents major conclusions about students' preferences and experiences with dark and light modes. It investigates elements like readability, eye strain, and overall user happiness, comparing them across demographics. This chapter also investigates the effects of these variables on user engagement and academic success.

Chapter Five. Conclusion. The last chapter describes how the study's findings were used to create a user interface design framework. This paradigm attempts to guide the design of educational platforms and tools, ensuring that they satisfy learners' needs and preferences for dark and light modes. This chapter highlights the study's contribution to the field of UI/UX design and makes recommendations for further research.

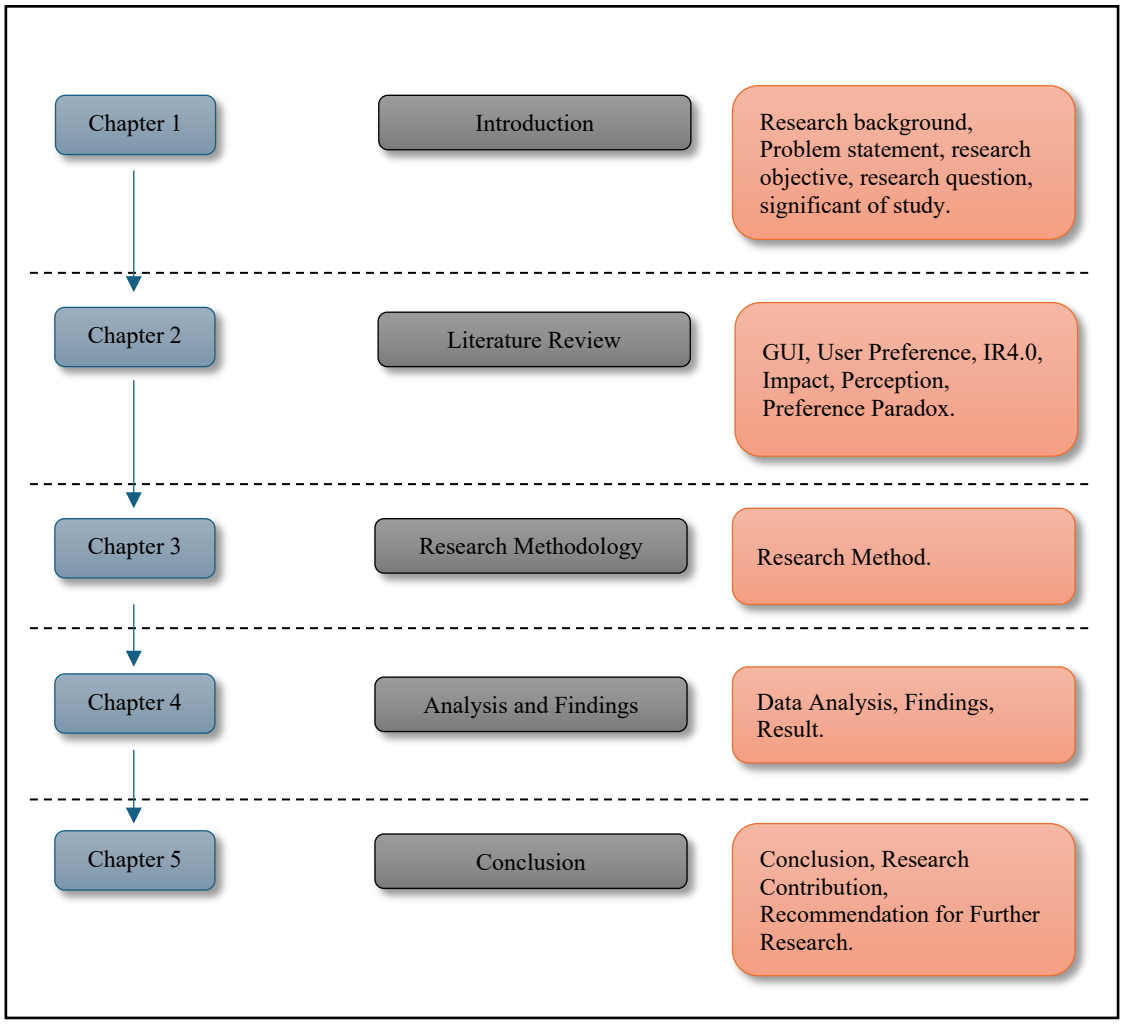

Figure 1.1 Research methodology and associated thesis chapter

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

Figure 2.1 Area of literature review

This chapter conducts a thorough examination of the literature to identify sustainable practices and developing trends in the field of user interface (UI) design, with a special emphasis on the changing paradigms of dark mode vs light mode interfaces. As digital interfaces grow more prevalent in daily life, the evolution of UI

design components has become an important factor in enhancing user experience and accessibility. This literature review aims to provide a thorough evaluation of current research and UI design trends, with a focus on the comparative analysis of dark and light modes, to support the thesis "Visual Ergonomics and User Preference: A Comprehensive Comparative Study of Dark Mode and Light Mode Interfaces on The Learning Experience of Higher Education Students."

Furthermore, the relationship between technology and user health, as highlighted by Sustainable Development Goal 3, is a key field of research. Advancements in UI design have been proved to have a significant impact on both physical and mental health. Existing research indicates that well-designed, user-centric interfaces can reduce stress and improve cognitive function. While this study focuses on display modes, other researchers have explored diverse UI/UX areas; for instance, navigation and interface complexity have been shown to affect user attention and purchase intentions (T. I. Hasan et al., 2024). In contrast, poorly designed systems can worsen user discomfort, resulting in problems including eye strain and repetitive strain injury (RSI). The integration of ergonomic and inclusive design principles has resulted in interfaces that meet the demands of a varied user base while encouraging healthy relationships with technology.

This review will look in depth at scholarly publications, case studies, and empirical research that shed light on contemporary improvements and user preferences in UI design, particularly in terms of dark and light modes. This review takes a methodical approach to aggregating and synthesizing information from a wide range of sources, with the goal of providing a thorough understanding that supports the basic argument. This analytical approach provides a thorough investigation of how light and dark modes impact the user experience, considering visual ergonomics, readability, and user preferences.

2.2 The Fourth Industrial Revolution and Its Impact on UI/UX

According to Schwab (2016), the Fourth Industrial Revolution has brought about significant technological changes, having a major impact on the way humans live, work, and interact with the digital world. Technologies such as artificial intelligence (AI), the Internet of Things (IoT), and big data have not only changed the industrial landscape but also influenced the patterns of technology use in daily life. Mohamed et

al. (2020) also emphasized that these changes involve various aspects such as the replacement of old equipment with modern technology, the use of artificial intelligence, the installation of smart sensors, enterprise-level solutions, and the application of machine learning (ML) in digital systems.

In terms of user interface (UI) and user experience (UX) design, technological advancements necessitate increasingly sophisticated, intuitive, and responsive designs to satisfy current users' expectations and demands. As digital systems become more intelligent, interfaces must be able to adapt to individual's preferences and usage patterns. One type of adaptation that is gaining popularity is the ability to flip between dark and light modes in digital interfaces. This feature not only improves the aesthetics of a system, but it also gives benefits in terms of visual comfort and energy efficiency, depending on the circumstance and area in question.

According to Mohd Noor et al. (2021), the level of skills and mastery of IR 4.0 technology among small and medium enterprises (SMEs) in Malaysia is still at the initial stage, which is level 1. This shows that many organizations are still in the phase of adapting to rapid technological changes. Therefore, the development of more flexible and user-friendly digital interfaces is very important to ensure that users can adapt to these changes without experiencing significant difficulties.

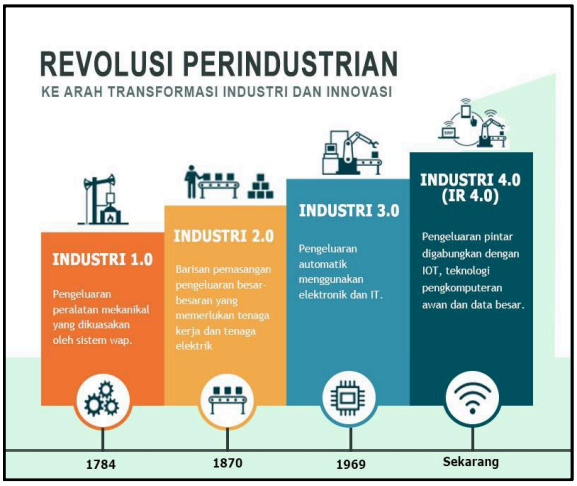

Figure 2.2 Industrial Revolution Infographic by NCER Malaysia

The need for interfaces that can be adapted to user preferences is increasing in line with technological developments. Understanding the choice of interface modes based on user demographics can help designers produce more personalized experiences that are relevant to the actual needs of users. By taking into account the main principles

in UI/UX, a design that is responsive to user tendencies not only increases user satisfaction but also strengthens the competitiveness of a digital product in this Fourth Industrial Revolution era.

2.3 Dark Mode and Light Mode in Graphical User Interfaces (GUIs):

Based onVinciunas & Kapocius (2023) on the need to balance the use of dark and light modes in graphical user interfaces (GUI), it is important to assess the broader implications of these design decisions. Their study highlights the importance of adapting GUI designs to meet changing user preferences and varying environmental conditions. The growing global trend towards adaptable interfaces is not only a change in aesthetics, but also in the understanding of the practical benefits associated with better user experience and accessibility.

In Malaysia, GUI design is increasingly showing a trend towards more inclusive and user-centered design principles. This change is not just an aesthetic trend, but also an awareness of the need to improve comfort and accessibility in digital interactions. With rapid advances in display technology, the ability to switch between dark and light modes is no longer just a decorative element but has become an important aspect in improving the usability and ergonomics of a system.

The ability to switch between dark and light modes plays an important role in reducing eye strain, especially when users are in different lighting environments. This flexibility helps create a more engaging and comfortable user experience, thus meeting the needs of diverse user groups. Modern, increasingly dynamic display technologies facilitate this level of customization, making it an important aspect of GUI design today. By taking into account a variety of lighting conditions and individual preferences, designers can improve user comfort and overall satisfaction, ultimately contributing to a more user-friendly digital environment.

Furthermore, geographical disparities in GUI design preferences and technology adoption highlight the importance of considering cultural and environmental elements during the design process. While global trends can provide broad design ideas, recognizing and incorporating local user feedback is essential to increasing the usability and acceptance of technology in communities. This customized

approach ensures that GUI designs are not only physically beautiful, but also culturally sensitive and tailored to the individual user's needs.

For example, in countries with high levels of natural light throughout the day, users may be more likely to choose a bright mode for easier reading and reduced reflections on the screen. Conversely, in areas with frequent use of low lighting or devices at night, a dark mode may be preferred to reduce glare and eye strain. Therefore, the use of GUI elements that can be adapted to local preferences is a reasonable approach to ensure a better user experience.

Combining global trends and regional perspectives in GUI design enables the creation of more personalized and user-friendly digital experiences. This bidirectional approach helps developers and system designers produce interfaces that not only appeal to users on a global scale but also meet local needs and preferences. By bridging the gap between universal design principles and local demands, this approach encourages the development of interfaces that are more globally relevant and appropriate to a specific cultural context, thereby increasing overall effectiveness and user acceptance.

In conclusion, the choice between dark mode and light mode in a GUI is not only a design choice, but also an important aspect of improving the user experience. Visual comfort, accessibility, and user preferences need to be taken into account in creating a more responsive and flexible design. By considering regional differences and cultural factors, GUI designers can create more user-friendly digital experiences that meet user expectations at both the local and global levels.

2.4 User Preference

2.4.1 Physiological Comfort vs Habit

Xie et al. (2021) emphasize an essential component of user interface design by investigating the complex interaction between physiological well-being and long-standing user behaviors. Their research indicates an intriguing paradox: consumers recognize that dark mode can minimize eye strain, but they prefer bright mode because they are accustomed to such displays. This phenomenon is a major challenge in developing digital interfaces that are truly user-centric. While ergonomic aspects that emphasize physiological comfort play an important role, their effectiveness may be limited by the strength of individual habits and tendencies that have been formed over time.

This shows that simply providing more physiologically appropriate design options is insufficient for improving the user experience. Instead, a more holistic approach is required, which includes examining how consumers adapt to change, their willingness to embrace new designs, and the factors that impact their decision to utilize a specific display mode. For example, many users may prefer bright mode because the backlight is more comfortable for reading in most situations, even though they recognize that dark mode can help reduce eye strain, especially in low-light conditions.

In this context, one step that can be taken is to involve users more actively in the interface design process. Usability testing and iterative feedback can help designers obtain better knowledge of users' preferences and the issues they confront when using digital interfaces. Furthermore, adding more interface customization choices can help bridge the gap between physiological benefits and current user behaviors. For example, allowing users to define their own contrast levels, color intensity, or automatic transitions between bright and dark modes based on ambient lighting conditions can lead to better user-friendly solutions.

According to Gao et al. (2024), design psychology seeks to provide in-depth insights into human behavior and perceptual systems that may be used to inspire design innovation and optimization. This method, based on scientific research and empirical studies, provides a firmer foundation for understanding users' true needs, allowing for the creation of interfaces that are not only more ergonomically effective but also easier to accept and use in everyday life. Thus, in order to streamline digital designs that are more inclusive and user-friendly, physiological comfort considerations must be combined with a thorough understanding of user behavior and preferences. This not only improves the user experience but also makes digital interfaces more effective in an era of continuously changing technology.

2.4.2 Preference Paradox

Palmén et al. (2023) conduct a thorough examination into the complexities of user preferences in the context of user interface (UI) design, particularly challenging conventional wisdom on text readability. While empirical evidence reveals that reading rates rise when black text is shown on light backgrounds, the study found that user preferences do not always correspond with light mode. This mismatch emphasizes the importance for UI designers to balance scientific data with a deep understanding of user preferences. Nissen (2020) goes deeper into this contradiction, demonstrating that,

while greyscale websites might be visually appealing, they require more cognitive resources from users, resulting in increased mental strain during navigation.

Furthermore, Nissen (2020) found that green websites are related with unpleasant emotional experiences, which might have an influence on user happiness and engagement, regardless of whatever initial preference users may have for the hue. Similarly, orange websites are seen as unpleasant and necessitate greater cognitive processing, indicating a mismatch between user preferences and the cognitive effort required to interpret these designs. These findings highlight the "Preference Paradox," in which user preferences and actual information on cognitive and emotional reactions to color do not always match, stressing the difficulty of building interfaces that successfully meet user demands and preferences.

2.4.3 Perception and Background Color

Löffler et al. (2017) undertook a thorough analysis into the psychological repercussions of UI design decisions, with a specific emphasis on how the background color in chat interfaces impacts user emotion. According to Lewandowska & Olejnik-Krugly (2022), using color is one of the most effective strategies to draw visual attention. Color not only serves to create contrast and hierarchy in design, but it also influences emotions and user perception. The perfect color combination may improve the appeal of a visual element, whilst using the wrong colors might generate confusion or impair the efficacy of visual communication. Their findings revealed a clear link between the employment of darker backgrounds and an increase in negative perceptions among users. This association demonstrates the powerful influence that color choices in UI design may have on users' psychological responses. The study found that darker backgrounds, which are frequently chosen for their aesthetic appeal or to minimize glare, might accidentally contribute to more unfavorable user experiences.

This research is crucial for designers and developers because it emphasizes the necessity of addressing psychological considerations when making design decisions. The study found that even seemingly simple aesthetic adjustments, such as changing the backdrop color, may have a significant impact on user psychology and overall experience. Understanding these psychological implications allows designers to make more informed decisions, potentially reducing negative emotions and increasing user pleasure through intelligent UI design. The study serves as a great reminder of how

important it is to match design decisions with user psychology in order to achieve the best user engagement and experience.

2.4.4 Demographic Preference

User preferences in UI design are heavily influenced by demographic considerations, notably gender and age, which have a substantial impact on how people interact with light and dark mode interfaces. Chen et al., (2023) found that gender influences UI preferences, with females usually having a quicker reading speed when using light mode interfaces and men doing better in dark mode settings. This implies that gender variations can have a considerable impact on the efficacy and efficiency of various UI modes, hence influencing overall user experience and satisfaction.

Age is another important demographic aspect that determines UI choices. According to Sethi et al., (2022), older persons prefer positive polarity, or light mode, owing to its capacity to lower cognitive load and improve readability, which is increasingly significant as people age and visual strain increases. This preference for light mode among elderly users is primarily motivated by the desire to reduce pain and retain visual clarity during extended use. Younger people, on the other hand, frequently express a strong preference for negative polarity, sometimes known as dark mode, owing to its aesthetic appeal. Younger users usually like the sophisticated, sleek image that dark mode delivers, which corresponds to current design trends and personal style preferences.

These findings emphasize the need to take gender and age into account when designing user interfaces. Recognizing and incorporating these demographic preferences allows designers to develop more inclusive and flexible interfaces that cater to a wide range of users, ensuring that digital environments are both pleasant and efficient for all users, regardless of demographic background.

2.5 Impact

2.5.1 Impact on System Usability

Vinciunas & Kapocius (2023) conducted an in-depth study and made a significant contribution to the discussion on the relationship between graphical user interface (GUI) style and system usability. This study systematically examined the different effects of dark and light modes on online system performance and user engagement levels. Through careful analysis, they were able to demonstrate how

specific visual settings can affect not only user experience but also overall system productivity. These findings are very useful for UI designers and system developers as they provide evidence-based recommendations for optimizing the use of dark and light modes in digital platforms.

Their findings underline the necessity of making educated design decisions that take into account a wide range of user preferences and usage circumstances. For example, adopting dark mode in low-light conditions can help reduce eye fatigue and boost user comfort, whilst using light mode in excellent lighting conditions improves reading and work effectiveness. As a result, flexibility in giving interface options is critical to guaranteeing a more functional user experience.

Apart from usability and productivity aspects, this study also links the effects of bright screen use to user physiology. Shrestha et al. (2024) explained that exposure to bright light, especially at night, can disrupt the secretion of melatonin, a hormone that is important for regulating the sleep cycle. This suggests that the choice between dark and bright modes is not only based on aesthetic factors or user habits but also has a direct impact on their physiological well-being.

Overall, this study not only adds to the existing literature in the field of UI design but also serves as a very useful reference source for industry practitioners who want to improve the usability and appeal of their digital products. With a more strategic and user-centered approach, digital platforms can be developed more efficiently, providing a more comfortable and user-friendly experience in various usage contexts.

2.5.2 Dark Mode in Low Light Conditions

Erickson et al. (2021) emphasize the importance of environmental factors in determining the effectiveness and user satisfaction of graphical user interface (GUI) designs. They focus on the effectiveness of dark mode in low-light conditions, which shows that user comfort and overall experience are greatly influenced by the environment in which the digital device is used. This study proves that when developing digital interfaces, the aspect of adapting to the environment cannot be ignored. This implies that UI design is not just a matter of aesthetics or functionality, but also how users interact with technology in different contexts, including lighting, duration of use, and eye fatigue.

These findings lend support to a more holistic design philosophy that takes into account not only visual attractiveness but also exterior variables that may influence

the user experience. For example, in low-light situations, an overly bright screen display might cause discomfort such as glare and eye strain. However, in high-light settings, bright lettering on a dark backdrop may be difficult to read due to insufficient contrast. As a result, developing flexible interfaces that can adapt to ambient lighting conditions is critical to providing a more comfortable and user-friendly experience.

By tailoring UI design to environmental factors, developers may boost user engagement while lowering discomfort caused by prolonged screen use. This will result in a more intuitive and enjoyable digital experience, allowing users to concentrate on their activities instead of being distracted by visual discomfort. For example, by including an automatic adaptation feature that allows the system to move between dark and bright modes based on ambient lighting, users avoid having to manually change settings, making their experience more seamless and efficient.

According to Shrestha et al. (2024), using dark mode can help alleviate dry eye syndrome and pain caused by prolonged exposure to strong blue light, particularly when studying or working at night. Dark backgrounds with brightly colored text and graphics have been demonstrated to reduce glare and eye strain, making it easier to view and navigate digital material, particularly in low-light conditions (Brag & Gulamhusein, 2023). This explains why, when reading or working in low light, more and more users prefer dark mode yet continuing to utilize bright mode in good lighting circumstances.

However, while dark mode reduces eye strain, it is not appropriate for all people or scenarios. Some people report that viewing white text on a dark background causes halt, which can make reading difficult in the long run. As a result, UI designers must allow users to tailor their experience to their specific needs and tastes.

To summarize, adjusting the user interface to ambient circumstances is an important aspect in providing a better and more comfortable digital experience. Creating UIs that adapt to lighting and usage situations can reduce pain, boost efficiency, and give each user control over how they interact with technology. By adopting a more user-centered approach, UI designs become not only more visually appealing, but also more physiologically friendly and responsive to users' actual demands in diverse usage circumstances.

2.5.3 User Engagement and Behavior

Research has continuously shown that the visual characteristics of a user interface (UI) may have a significant influence on user behavior and perception.

Significant research by Koning & Junger (2021) indicated that people dealing with a dark UI were more likely to engage in dishonest conduct than those using a lighter UI. This surprising discovery is similar with previous study undertaken by Löffler et al. (2017), who discovered that dark mode displays evoke more negative responses from consumers than light mode displays. These findings demonstrate that choosing a UI color scheme is more than just an aesthetic decision; it may also impact user behavior and emotional responses. Such findings highlight the vital relevance of properly assessing the consequences of visual design decisions in UI development.

According to Kudlak (2024), dark mode not only creates a contemporary and relaxing environment, but it also plays an important function in decreasing cognitive load, which improves user perception and engagement. This mode is frequently selected for its ability to provide a more immersive and pleasant user experience, especially in low-light conditions. In contrast, light mode, which is associated with clarity and simplicity, is better suited to well-lit surroundings. It successfully generates a sense of cleanliness, orderliness, and professionalism, all of which are necessary attributes in environments that need high levels of productivity and attention. The different results of these modes highlight the significance of matching UI design decisions to the user's individual demands and situations, ensuring that the interface not only looks good but also supports the desired user experience and behavior.

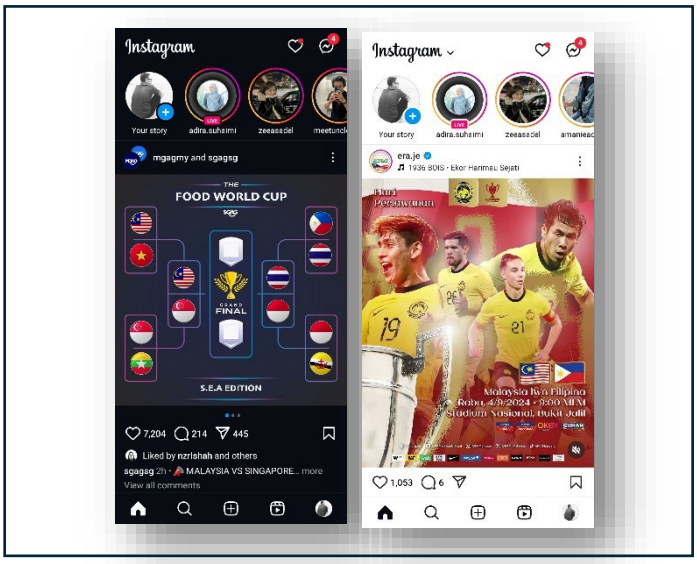

Figure 2.3: Dark mode (left) and Light mode (right) user interface of mobile Instagram

In addition to these behavioral insights, internal research undertaken by Facebook and Instagram provides significant perspectives on the influence of dark mode on user engagement. Internal statistics from Mantzios (2023) showed that 15% of users spent more time on the platform when dark mode was activated. This noteworthy discovery emphasizes dark mode's ability to improve user interaction and retention, demonstrating that visual design decisions may have a considerable impact on user behavior. The greater time spent on the platform when dark mode is enabled is most likely due to the improved visual comfort and reduced eye strain that comes with dark mode. These elements make continuous usage more fun and less tiring, implying that dark mode not only enhances user experience but may also increase engagement metrics. This study emphasizes the larger consequences of design decisions, emphasizing the importance of user comfort and visual ergonomics in developing effective UI tactics and maximizing overall user happiness.

2.5.4 Contrast Polarity

Contrast polarity is the relationship between the backdrop color and the color of text or visual objects on the screen. In a study conducted by While & Sarvghad (2024), it was discovered that both positive and negative contrast polarity had a favorable influence on user performance with no significant variations between age groups investigated. Positive contrast polarity refers to dark text on a light background, while negative contrast polarity involves light text on a dark background.

One of the main findings of While & Sarvghad (2024) study was the significant influence of contrast polarity on user response time, which has an effect almost equivalent to the selection of visualization type. This shows that contrast elements are not just an aesthetic aspect of UI design but also play an important role in determining the effectiveness of information delivery and the overall user experience. For example, in situations where users need to read text for a long time, positive contrast polarity is often preferred because it increases readability and reduces eye strain.

In low-light settings or while using the device at night, negative contrast polarities, such as dark mode, are more effective because they reduce glare and eye strain. Understanding the impacts of contrast polarity enables UI/UX designers to create more adaptable and user-friendly interfaces. In the context of digital design, offering

the option to switch between light and dark modes is one method for increasing user comfort and satisfaction in a variety of usage scenarios.

2.5.5 Contextual Factor

Pedersen et al. (2020) discovered the subtle efficiency of dark mode in user interface design. While the study discovered that dark mode does not significantly increase productivity in well-lit environments, it does show that dark mode may have particular advantages in some situations. For example, dark mode can be very useful in low-light situations since it minimizes glare and eye strain, hence improving user comfort. Furthermore, the study indicates that dark mode can help to cut power usage on OLED panels, as darker pixels demand less electricity. This study supports the notion that the benefits of dark mode are not universal but rather strongly dependent on the use scenario, underlining the significance of context-sensitive design decisions in UI creation (Pedersen et al., 2020).

2.6 Conclusion

This literature analysis examined current trends and environmentally friendly techniques in user interface (UI) design, having a special emphasis on the comparative benefits and downsides of dark mode and light mode interfaces. The findings indicate that these two interface paradigms influence crucial elements like user experience, accessibility, visual ergonomics, and even user behavior. The review synthesizes a wide range of scholarly literature, empirical research, and case studies to give a more in-depth knowledge of the broader implications of dark and light modes for both higher education students and digital users in total.

According to Schwab (2016), the technological improvement brought about by the Fourth Industrial Revolution has raised the demand for customized and user-centered UI design. Personalization options, such as the ability to choose between light and dark settings, have grown in importance as users' demands become more diverse. This trend toward more responsive and welcoming design aligns with the overall direction of UI/UX development, highlighting the significance of ergonomic and configurable interfaces that cater to a wide range of user demographics and environmental settings.

Xie et al. (2021) investigate the relationship between physiological comfort and user behaviors, which is a common issue in literature. The interplay between

lowering visual fatigue and user desire for light mode highlights the complexities of interface design that blends health advantages with regular behavior. Furthermore, Palmén et al. (2023) introduced the idea of the "Priority Paradox," which indicated a disconnect between user preferences and cognitive ease, particularly in the context of color and polarity preferences. This contradiction is a substantial problem for designers, who must strike a delicate balance between meeting consumers' demands and enhancing cognitive and emotional well-being.

Gender and age are important demographic elements that impact preferences for light and dark modes, complicating the design landscape even further. Chen et al. (2023) and Sethi et al. (2022) conducted research on the diverse demands of various demographic groups, emphasizing the need for inclusive and adaptive user interface design. Age-related preferences, particularly the tendency of older users to choose light mode for reading, clash with younger users' aesthetic preference for dark mode, necessitating a flexible design strategy that can accommodate all age groups. Furthermore, the research stresses the role of environmental elements, particularly low light circumstances, in altering the effectiveness and comfort of dark mode, as demonstrated by Erickson et al. (2021).

The broader ramifications of dark mode for user engagement, behavior, and system usability are especially important. Internal study undertaken by platforms such as Facebook and Instagram show that dark mode can boost user engagement by lowering eye strain and boosting user comfort during extended use. These findings highlight the practical benefits of dark mode, not just in terms of aesthetic choice, but also in its ability to boost user engagement metrics and satisfaction. However, Pedersen et al. (2020) found that contextual elements, such as lighting conditions and device kind, are still important in selecting the best use case for dark mode.

Finally, this literature study emphasizes the need to take a balanced and user-centered approach to UI design that supports both dark and light modes while also catering to the individual demands of varied user demographics and environmental situations. A review of the literature suggests that good UI design must combine aesthetic appeal with practical utility, with a strong emphasis on boosting user comfort, engagement, and overall system usability. Higher education students, and indeed all digital users, require flexible and context-sensitive design methods to create healthier and more engaging interactions with digital interfaces. This balance will not only

improve the user experience but will also help to achieve the larger goals of accessibility, inclusivity, and sustainability in UI/UX design.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Prelude

This chapter presents the methodological approach used in this investigation, focusing on the comparative analysis of light and dark modes from the perspective of higher education students. It begins with an overview of the background of the research, providing a detailed explanation of the theoretical underpinnings underpinning the study. This included a review of existing literature, which guided the formulation of research questions and objectives, and a description of the methods chosen for this investigation. This chapter emphasizes the importance of adopting a structured and systematic approach to research to ensure that the findings are reliable and trustworthy. The theoretical framework outlined in this chapter has been developed through a comprehensive review of previous studies. This framework integrates key concepts and principles that inform the research techniques, data collection methods, and data analysis procedures adopted in the study. The main focus is on how the field research was conducted, detailing the steps taken to systematically collect data. This includes a description of the tools and instruments used, the frequency and duration of data collection, and the steps implemented to maintain consistency throughout the process. Particular attention is paid to the analytical methodology, which is designed to process the data efficiently and provide accurate insights that are aligned with the research objectives.

To ensure the quality and integrity of the study, validation procedures are also discussed. These procedures include strategies for validating study instruments, maintaining ethical standards, and ensuring that findings are a true representation of respondents' experiences and preferences. Through this methodological approach, this study aims to offer a comprehensive understanding of user preferences for light and dark modes, highlighting how these choices can impact user experience, especially in the context of higher education students. This chapter lays the groundwork for

subsequent analysis and discussion, ensuring that research results are meaningful and actionable.

3.2 Research Plan

To increase awareness of research goals. Before starting the research, research objectives and research questions must be established to choose the most appropriate research technique. This study aims to investigate higher education students' preferences and experiences with dark and light modes in user interfaces. Understanding how students interact with digital tools becomes increasingly important as they become more integrated into the learning environment. This study aims to investigate the subjective factors that drive students' interface mode choices, as well as how these choices affect their overall user experience, such as comfort, readability and cognitive load.

The research will be carried out in stages, starting with the collection of data through a survey that will be participated in by UiTM Shah Alam students. According to Takona (2024), the sample size for qualitative research is determined by the study's level and breadth. In most circumstances, 10 to 50 participants may be adequate to collect useful data and provide a complete picture of a phenomenon. However, Subedi (2021) adds that in some cases, particularly when the study incorporates unique locations and conditions, a single participant may be adequate. This is because detailed research on individual experiences can yield useful insights without requiring a huge number of participants. Meanwhile, Renwick (2019) contends that qualitative research with fewer than 20 participants might yield more accurate and thorough results. With a smaller sample size, researchers can focus on the specifics of each response, ensuring that the analysis is more thorough and complete. Therefore, a total of 30 UiTM Shah Alam students will be selected. This selection considers several factors, including demographic factors such as study background, level of study, age and gender. This calculation was taken because men and women have differences when using light and dark modes (Chen & Zhai, 2023).

Then, the survey data will be used for interviews with experts in the user interface (Ui/Ux) field to gain certainty in the influence of student selection. The information needed to link the macro and micro levels of analysis can be obtained through expert interviews (Von Soest, 2023). This stage will enable the collection of a

detailed and comprehensive report on the students' choice of mode and the reasons why that choice was made.

These surveys will gather a variety of user experiences, while interviews with UI/UX professionals will provide expert insight into interface design based on the collected surveys. Together, these methodologies will form the basis for a theoretical framework that aims to explain the key elements that influence student preferences. The main goal is to contribute to the creation of a more inclusive and user-friendly digital environment that meets the demands of higher education students.

The study plan design, which outlines the theory and related actions conducted in this research, is depicted in Figure 3.1. There are two categories for this study project. Investigate the dark and light mode interfaces based on user preferences falls within the first category. Next, analyse the user preferences of dark mode and light mode interface. For simpler comprehension and memory, use the study strategy infographic in figure 3.1.

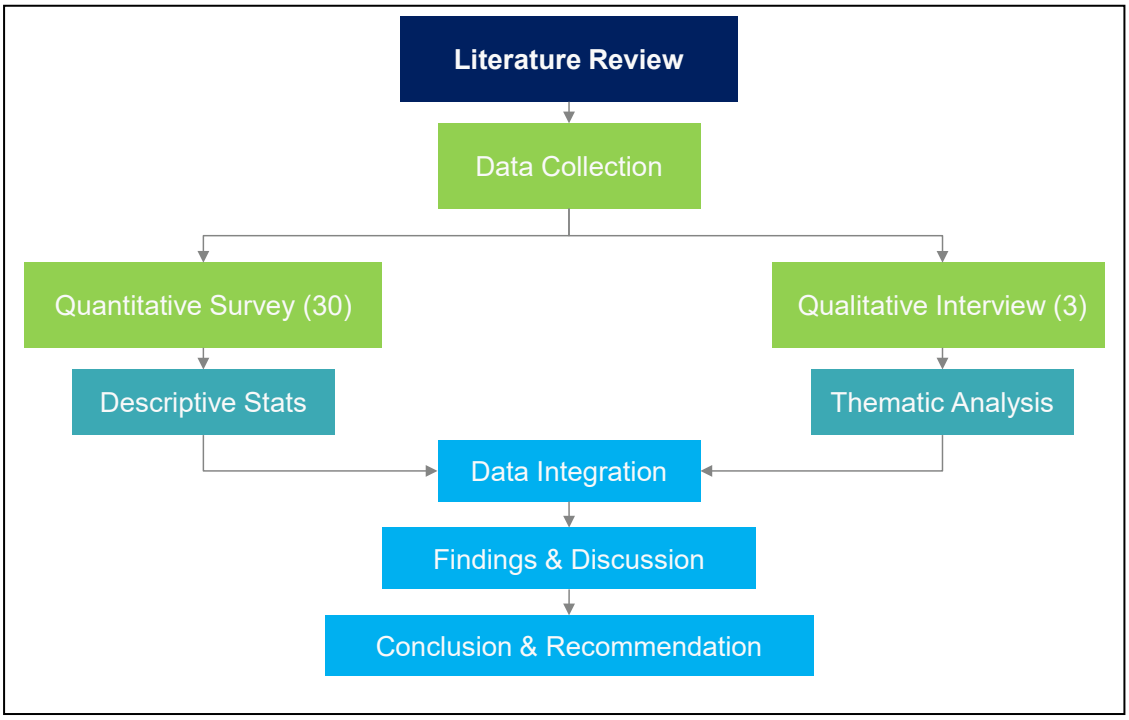

Figure 3.1 Research Plan

In this study, a descriptive research approach was chosen because it is able to provide a detailed picture and bring to life the researched theory. This approach is often used in various fields such as social science, psychology, and education, where qualitative and descriptive research methodologies are proven to make a significant

contribution in understanding certain phenomena (Nassaji, 2015 and Furidha, 2024). Therefore, it is not surprising if this study also applies this method to achieve the research objective, which is based on higher education students. According to Ayton et al. (2023), qualitative descriptive research is an essential and relevant approach for research questions that seek insights into areas of research that are still understudied. Rather than focusing on a single phenomenon, this technique allows researchers to thoroughly investigate a range of views and participant experiences. This contributes to a deeper knowledge of the topics under consideration, particularly in circumstances that have not yet been well investigated in the current literature. Thus, the use of this approach allows the data obtained to be analyzed in more detail, thereby producing more comprehensive and relevant findings for the issues being studied.

According to Ayton et al. (2023), most qualitative descriptive studies employ semi-structured interviews because they allow researchers to collect data in a more flexible but yet methodical manner. This technique strikes a compromise between predetermined questions and the opportunity to delve further into participants' replies, ensuring that the data gained is richer and more relevant to the study's aims. In line with the approach used in this study, the main instruments chosen are surveys and interviews. Therefore, this study requires researchers to conduct a survey on students of higher education institutions to obtain primary data that is current and authentic. Next, interviews with experts will be conducted to further strengthen the findings obtained from the survey. Primary data is first-hand data collected by the researcher himself by conducting surveys, interviews, experiments and so on (Salsabila, 2022). This method is usually used in research related to human behavior and habits. All data collected will be analyzed in Part B of this study to provide a more comprehensive and accurate picture.

In addition, secondary data is defined as data obtained from previous studies or existing sources. In this study, the researcher has collected secondary data through various reference materials, including printed and online publications. These resources include books, past theses, journals, websites, articles, and online and print newspapers. The secondary data obtained serves as the main support in the literature review discussed in detail in Chapter 2.

3.3 Research Method

Shona & Tegan (2022) stated that methodological research refers to the discussion and explanation of the methods used in analyzing research data. In short, methodology can be considered as fieldwork carried out by researchers to obtain the information needed in a study. Choosing the right method in research is very important because it determines accuracy and effectiveness in obtaining quality findings.

According to Fuad (2024), there are three main approaches in methodological research, namely quantitative methods, qualitative methods, and mixed methods. Quantitative approaches entail the collection of numerical data and statistical analysis to determine patterns and correlations among variables. Qualitative approaches, on the other hand, use interviews, case studies, and content analysis to conduct in-depth observations of individuals' or groups' behaviors, perceptions, and experiences. Mixed methods research combines both methodologies to get a more complete picture.

In order to achieve a comprehensive and holistic understanding of the research problem, this study adopts a robust Mixed-Methods Research Design. This methodological approach integrates quantitative data derived from student surveys with qualitative insights obtained through in-depth expert interviews. According to Fuad (2024), utilizing a mixed-methods design allows researchers to corroborate findings across different data sets, thereby overcoming the inherent limitations associated with using a single research approach. By combining statistical trends with professional technical explanations, this study ensures that the findings are not only statistically descriptive but also contextually rich.

3.3.1 Rationale for Research Design

The study specifically employs an Explanatory Sequential Design, where the data collection occurs in two distinct but connected phases. First, the Quantitative Survey is utilized to identify broad patterns, usage habits, and demographic preferences among the student population regarding Dark Mode and Light Mode. Following this, the Qualitative Expert Interviews are conducted to validate these patterns and provide technical, psychological, and ergonomic explanations for the students' choices. The qualitative phase effectively serves to "explain" the numbers generated in the quantitative phase, providing the "why" behind the "what."

3.3.2 Sampling Strategy and Justification

For the quantitative phase of this research, a non-probability purposive sampling technique was employed to select 30 respondents from the student body of UiTM Shah Alam. While large-scale market research often requires hundreds of respondents, a sample size of 30 is statistically recognized in academic literature as the minimum number required to observe a normal distribution in a pilot study or a specific user experience (UX) case study (Takona, 2024).

Furthermore, for the specific purpose of this study, which focuses on identifying usability trends and user experience preferences rather than generalizing population statistics for a census, this sample size is deemed sufficient to reach "data saturation." Data saturation occurs when the collection of new data sheds no further light on the issue under investigation (Subedi, 2021). The validity of this data is further reinforced through triangulation with the qualitative insights from three industry experts, ensuring that the final conclusions are robust, technically grounded, and representative of the user experience.

3.3.3 Qualitative Research

Qualitative methods allow for in-depth data collection through observation, survey, and interview to gain a more comprehensive understanding of the issue being studied. According to Scott (2024), qualitative research refers to research that uses methods such as participant observation or case studies, which produce narrative and descriptive reports about a particular environment or practice. Ugwu & Eze (2023) also define qualitative research as research that focuses on the nature of a phenomenon, including the variety of manifestations and how the phenomenon appears or is seen from various perspectives. This research does not involve aspects such as the range, frequency, or location of the phenomenon, but rather focuses on a deep understanding of the social phenomenon in the context of the participant's environment.

A qualitative technique allows researchers to delve deeper into the feelings, perceptions, and relationships that take place in a given setting. This is because this strategy focuses on the meaning that individuals assign to an issue or phenomenon, which cannot be fully achieved via quantitative data alone. For example, in user interface (UI) and user experience (UX) design studies, input from users gathered through qualitative interviews or surveys can provide a fuller picture of their

preferences, issues encountered, and variables influencing their decisions when using an interface.

According to Bhandari (2020), qualitative research includes several main methods such as observation, interview, focus group, and survey. In the context of this study, a combination of survey and interview methods is very suitable to ensure that the data obtained is not only extensive but also has clarity and validity. Surveys are needed to obtain information and views from everyday users who interact with a particular interface, while interviews aim to obtain expert perspectives that can provide explanations and certainty on the findings from user responses. With this two-stage approach, researchers can obtain a more holistic and comprehensive understanding, because each finding from the survey can be further detailed through interview sessions.

Furthermore, the primary benefit of the qualitative approach is its capacity to capture complexities that are difficult to quantify numerically, such as emotions, subjective impressions, and personal experiences. For example, in a study on dark and light display modes in UI/UX, user responses to each mode are determined not just by habit or aesthetics, but also by cognitive experience, visual comfort level, and psychological aspects that can be influenced by individual background. As a result, qualitative methods are better suited to investigating these aspects in greater depth.

Overall, the use of qualitative methodologies in this study allows for a more in-depth knowledge of the phenomenon under consideration, taking into account the experiences and perspectives of direct participants. The use of survey and interview methodologies can not only improve the validity of the data collected, but it also allows researchers to find trends and significant topics connected to user behavior while selecting a certain display mode. As a result, this approach is a successful strategy for achieving the study's objectives in a more comprehensive and thorough way.

3.3.4 Survey

Survey questions are the main instrument in primary data collection used to obtain information directly from respondents. According to David A & Alan R (2019), a survey needs to be designed with clear research questions and a minimum number of questions but of high quality. The questions posed must be important and relevant in order to attract the interest of the target group to provide accurate and honest feedback. The use of a limited number of questions but dense with important content can avoid boredom among participants, thus encouraging them to answer more sincerely without

feeling burdened. In research, the honesty of respondents plays a major role because it affects the accuracy of the data obtained. Therefore, designing questions that are clear, easy to understand, and not excessive is an important aspect in ensuring the quality of the study findings.

Furthermore, according to Jessica G. (2024), surveys can be used not just to collect preliminary data, but also to test hypotheses, track changes over time, and serve as the foundation for more in-depth research. In other words, surveys are more than just a tool for gathering data; they can also help researchers discover specific trends in consumer behavior or inclinations. When survey questions are designed based on previous research and take into account expert recommendations, the quality of the data obtained can also be improved. This is because previous research has provided a solid foundation for designing more accurate questions, avoiding unnecessary repetition, and ensuring that the study conducted maintains a high level of accuracy.

When drafting survey questions, researchers must ensure that each question is directly related to the study objectives and does not burden participants with extraneous information. Questions that are too long or too many can make participants feel sluggish or lose interest in answering, lowering the quality of the answers provided. As a result, the best technique is to strike a balance between the appropriate number of questions and the amount of information requested. At the same time, researchers must ensure that the questions are written in clear, non-misleading language so that participants may provide more accurate and relevant responses.

Overall, a well-designed survey can provide great benefits to researchers in achieving the study objectives. By taking into account recommendations from previous research and ensuring participant-friendly question design, researchers can not only obtain more valid data but also increase the rate of respondent participation in the study. Therefore, every aspect of survey preparation, including length, order, and quality of questions, needs to be given attention so that the study results obtained truly reflect the reality being studied.

3.3.5 Interview

The second qualitative method employed in this study is an interview, which will be conducted once there is enough user survey data. Interviews are an important tool in qualitative research because they allow researchers to obtain a better grasp of a topic by engaging in direct talks with people who have relevant knowledge or

experiences. In his book "*Metologi Penyelidikan: Panduan Menulis Tesis*", Fuad (2024) describes interviews as a type of two-way communication that can take place in person or remotely. This strategy enables researchers to elicit extensive explanations from participants and gain a deeper understanding of their perspectives. According to Elhami & Khoshnevisan (2022), interviews are one of the effective methods for collecting relevant information from participants. There are various types of interviews that are often used to explore the views and perceptions of participants in more depth, depending on the purpose and needs of the study being conducted.

In the context of this study, interviews will be used to obtain expert views in the field of user interface design (UI/UX). The survey results will be utilized as the primary source for developing interview questions, ensuring that talks with experts focus on issues that are actually relevant to the initial findings from consumers. The primary goal of this interview was to gather expert opinions on the survey respondents' preferences for dark or light display modes, as well as the reasons for these choices. Furthermore, the interviews sought to elicit the experts' personal perspectives on the display modes they use in their everyday lives, as well as the variables that impact these decisions based on their professional expertise in the UI/UX sector.

This approach is important because survey findings alone may not be sufficient to fully understand why users choose a particular display mode. By having expert interviews, researchers can obtain stronger justification for the survey results, thus ensuring that each user response can be explained with a deeper perspective and based on professional experience in the industry. Furthermore, expert views can help identify additional factors that users may not be aware of but that affect their tendency to choose between dark and light modes.

Through this combination of surveys and interviews, the study was able to not only gather information from ordinary users but also obtain a more technical and in-depth perspective from experts. The outcomes of these interviews will not only supplement the study findings but will also provide a stronger context for the study's ultimate results. Researchers can therefore make more accurate findings and propose relevant improvements in the field of UI/UX based on a more comprehensive understanding of user behavior and preferences.

3.3.6 Survey Design

Surveys are one of the main instruments used in this study to collect primary data. They function as a measurement method that allows researchers to identify the level of interest based on individual habits and determine the behavior or opinions of a portion of the population being studied. According to McCombes (2019), survey research is the act of gathering information about a group of people by asking them questions and assessing their responses. This approach is commonly used in social research and behavioral sciences because it enables researchers to collect data about participants' ideas, experiences, or actions in a methodical manner. Furthermore, survey research may be performed via a variety of methods, including online questionnaires, structured interviews, or survey forms, depending on the study's aims and target respondents. A well-designed survey can provide a clear picture of the user's perspective and help researchers identify certain trends that exist among respondents.

In designing survey questions, accuracy and clarity are the main factors that need to be paid attention to. According toS. Hasan (2020), survey research can focus on individuals, including their choices, thoughts, and behaviors, or it can also examine groups and organizations. This type of study allows researchers to understand patterns of tendencies in society, whether related to personal decisions, social dynamics, or the work culture within an organization. Depending on the objectives of the study, survey research can be conducted on a small or large scale, using quantitative, qualitative, or a combination of both approaches to obtain a more holistic picture. Each survey question needs to be formulated clearly and precisely so that participants can understand its meaning without any confusion. Vague or overly complex questions can cause participants to give less accurate answers, thus affecting the quality of the data obtained. In addition, the use of negative terms and multiple questions (questions that contain more than one element in one sentence) should be avoided. This is because questions that contain two or more ideas in one question can cause respondents to be confused about which part to answer, resulting in inconsistent data. In addition, each question should be accompanied by clear instructions to avoid any confusion among participants. With comprehensive instructions, respondents can submit responses with greater confidence and accuracy, boosting the study's reliability.

To ensure the quality and accuracy of the survey instrument used in this study, the researchers developed questions based on relevant literature sources and solicited

feedback from academic experts. This approach ensures that each question not only has a good theoretical foundation but has also been validated for its usefulness in gathering the necessary data. Previous research has demonstrated that surveys prepared with a systematic approach and directed by academic sources provide more accurate and reliable results. As a result, the expert review process not only improves the structure of the questions but also guarantees that each question is actually related to the study's objectives.

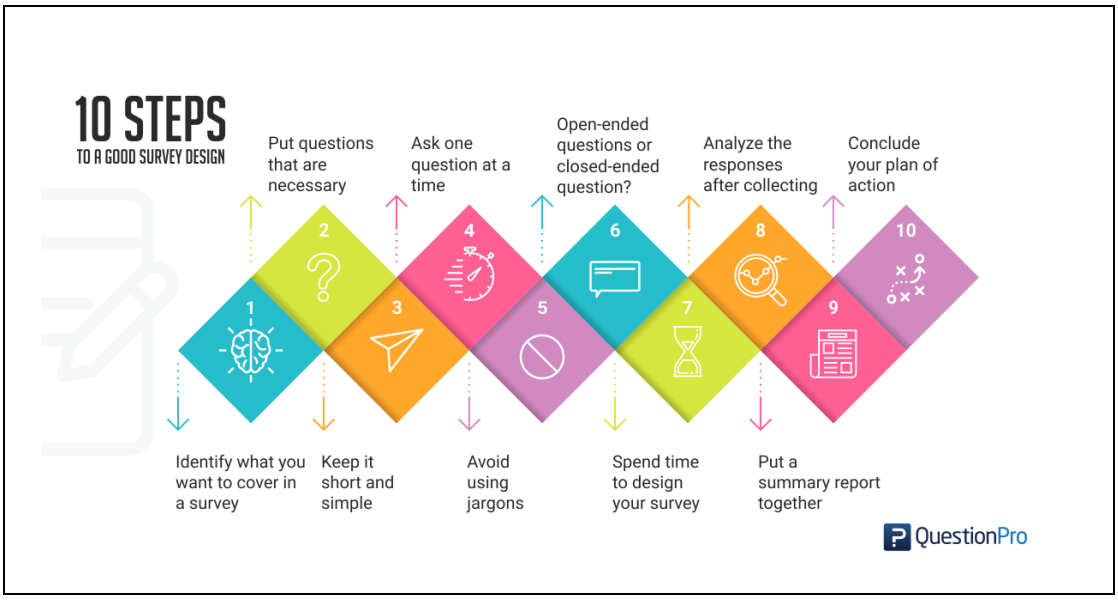

Figure 3.3.2: Inforgraphic of 10 Steps to a Good Survey Design by QuestionPro

Furthermore, understanding the procedures in constructing a good survey is a significant element of this research. Figure 3.3.2 is an infographic outlining the ten critical phases in building an effective survey, as recommended by QuestionPro. These processes involve setting survey objectives, selecting appropriate question types, and confirming the instrument's accuracy prior to its use in the study. By adhering to these methodological rules, researchers can ensure that the data gathering process works smoothly and produces high-quality results.

Overall, surveys are a significant tool in this study since they allow researchers to understand users' perspectives and trends while also assisting in the formulation of more in-depth analysis based on the information obtained. This study could assure the correctness of the data acquired if the questions posed are clear, unambiguous, and verified by professionals. This meticulous survey preparation

approach will lay a firm basis for the study's findings and add to the overall efficacy of the research.

3.3.7 Method of Data Collections

Table 3.1 details the data collection methods used in this study. To ensure meaningful and structured research findings, the data collection flow needs to be determined in advance. This study involves participation from end users, namely students of higher education institutions, using a survey form as the main research instrument. This survey will allow for the systematic collection of data on user preferences for dark and bright modes.

In addition, this study contains interviews with UI and UX specialists. The experts engaged have diverse backgrounds in UI/UX, including designers and software developers. The engagement of these experts is intended to add value to the study by providing a professional viewpoint on the survey results. By comparing the views of experts and the results of the end user survey, this study can ensure that the information obtained is more comprehensive and in line with current developments in the field of UI/UX.

After the data is collected, the analysis process will be carried out using the thematic analysis approach as the main method. This thematic analysis will allow the researcher to identify patterns and main themes that emerge from the data collected. In addition, content analysis elements were also used as a complement to provide a deeper context to the study results. The combination of these two methods ensures that the findings obtained are more detailed, structured, and in line with the study objectives. With this approach, the study results are not only relevant but can also provide a meaningful contribution in understanding user preferences towards dark and light interfaces among students in higher education institutions.

Table 3.3.1
Method of data collections

Research Questions	Source of Data	Instrument	Data Measurement	Output
What factors influence users' choices between dark	End User & UiUx Professional	Survey & Interview	Thematic Analytic	Investigate the dark and light mode interfaces based on user preferences.

and light mode interfaces?				
How do dark and light mode interfaces affect users' preferences?	End User & UiUx Professional	Survey & Interview	Thematic Analytic	Analyze the user preferences of dark and light mode interface.

3.3.8 Method of Data Analysis

The data collected in this study will be analyzed using thematic analysis, which is one of the main approaches in qualitative research. This method is often used by researchers to identify recurring patterns in the data collected, thus allowing researchers to formulate comprehensive themes or statements based on the study findings (Lochmiller, 2021). Through this approach, researchers can identify important elements in the data, connect the information obtained with the research questions, and provide a deeper understanding of the issue being studied.

According to Lochmiller (2021), thematic analysis consists of three main components, namely individual codes, categories, and themes. Individual codes refer to small fractions of data that have a certain meaning, categories function as grouping codes based on certain similarities or relationships, while themes are the final result of the categorization process that forms a comprehensive picture of the study findings. By using this approach, data analysis can be done more systematically and thoroughly, thus ensuring accuracy in the interpretation of the study results.

According to Humble & Mozelius (2022), the thematic analysis process consists of six key stages. The first stage involves familiarizing oneself with the data by thoroughly reading and understanding its content. During this process, the researcher transcribes the data and takes note of any initial observations that may be useful for the next steps in the analysis. The second phase is to develop initial codes, which include the researcher identifying specific areas of the data that have significant value. This code can be based on the literal (semantic) content or the implicit (latent) meaning in the data being studied. The third step involves the process of identifying themes. At this stage, the codes that have been generated will be collected and arranged according to certain categories to form main themes that have the potential to describe the pattern of findings in more detail. The fourth phase is to review the concepts that have been developed. This method ensures that each identified theme accurately reflects the data and is clearly related to the research topic. The fifth phase is the process of naming

themes. In this phase, the researcher will give an appropriate name to each theme based on the content highlighted, thus ensuring that the themes formed can accurately and clearly represent the meaning of the data. Finally, the sixth step is to report the results of the analysis. This entails structuring the data in a methodical and structured writing style to ensure that the study's results are well understood.

In this study, all interview transcripts will be examined using the NVivo 15 program. This program can help to streamline the coding and theme mapping processes while also improving data categorization accuracy. Researchers can use NVivo 15 to detect more complicated patterns in data and guarantee that each theme is built on a solid foundation of acquired data. The combination of theme analysis and the use of this software is likely to yield deeper and more relevant results in this study.

3.4 Source of Data

This study was conducted to analyze user preferences for dark and light modes and to understand the effects and factors that influence the choice between these two modes. In order to achieve the study objectives, two data collection methods were used, namely surveys and interviews. This combined approach allowed the researchers to obtain a more comprehensive perspective on user preferences, especially among students in higher education institutions, as well as the views of experts in the field of user interface (UI) and user experience (UX) design.

A study of students at Universiti Teknologi MARA (UiTM) Shah Alam was undertaken to better understand their user interface preferences. The survey questions were carefully designed to elicit not simply students' favorite interface options, but also the reasoning for their decisions. Factors such as ease of use, impact on productivity, and usage habits in daily life were also taken into account in this survey. In addition, this study also examined the extent to which environmental factors, such as lighting and prolonged use of devices, influence students' preferences for certain display modes.

The survey data was collected face to face on the UiTM Shah Alam campus. This strategy enables researchers to connect directly with participants, allowing them to clarify any uncertainty that may have developed while they were answering survey questions. Furthermore, this strategy helps to ensure that the responses provided are more accurate and of high quality because participants can request clarification if they do not understand a question. Researchers can watch participants' reactions and

expressions during this direct engagement, which may provide more insight into their perspectives towards the employment of dark and light modes.

In addition, interviews with specialists were undertaken to get professional perspectives on the influence of using dark and light modes on usability, user engagement levels, and overall happiness with the program or application experience. The experts interviewed included those with UI and UX experience, as well as those who were actively involved in the development and design of digital interfaces. These interviews allowed professionals to give their perspectives based on their industry expertise, resulting in a more technical and in-depth understanding of the aspects that determine the success of display modes.

These interviews were conducted throughout Klang Valley, with a focus on UI/UX designers and developers. This location was chosen since the majority of professionals in this sector reside and work in big cities with thriving digital technology industries. By gathering insights from those with direct experience in UI/UX, this study can provide a more comprehensive understanding of how dark and light modes affect user experiences, not only from a personal preference standpoint, but also from a practical and ergonomic standpoint in digital interface design.

Overall, this study combines data from a student survey and expert interviews to present a more balanced and thorough picture of the factors influencing consumers' display mode preferences. This method enables researchers to not only identify user preferences but also weigh the benefits and drawbacks of each mode from a broader UI/UX design standpoint.

3.4.1 Primary Data

Primary data refers to information collected directly by researchers from original sources, without going through third parties or secondary data (Wiratna & Dimas Agung, 2020). According to Wiratna & Dimas Agung (2020), primary data is data obtained directly in an original, up-to-date form, and relevant to the objectives of the study being conducted. In other words, primary data is new information collected by the researchers themselves while conducting the research.

Primary data can be obtained through various methods depending on the needs of the study, including survey, interview, observation, and experiment methods (Evon et al., 2020). The selection of the appropriate method depends on the research objectives and the nature of the information to be obtained. For example, the survey

method is often used when researchers want to collect data from a larger group of respondents in a short period of time, while interviews are more suitable for obtaining in-depth insights from specific individuals. The observation method is often used in studies involving behavioral analysis, while experiments allow researchers to test variables in a controlled environment.

In this study, the approach used is a combination of survey and interview methods. This approach was chosen to ensure that the data collected was comprehensive and could provide a clearer understanding of the issue being studied. Surveys were conducted to obtain feedback from a larger sample, while interviews were conducted to obtain more detailed perspectives from individuals who were experienced or specialized in the relevant field. By combining these two methods, researchers were able to ensure that the data obtained was not only complete but also relevant to the study's stated objectives.

3.4.1.1 Empirical Data

In this study, a survey and interview approach were used to collect empirical data directly from respondents. The survey was conducted on 30 students from Universiti Teknologi MARA (UiTM) Shah Alam, Selangor, consisting of undergraduate and postgraduate students. The involvement of both groups is important to obtain a broader perspective on users' tendencies and preferences towards light mode and dark mode in their daily use.

The major goal of using the questionnaire in this study was to learn about users' preferences for both display modes based on their actual experiences. The questionnaire included questions aimed primarily at identifying aspects that influence mode selection, such as visual comfort, text readability, duration of usage, and impact on user productivity or focus. In addition, this survey also aimed to understand the extent to which users were aware of the existence of this mode option and how they adapted its use according to their needs.

To complement the data obtained from the survey, interview sessions were conducted with several experts in the fields of user interface (UI) and user experience (UX). The interviews aimed to acquire deeper insights and professional interpretation of the survey data, offering a better context for user decisions. Researchers were able to better grasp the technological and psychological elements that may impact consumers' choices for specific modes thanks to these interviews. UI/UX specialists also provided

insights into more user-friendly interface design and how display mode selection can be adjusted to improve the overall user experience.

Overall, the empirical data acquired in this study not only served as a strong foundation for research analysis but also helped to directly grasp consumers' experiences and viewpoints. The use of survey and interview methodologies enabled researchers to collect more comprehensive and thorough data, ensuring that the study's findings were more informed and relevant to the reality of usage among university students.

3.4.2 Secondary Data

Secondary data is information gathered by researchers indirectly from other sources rather than directly from respondents (Harefa et al., 2020). Undari & Muhamad (2024) state that secondary data might come from a variety of sources, including books, academic journals, research articles, financial reports, and other public documents. This information is often gathered and examined by others before being used in a new study.

Simply described, secondary data is information gathered from prior readings or research that are available in various formats. This information is significant because it can provide a more comprehensive background to study and assist researchers in better understanding the context prior to undertaking primary research.

In this study, researchers used a variety of secondary sources to help construct a theoretical framework and provide a more complete context for the study findings. Academic articles, research journals, scholarly publications, and physical and digital reference resources have all been used as sources. The utilization of secondary data not only aids in the identification of prior similar studies but also allows researchers to compare the findings of this study to other published research results. Referring to these sources allows researchers to guarantee that the study has a solid theoretical foundation and can make more important contributions to this field of research.

3.4.2.1 Theoretical Data

Theoretical data for this study were gathered from a variety of sources, including books, academic publications, research articles, and previous research reports. These sources were accessed using well-known databases such as MyCite, Scopus, Web of Science, and IEEE Xplore, which offer access to a wide range of high-quality and recent studies in relevant topics. References to these academic sources are

essential to ensuring that each concept and hypothesis employed in the study has a solid foundation and is supported by relevant prior research.

The theoretical data collected plays a major role in forming a robust theoretical framework by highlighting important concepts such as the Fourth Industrial Revolution (IR4.0), Graphical User Interfaces (GUI), user preferences, and the impact of interface choices on user experience. By understanding and studying these concepts in depth, researchers can relate the study findings to existing theories, thus providing a clearer perspective on the issue being studied.

In addition to supporting theoretical understanding, this data is also used to interpret empirical findings in more depth. The integration of theoretical and empirical data enables researchers to perform a more thorough examination and provide convincing rationale for their findings. Using this approach, the study not only relies on data received directly from respondents, but also compares it to past studies, resulting in more valid and authoritative findings.

In this study, the emphasis on the theoretical framework contributes to the research's validity and usefulness. By citing credible academic sources, this study not only ensures that each argument provided has a sound theoretical foundation, but it also adds to a more relevant academic discussion in the field of UI/UX. As a result, this study can contribute to the current literature and aid in a better understanding of how user interface design influences user experience in the context of today's more technologically oriented world.

3.4.3 End User

The main data in this study were obtained from end users who participated in a survey conducted at Universiti Teknologi MARA (UiTM) Shah Alam, Selangor. This study involved 30 participants consisting of undergraduate and postgraduate students. The selection of this number of participants refers to the view of Takona (2024)who stated 10 to 50 participants is sufficient for a qualitative study.

In the context of this study, data gathering followed a consistent pattern after approximately 25 respondents, with no new topics emerging noticeably. This suggested that data saturation had occurred, and that adding more respondents would no longer give new information relevant to the study aims. This data saturation principle is an important feature of qualitative research since it ensures that the data collected is sufficient to answer the research questions correctly. As a result, the number of 30

respondents was deemed appropriate to reflect the range of user experiences without requiring unnecessary data collecting.

The study participants were carefully selected to ensure diversity in responses, including factors such as level of study and gender. To ensure that the study results were more balanced and meaningful, the number of participants was divided equally between males and females, namely 15 participants for each group. This selection refers to the study by Chen & Zhai (2023), which found that gender influences user preferences in choosing user interfaces (UI). By controlling this factor, the study was able to assess whether there were significant differences in the selection of dark mode and light mode based on gender. In addition, the participation of students from both levels of study allowed this study to examine in more depth how their academic experience influenced the choice of display mode.

To ensure that this study reflected diverse perspectives, the selection of respondents also took into account the following factors:

i) Academic field – Respondents comprised various faculties and study programs at UiTM Shah Alam, to ensure different perspectives in the experience of using dark mode and light mode in UI/UX.

ii) Age range – This study involved students from first year to final year, to capture variations in experience in using UI based on their level of study.

iii) Level of exposure to UI/UX – Respondents ranged from casual users to those with a technical background in UI/UX design, allowing this study to examine various levels of experience and user preferences.

This diversity is expected to produce a more comprehensive response, providing a clearer picture of user preferences in choosing between dark mode and light mode. The data obtained not only helped in formulating the study's conclusions, but also supported the main objective of this study, which was to examine the preferences of students of higher learning institutions towards both display formats. Through the analysis of participant feedback, this study was able to identify the main factors that influence user choices and the extent to which elements such as visual comfort, readability, and screen usage duration played a role in their decisions. This information collected can provide meaningful contributions in the field of UI/UX, especially in the development of more friendly user interfaces that meet the real needs of users.

3.4.4 UI/UX Professional

According to Dunwoodie et al. (2023), interviews are one of the research techniques often used in social sciences to understand how individuals subjectively interpret social phenomena around them. This method allows researchers to obtain a deeper picture of the thoughts and experiences of participants, which may be difficult to obtain through other methods such as questionnaires. In addition, Dunwoodie et al. (2023) also explains that interviews provide space for participants to share their feelings, beliefs, opinions, desires, and attitudes towards various phenomena experienced. This makes interviews an important tool in understanding individual perspectives in more detail. Since the early 1990s, the most widely discussed qualitative technique in political and social studies has been expert interviews (Döringer, 2021). According to Döringer (2021) expert interviews are a type of qualitative interview that follows thematic rules and focuses on the knowledge of experts in a certain topic.

The specialists in this study are UI/UX professionals, either developers or designers. More importantly, they are experienced and knowledgeable in this industry. Nagao et al. (2019) define experts as persons with deep technical knowledge, an understanding of industrial work procedures, and the ability to deliver meaningful interpretations based on their expertise. Therefore, the selection of experts in this study was based on their ability to interpret and analyze situations within the scope of their respective expertise. This makes them a key resource in qualitative research that requires in-depth perspectives and more detailed analysis.

In addition, the knowledge possessed by experts is often considered to be specialized knowledge that develops in a particular field and requires professional action or decision. This expertise is based not just on experience and academic background, but also on direct exposure to the issues at hand, allowing them to provide more insightful and reality-based perspectives on a subject of study. As a result, in social and political studies, expert interviews are frequently employed as the primary method for gathering more thorough and contextual information on difficult subjects that necessitate extensive research.

3.5 Data Analysis

According to Bingham (2023), legitimate qualitative research must show that data analysis was carried out correctly, consistently, and fully. This can be

accomplished by a systematic recording approach and a thorough explanation of the analytical methodologies employed. By giving adequate detail, readers may examine the process's transparency and dependability, ensuring that the study's conclusions have a strong foundation and can be cited in both academic and practical settings. In qualitative research, Ravindran (2019) explains that data analysis is a complex and repetitive procedure. This is because in qualitative research, researchers not only need to categorize or organize data but also try to understand the implicit meaning behind individual responses and behaviors towards a particular event or situation (Ravindran, 2019).

As a result, the data analysis process must be carried out carefully to ensure the validity and reliability of the information gathered. Errors in analysis can reduce the accuracy of study results and lead to incorrect interpretations. Therefore, researchers need to employ a methodical and rigorous approach at each level of analysis so that no errors occur that can damage the integrity of the data.

Furthermore, good data analysis enables researchers to detect patterns and significant themes in study findings, resulting in a better knowledge of the problem under study. This procedure demands not just the random collection of information, but also a thorough knowledge of the data's context and background. By ensuring the accuracy of the analysis, the study's findings will be more meaningful and relevant to the research aims. As a result, this strategy not only aids in the production of high-quality research, but it also ensures that the data acquired accurately reflects the experiences and opinions of the study participants.

3.6 Conclusion

This chapter has explained in detail the research methodology used in this study to examine the preferences and experiences of students of higher education institutions towards the use of dark mode and light mode in user interfaces. This study uses a descriptive research approach with an emphasis on qualitative methods to gain a deeper understanding of the factors that influence user preferences. This approach was chosen because it is able to provide a more holistic picture and detail how user preferences are formed based on certain factors such as comfort, readability, and cognitive load.

In an effort to form a solid study, this chapter has presented the theoretical framework, research design, and data collection and analysis methods used. This study has two core data collection stages: a survey of 30 UiTM Shah Alam students and interviews with UI/UX professionals. The purpose of this survey is to collect data on users' experiences with interfaces in dark and bright modes. Meanwhile, interview sessions with UI/UX experts were conducted to confirm and strengthen the findings obtained from the survey. The combination of these two approaches provides a balance between user perspectives and professional views in the field of user interface design.

In addition to primary data, this study relies on secondary data acquired from a variety of sources, including books, academic journals, and linked articles. The goal of using secondary data is to establish a solid theoretical foundation and provide a larger context for the subject under consideration. With the availability of secondary data, this research can connect the study findings with theory and past studies, thus strengthening the argument and understanding of the phenomenon being studied.

The survey design process in this study was also emphasized, especially in ensuring that the questions developed were simple, relevant, and easy to understand by the respondents. Clear and not too long questions can encourage participant participation and ensure that the data obtained is of quality and relevant to the study objectives. In addition, interview sessions with UI/UX experts allowed the researcher to gain a deeper insight into the principles of user interface design and how certain elements in dark mode and light mode affect the user experience.

In terms of data analysis, this study relied mostly on thematic analysis to uncover themes and patterns in the data obtained. Content analysis was also used to help improve understanding and offer new dimensions to data interpretation. The combination of these two procedures ensures that the study results are thorough and consistent with the research objectives.

Overall, this chapter provides a thorough summary of the research technique employed in this study. By combining survey methods with expert interviews, this study was able to obtain more comprehensive data, allowing for deeper analysis and more significant findings. Furthermore, the utilization of secondary data contributes significantly to the theoretical framework and provides a broader context for the topics under consideration. The method adopted in this study is expected to provide a deeper

understanding of the choices and experiences of students in higher education institutions in the use of dark mode and light mode in user interfaces.

CHAPTER 4
ANALYSIS AND FINDINGS

4.1 Preamble

This chapter discusses in detail the findings of the study obtained, followed by data analysis to achieve the objectives of the study that have been stated in Chapter 1. This empirical study involves the collection of primary data through two main methods, namely surveys and interviews. A survey was conducted on end users, namely students of higher education institutions, to obtain their views on preferences between dark mode and light mode. The data obtained from the survey is analyzed in detail and presented clearly in the form of tables and graphs to provide a comprehensive picture.

Additionally, the data from the survey was used as a basis for formulating questions for interviews with experts in the UI/UX field. This interview aims to obtain in-depth information from an expert's point of view, as well as ensure the validity of the survey data that has been previously obtained. This chapter aims to analyze the participants' responses to the surveys and interviews that have been conducted. It also focuses on the demographic analysis of the participants and the reasons behind the mode selection by the participants, which may influence their preference for dark mode or light mode. With this approach, this chapter ensures that all findings are thoroughly researched to support the objectives of the study.

4.2 Outline of Survey Questions

Tables 4.1 to 4.5 below describe the questions used to collect survey data from students of higher education institutions, including the types of questions used. As mentioned, the questions in the 1st section include demographic information involving age, gender, field of study, and level of study. This section plays an important role because it aims to determine whether demographic differences are factors that influence mode selection between dark mode and light mode.

The second section of the survey focused on the use of devices by participants in their daily activities, as noted in Table 4.2 below. This section aims to determine whether the use of different devices affects the user's choice of dark mode or light mode.

Among the questions asked to the participants included the main device used, the operating system used, and the frequency of device use in a day. Next, the third section of the survey deals with the participants' experience using dark mode and light mode. As indicated in Table 4.3 below, this section is the main part of this survey, as it contains important questions that evaluate the user's choice between the two modes. While the fourth section, as shown in Table 4.4 below, is closely related to the third section. The answers given in this section are an extension of the participants' answers in the previous section. This section is important because it allows researchers to identify the factors and effects of mode selection by participants. This approach ensures that every aspect of consumer choice is analyzed in depth to support the objectives of the study.

Finally, the fifth section of the survey deals with suggestions for improvements in the context of UI/UX as well as the use of dark mode and light mode. As shown in Table 4.5 below, this section only contains two specific questions about the participants' suggestions. The first question asks whether it is necessary to add a dark mode in the UiTM digital application or platform. While the second question focuses on suggestions for improving dark mode and light mode to be more user-friendly. As additional information, the questions in this survey do not involve any visual representation as the survey only focuses on the experience and knowledge of the participants regarding the two modes.

Table 4.1
Question of Section 1: Demographic Information.

No.	Question	Question Type
1.	Age	Demographic question
2.	Gender	Demographic question
3.	Field of study	Demographic question
4.	Level of study	Demographic question

Table 4.2
Question of Section 2: Device Use.

No.	Question	Question Type
1.	What primary device do you use?	Closed-end question
2.	What operating system is used on your primary device?	Closed-end question
3.	How often do you use the device each day?	Closed-end question

Table 4.3
Question of Section 3: Experience with Dark Mode and Light Mode.

No.	Question	Question Type
1.	What mode do you often use when accessing mobile apps or software (Example: WhatsApp, Chrome, Microsoft, etc.) on your device?	Closed-end question
2.	Is the choice of dark or light mode important in the situation when studying or reading?	Closed-end question
3.	Which mode do you think is more friendly to the eyes?	Closed-end question
4.	Do you prefer dark mode or light mode?	Closed-end question

Table 4.4
Question of Section 4: Factors Influencing Mode Choice.

No.	Question	Question Type
1.	What factors most influence your choice of mode in the question above? (example: eye comfort, aesthetics, text clarity)	Open-ended question
2.	Do you think the mode selected above helps you focus while doing assignments or studying on the computer/phone?	Likert scale question
3.	Does the mode you choose above affect how long you use an application?	Likert scale question

Table 4.5
Question of Section 5: Suggestions for Improvement.

No.	Question	Question Type
1.	In your opinion, should dark mode and light mode be established on UiTM applications/platforms (Example: Student Portal, UPTrack, etc.)?	Closed-end question
2.	What are your suggestions to improve dark mode or light mode to be more user friendly?	Open-ended question

4.3 Method of Findings and Presentation of Data Analysis

This section describes how the data was collected, analyzed, and how the findings of the study were presented. Data was collected through specially designed

survey and interview methods to understand user preferences for dark mode and light mode. This survey used open-ended questions to obtain the views of students of higher education institutions about their experiences using the two modes. This survey also aims to identify an initial pattern that will be used as a guide in the interview session.

Thematic analysis was used to analyze data obtained from surveys and interviews. According to Heriyanto (2018), thematic analysis is one way to analyze data by identifying the main patterns in the data. For this study, the responses from the survey were carefully read to identify the main themes relevant to the study's objectives.

The research findings are presented in the form of main themes supported by direct quotes from respondents to ensure the originality and depth of the analysis. Data from the survey was organized into thematic categories, while data from the interviews were used to reinforce the survey findings and provide a deeper narrative. This approach ensures that the findings of the study are in line with the objective of the study, which is to understand the user's preference for dark mode and light mode as well as the factors that influence their choice.

4.4 Findings and Data Analysis of Surveys

A total of 30 students from higher education institutions were selected as respondents to answer the survey conducted in this study. The selection of these students involved a variety of demographic backgrounds, including gender, field of study, education level, and age range. This diversity was intended to assess whether demographic factors play a role in influencing users' preferences towards the choice between dark mode and light mode in the user interface. By taking this aspect into account, researchers were able to identify certain patterns and tendencies that may exist among students with different backgrounds.

In addition to demographic questions, this survey included five additional sections that were systematically designed to obtain more in-depth information about user preferences and experiences. These sections include Device Usage, Mode Display Choices, Factors Influencing Mode Selection, and Suggestions for Improvement. Each section was carefully designed to ensure that the questions presented could fully reflect the respondents' perspectives, thus allowing

This survey was conducted face-to-face with randomly selected students at the Tun Abdul Razak Library, UiTM Shah Alam, Selangor. This approach was chosen

to ensure that only students who truly qualified as the target of the study were involved in this survey. Respondents were given a questionnaire in the form of Google Form that could be accessed using electronic devices such as smartphones or laptops. With this method, data could be collected more quickly and systematically, in addition to facilitating analysis in the next stage.

This face-to-face survey approach also allowed researchers to provide brief explanations to respondents if there was any confusion about the questions posed. This ensured that the answers given were accurate and based on a correct understanding of the questions asked. In addition, the random selection of students in the library also increased the diversity of the sample, because the library is a location frequently visited by students from various faculties and levels of study.

Overall, the survey method used in this study was designed to collect data that was authentic, relevant, and indicative of the true opinions of students in higher education institutions on the use of dark and light modes. The use of a structured questionnaire technique and careful sample selection meant that the study's findings provided a more accurate picture of the elements influencing user choices and the impact of their experiences using interfaces with varied display modes.

4.4.1 Respondent Demographic Information

This section discusses and presents the demographic statistics of 30 respondents like the questions mentioned in table 4.1 before. This demographic analysis is used to measure the human population involved and divide them into categories such as age, gender and background.

4.4.1.1 Age

The data presented in Table 4.6 shows that the majority of respondents in this study are young adults, which is the main population among students in higher education institutions. When categorized by year of birth, the most dominant group are those born between 2000 and 2004. The second largest group is those born between 2005 and 2007, while the smallest group is those born between 1995 and 1999.

According to a study conducted by Tri Marhendra Rahardyan et al. (2023), individuals born between 1995 and 2010 are categorized as Generation Z (Gen-Z). Based on this range of birth years, the Gen-Z group can be classified into three categories: early Gen-Z (1995-1999), mid-Gen-Z (2000-2004), and late Gen-Z (2005-

10). Respondents in this study came from all three sectors, with a particular emphasis on the mid-Gen-Z demographic, which makes up the bulk of students in higher education.

More specifically, this study involved a total of 30 respondents with an age distribution that showed dominance of the 21- to 25-year-old group. This group recorded the highest number of respondents with a total of N=17 or equivalent to 56.7% of the total sample. Next, the 18- to 20-year-old group recorded the number of respondents of N=8 or 26.7%. Meanwhile, only a small portion of the respondents, namely 16.6% or equivalent to N=5, consisted of those aged between 26 to 30 years.

This finding shows that the majority of respondents were in the age range that is directly related to the level of higher education, with the main focus on students in the 21- to 25-year-old range. This age distribution pattern also provides an impression that the use of dark mode and light mode in user interfaces is more relevant to analyze among the younger generation born after 2000. This is because this group grew up in an era of rapidly developing technology and is more likely to be exposed to changes and innovations in the digital user experience.

With the diversity in the age segment of the respondents, the findings of this study can provide a clearer picture of how age factors influence the choice of display mode in user interfaces. Although the majority of the respondents are from the middle of Gen-Z, the presence of respondents from the early and late Gen-Z groups allows for comparative analysis to determine whether there are significant differences in their tendencies and experiences with the use of dark and light modes.

Table 4.6
Summary table of total respondents by age based on percentage

Age	Frequency (N)	Percent (%)	Cumulative Percent (%)
18-20 (Late Gen-Z)	8	26. 7	26.7
21-25 (Mid Gen-Z)	17	56.7	83.4
26-30 (Early Gen-Z)	5	16.6	100.00
Total	30	100.00	

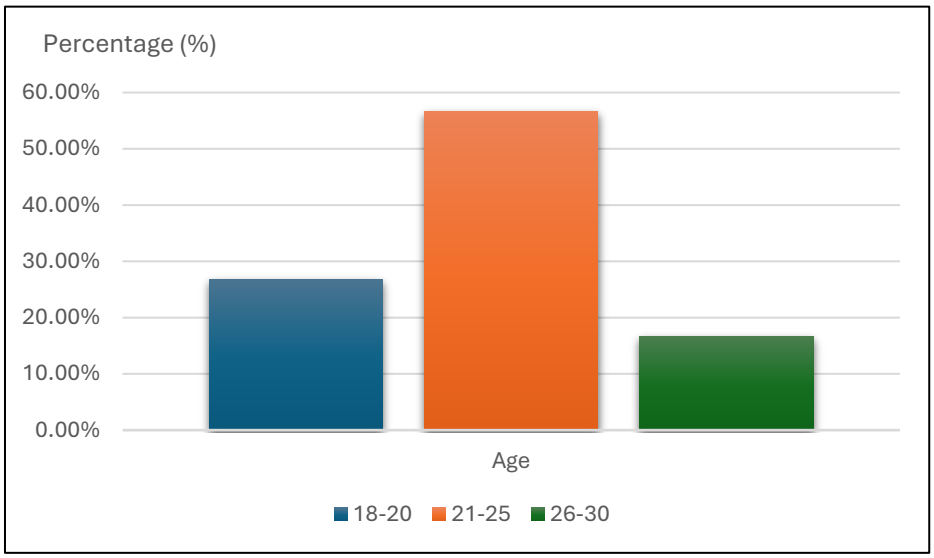

Figure 4.1 Percentage graph of respondent by age

4.4.1.2 Gender

Table 4.5 and Figure 4.2 display the number of respondents who answered the survey based on gender. In this study, gender refers to the characteristics that distinguish men and women in a social and biological context. Gender diversity in the respondent group is an important element because it can influence users' tendency to choose a display mode that suits their experience and preferences. Based on the statistics, there were 15 male respondents, accounting for 50% of the total sample. This means that there were 15 female respondents (50%). This even distribution of male and female respondents offered balance to the study, allowing researchers to conduct a more realistic investigation of the influence of gender in the decision between dark and light modes.

This balance is also necessary to guarantee that the study's findings are not biased towards any gender. With the same number of male and female respondents, any disparities in display mode preferences can be examined objectively. Furthermore, it enables researchers to determine whether there are specific trends among men and women that influence their decision to use digital interfaces. Through the analysis of this data, the study was able to determine the amount to which gender characteristics influence the user experience of the chosen display style. With a balanced sample, the analysis was able to provide a better understanding of how gender characteristics influence user preferences for dark or light mode.

Table 4.7
Summary of total respondent by gender based on percentage

Gender	Frequency (N)	Percent (%)	Cumulative Percent (%)
Male	15	50.0	50.0
Female	15	50.0	100.0
Total	30	100.0	

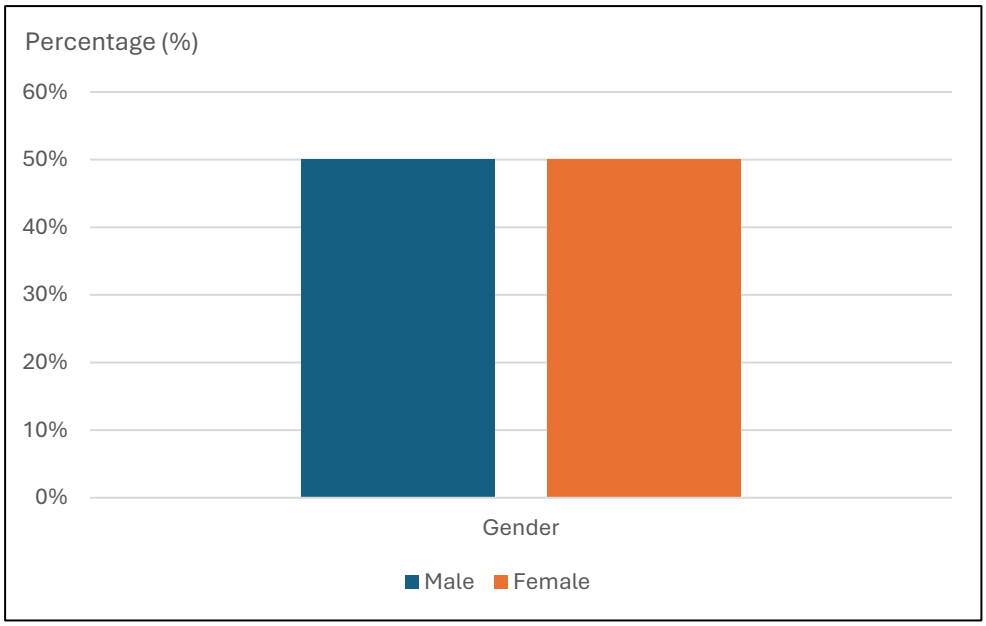

Figure 4.2 Percentage graph of respondent by gender

4.4.1.3 Field of Study

Table 4.8 and Figure 4.3 show the educational background of the participants involved in this study. A total of 30 students participated, and they came from various different faculties in higher education institutions. In total, there are six main faculties listed in this study, namely the Faculty of Applied Sciences (AS), Faculty of Accounting (AC), College of Creative Arts (CA), Academy of Contemporary Islamic Studies (IC), Faculty of Hotel and Tourism Management (HM), and Faculty of Business Management (BA/BM). This diversity of academic backgrounds is important to provide a broader perspective on the factors that influence the choice of display mode among students.

Based on the figure shown, the majority of respondents were students from the Faculty of Applied Sciences, with a total of N=10 or equivalent to 33.3% of the total sample. This number clearly shows that students in the applied sciences field are the largest group participating in this study, which may be due to their tendency towards the use of technology and software that is often associated with the need for screen display.

Furthermore, the Faculty of Accounting and the College of Creative Arts share the second highest rank with the same number of respondents (N=8, or 26.7%). This demonstrates that both faculties have a considerable representation in this study and comparing them can provide a more complete picture of how the field of study influences the likelihood of adopting dark mode and light mode in user interfaces.

Meanwhile, the Academy of Contemporary Islamic Studies recorded a lower percentage, which is 6.7% or N=2. Although this number is relatively small compared to other faculties, it still provides value in assessing whether students from the field of Islamic studies have different preference patterns in the use of display modes.

The Faculty of Hotel and Tourism Management and the Faculty of Business Management recorded the least representation, each having only one respondent (N=1), equivalent to 3.3% of the total sample. Although this number is low, it still provides a variety of data that can help in identifying whether there is a need for more participation from certain faculties to gain a more comprehensive understanding.

Overall, this diversity allows for a more comprehensive analysis of how academic background can influence display mode choices, whether in the context of academic needs, technology usage habits, or other factors related to the respective field of study.

Table 4.8
Summary of total respondent by field of study.

Faculty	**Frequency (N)**	**Percent (%)**	**Cumulative Percent (%)**
Faculty of Applied Sciences (AS)	10	33.3	33.3
Faculty of Accountancy (AC)	8	26.7	60.0

College of Creative Arts (CA)	8	26.7	86.7
Academy of Contemporary Islamic Studies (IC)	2	6.7	93.4
Faculty of Hotel and Tourism Management (HM)	1	3.3	96.7
Faculty of Business Management (BA/BM)	1	3.3	100.0
Total	30	100.0	

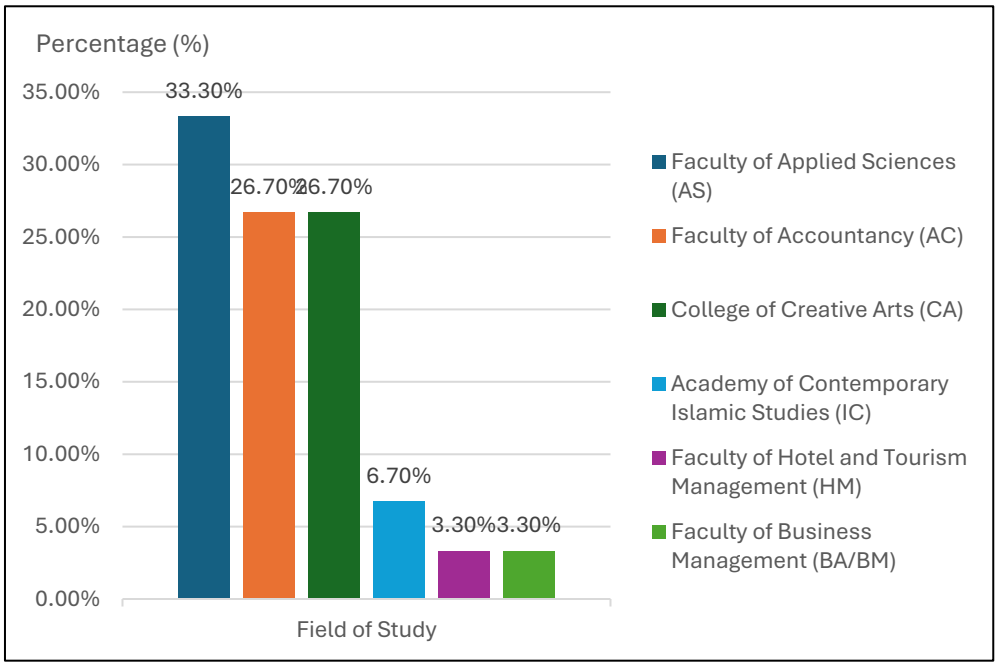

Figure 4.3 Percentage graph of respondent by field of study

4.4.1.4 Level of Study

Table 4.9
Summary of total respondent by level of study

Study Level	Frequency (N)	Percent (%)	Cumulative Percent (%)
Bachelor's Degree	25	83.3	83.3
Master's Degree	4	13.3	96.6
PhD	1	3.4	100.0
Total	30	100.0	

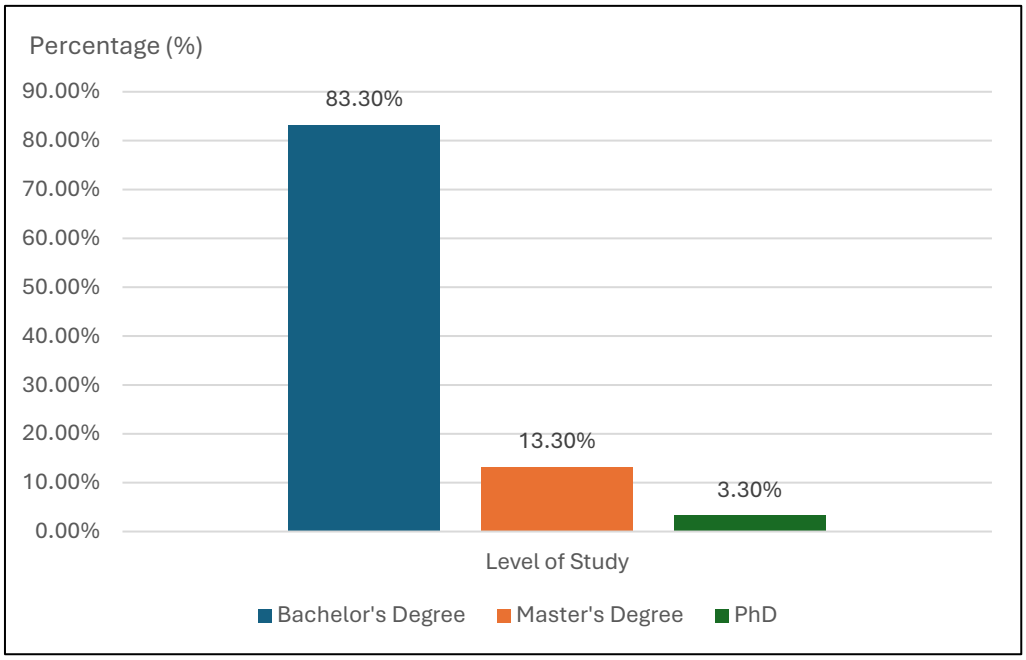

Figure 4.4 Percentage graph of respondent by level of study

As shown in Table 4.9 and Figure 4.4, this information includes the level of study of the participants involved in the study. The participants consist of bachelor's degree, master's degree, and Doctor of Philosophy (PhD) students. Based on the table, the blue column represents the highest level of study in this study, namely bachelor's degree students, with the highest number of N=25, equivalent to 83.3%. Meanwhile, master's degree students recorded 13.3% with a frequency of N=4. The lowest representation was from PhD students, as shown in the yellow column, with only one participant (N=1), equivalent to 3.3% of the total. This percentage indicates that the majority of respondents in this survey were bachelor's degree students.

4.4.2 Respondent Device Use

This section shows the device usage statistics for each respondent. The detailed information includes the type of primary device used, the operating system (OS) chosen, and the frequency of device usage per day per hour. This data also plays an important role in determining whether the type of device used affects the choice of mode.

4.4.2.1 Primary Device Use

Referring to Table 4.10 and Figure 4.5, this data shows the main device used by respondents. Based on the table, the blue column represents the most used device, which is a smartphone, with a frequency of N=27 equal to 90.0%. This is followed by laptops with 6.7% (N=2). Meanwhile, the least used device is the tablet, as shown in the yellow column, with only one user (N=1), equivalent to 3.3%. In this sophisticated digital era, it is not surprising that smartphones are the most dominant device. This is because smartphones have become a basic necessity in daily life, allowing users to easily access various applications and services.

Table 4.10
Summary of total respondent by device use

Device	Frequency (N)	Percent (%)	Cumulative Percent (%)
Smartphone	27	90.0	90.0
Laptop	2	6.7	96.7
Tablet	1	3.3	100.0
Total	30	100.0	

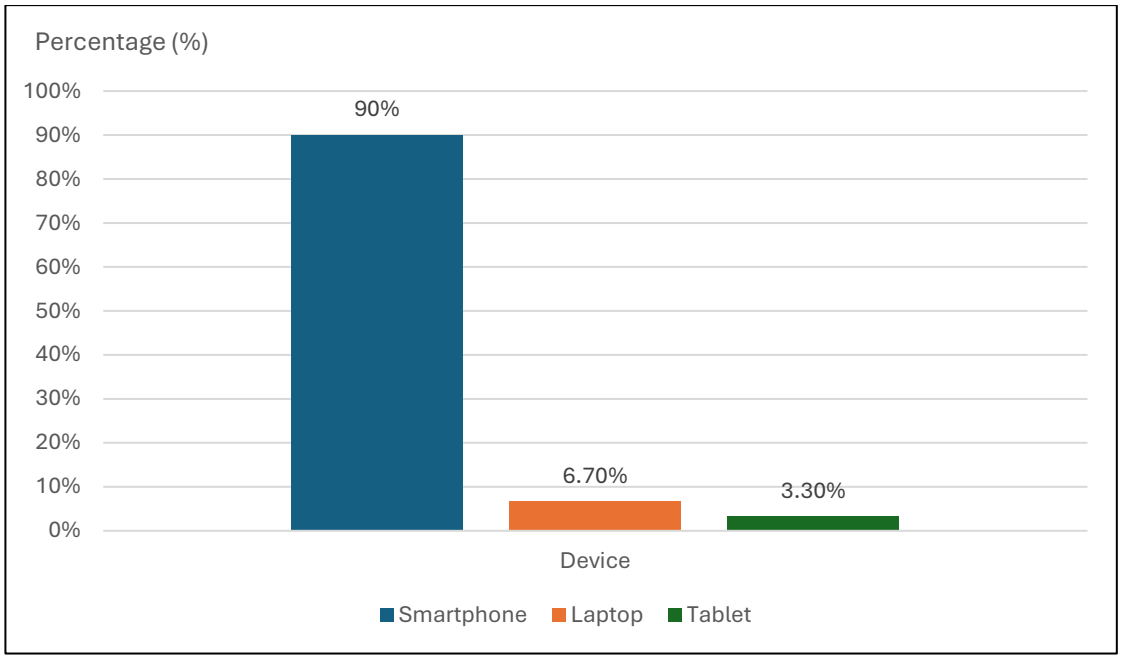

Figure 4.5 Percentage graph of respondent by device use

4.4.2.2 Operating System Use

This section categorizes respondents based on the operating system (OS) that they use on their devices. This analysis recognized three operating systems: Android, iOS, and Windows. Table 4.11 and Figure 4.6 show the percentage of users for each operating system used by respondents.

According to the statistics in Table 4.11, iOS users had the largest percentage, accounting for N=15 or 50% of all responses. This means that half of the survey participants are more likely to use iOS-based devices, such as iPhones and iPads. Meanwhile, Android users registered a total of N=13, representing 43.3%. Although this figure is slightly lower than iOS, it remains a considerable presence in the research population.

The category with the lowest percentage is Windows users, with only two respondents, or 6.7%. This modest number is most likely due to the fact that Windows is more often used on laptops or desktop computers than on mobile devices like smartphones or tablets, which are the primary subject of this study.

In addition, if referred to section 4.4.2.1, 28 out of 30 respondents stated that they use a smartphone or tablet as their main device. Among them, more than half use iOS with a percentage of 53.57% (N=15), while the rest use Android, which is 46.43%

(N=13). This provides a clearer picture of the operating system trends used among students of higher education institutions involved in this study.

Table 4.11
Summary of total respondent by operating system use

Operating System (OS)	Frequency (N)	Percent (%)	Cumulative Percent (%)
Android	13	43.3	43.3
iOS	15	50.0	93.3
Windows	2	6.7	100.0
Total	30	100.0	

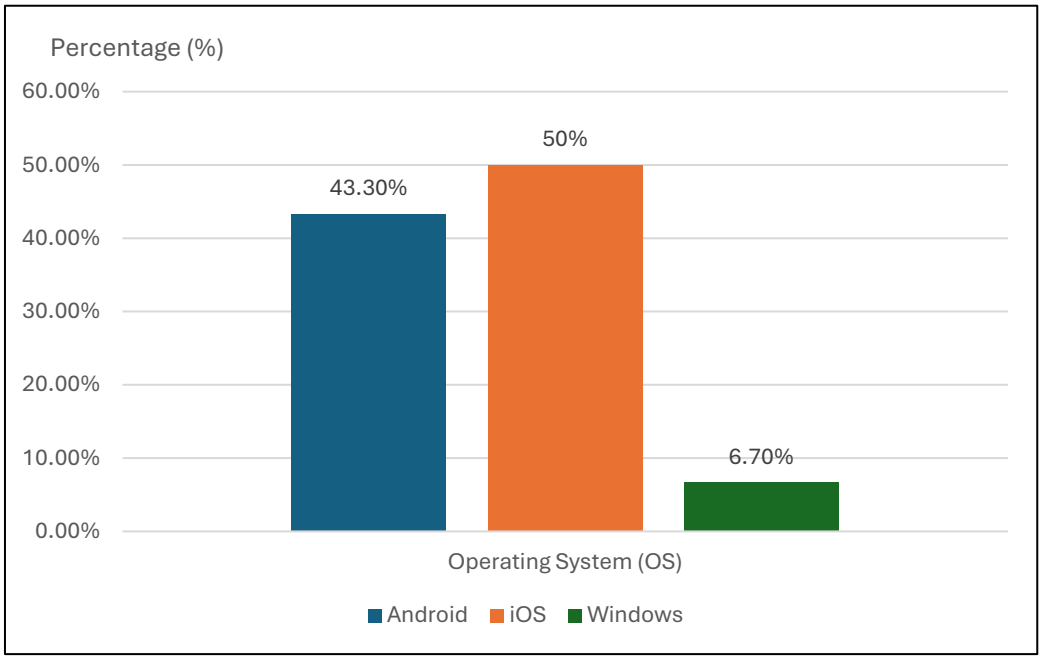

Figure 4.6 Percentage graph of respondent by operating system use

4.4.2.3 Daily frequency of device use

As indicated in Table 4.12 and Figure 4.7, it essentially displays the time based on each respondent's daily device usage hours. The blue column in the table below indicates the most common times that respondents use their devices, with a frequency of N=15, or 50%, meaning that they use their devices for 7-9 hours a day. N=8 respondents, or 26.7% of the total, utilize the device for four to six hours every day. As indicated in the yellow column, there are only N=7 users who use the gadget for more than nine hours, representing a 23.3% rate.

Table 4.12
Summary of total respondent by frequency of device use per hour

Device Use (Hour)	Frequency (N)	Percent (%)	Cumulative Percent (%)
4-6	8	26.7	26.7
7-9	15	50.0	76.7
More than 9 hours	7	23.3	100.0
Total	30	100.0	

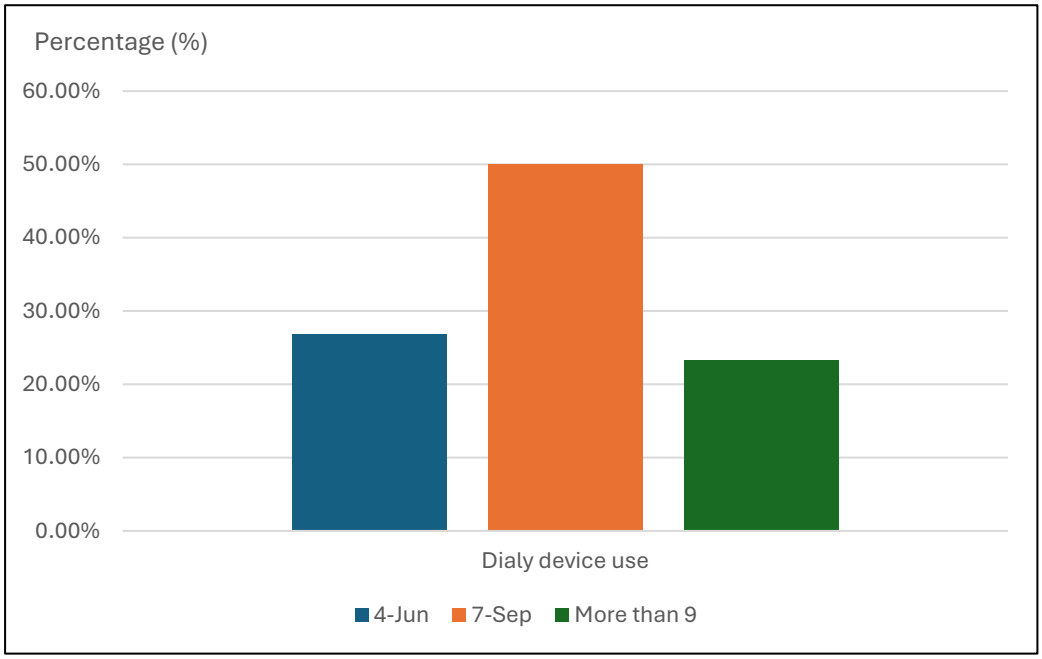

Figure 4.7 Percentage graph of respondent by device use per hour

4.4.3 Dark Mode and Light Mode Experience

This section explores respondents' experiences with dark mode and light mode in their daily device usage. The questions in this section include their preferred mode when using specific software or applications, the significance of mode selection when reading or reviewing lessons, and which mode is perceived as more eye-friendly. Figures 4.8, 4.9, and 4.10 illustrate the percentage distribution of respondents' preferences.

4.4.3.1 The preferred mode used when accessing software or apps

Table 4.13 and Figure 4.8 indicate respondents' favorite display mode when using various software and programs such as WhatsApp, Google Chrome, Microsoft Office, and others. The study's findings revealed a strong preference for dark mode, as

indicated by the blue column, with N=25 respondents (83.3%) selecting it as their primary choice. In contrast, N=3 respondents (10%) stated that their display mode preference was determined by the type of program or application used. Meanwhile, just two respondents (6.7%) indicated a preference for light mode. This finding clearly demonstrates the dominance of dark mode preference among the users studied.

In addition, further analysis of the data provides a deeper understanding of user preferences based on gender. Of the N=25 respondents who chose dark mode, N=13 were male students, while N=12 were female students. The small difference between the number of male and female respondents indicates that the choice of dark mode is balanced between both genders. This proves that dark mode is not only the main choice of male users but is also welcomed by female users.

These results reflect those factors such as visual comfort, reduced eye strain, battery saving, and aesthetic aspects may play an important role in determining a person's choice of display mode. Furthermore, the increasing number of applications and digital platforms that offer dark mode options may also be a driver of its popularity among students regardless of gender. The small difference in the choice between men and women also indicates that the preference for dark mode is more influenced by individual usage and comfort factors than gender.

Table 4.13
Summary of total respondent by mode use when accessing software

Mode	Frequency (N)	Percent (%)	Cumulative Percent (%)
Dark Mode	25	83.3	83.3
Light Mode	2	6.7	90.0
As Appropriate	3	10.0	100.0
Total	30	100.0	

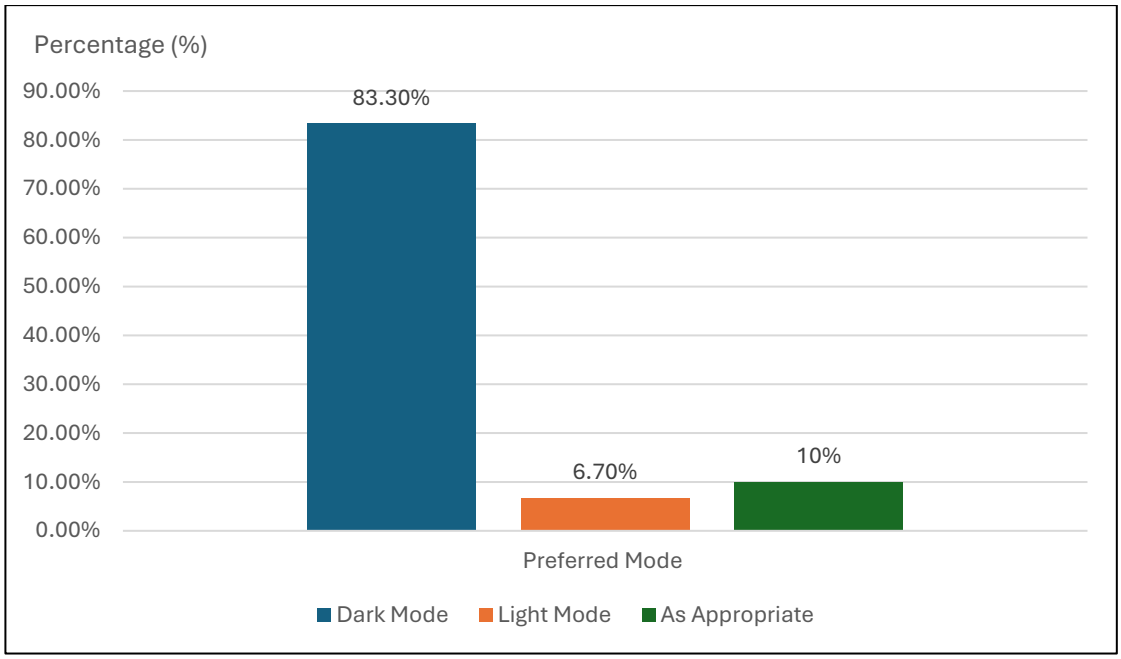

Figure 4.8 Percentage graph of respondent by preferred mode used

4.4.3.2 Importance of Mode Selection While Studying

Table 4.14 and Figure 4.9 present survey data on the significance of selecting dark mode or light mode when studying or reading on digital devices such as laptops and smartphones. The majority of respondents, represented by the blue column, agree that mode selection is important, with N=29 (96.7%) supporting this view. In contrast, only N=1 respondent (3.3%), indicated in the yellow column, disagrees with this statement. These findings suggest a strong consensus on the relevance of display mode in enhancing the reading and studying experience.

Table 4.14
Summary of total respondent by their opinion

Opinion	Frequency (N)	Percent (%)	Cumulative Percent (%)
Yes	29	96.7	96.7
No	1	3.3	100.0
Total	30	100.0	

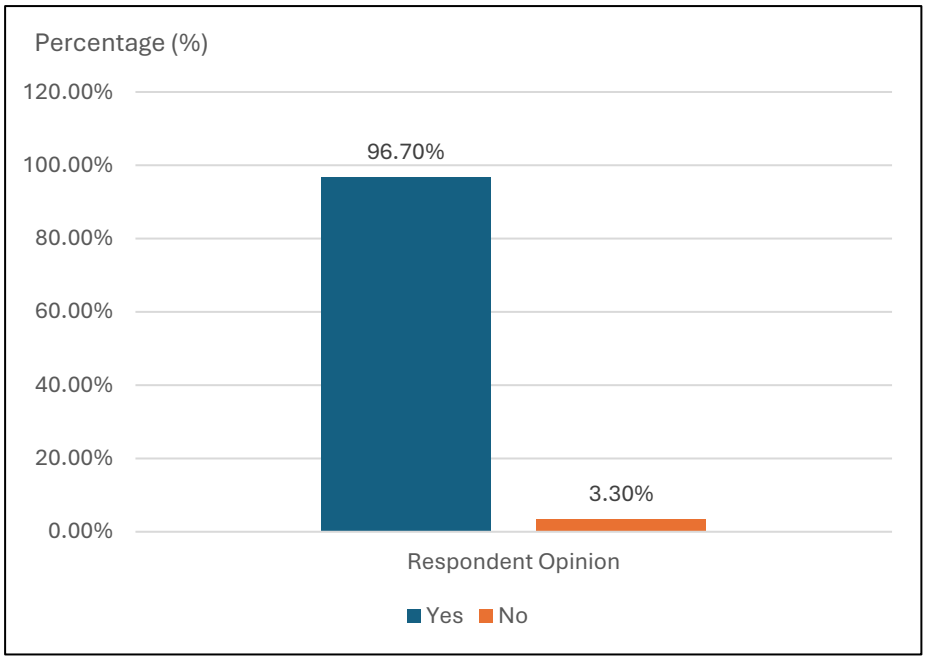

Figure 4.9 Percentage graph of respondent by their opinion

4.4.3.3 Eye-friendly mode

The following are the survey responses regarding the display modes that respondents considered more eye friendly. Based on Table 4.15 and Figure 4.10, the majority of respondents chose dark mode as their top choice, with a total of N=24 respondents (80%). Furthermore, N=5 respondents (16.7%) thought that both modes were equally suitable for their eyes, while only N=1 respondents (3.3%) chose bright mode as the most comfortable mode for the eyes. This finding clearly shows a higher tendency towards dark mode in terms of visual comfort.

Further analysis of this data shows that out of the N=24 respondents who chose dark mode, N=12 respondents were male students, while N=12 were female students. This almost insignificant difference proves that both genders have the same tendency in choosing dark mode due to eye comfort factors. This once again reinforces that dark mode is not only preferred by male users but also receives equal attention among female users.

Furthermore, this data calls into question the idea that women read more quickly in light mode. If the theory were correct, we would expect female pupils to choose light mode. However, records reveal that many female students, like male students, prefer dark mode. This shows that individual tastes and usage situations may have a greater influence on visual comfort than gender.

Table 4.15
Summary of total respondent by their opinion of eye-friendly mode

Mode	Frequency (N)	Percent (%)	Cumulative Percent (%)
Dark Mode	24	80	80
Light Mode	1	3.3	83.3
Both	5	16.7	100.0
Total	30	100.0	

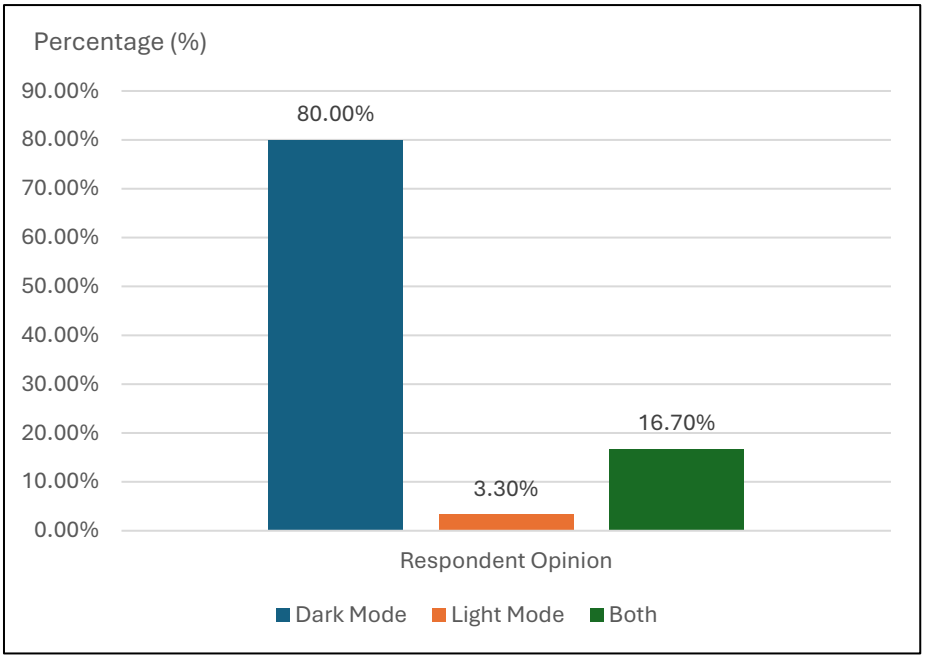

Figure 4.10 Percentage graph of respondent by their opinion of eye-friendly mode

4.4.4 Respondent Preference

This section is an important component of the study, where respondents will determine their mode choice. In addition, they are also asked to state the reasons behind their choice and explain its impact on the experience of using the device. Among the questions asked are which mode is the main choice, whether it helps them focus more when studying or completing tasks, its impact on the duration of device use, and the factors that influence the choice of the mode.

4.4.4.1 Preferred Mode

based on Table 4.16, Table 4.17, Table 4.18, Table 4.19 as well as Figure 4.11 and Figure 4.12, the percentage and frequency of respondents in selecting display modes, their views on the selected mode, and its impact on device usage have been

described in detail. The data in these tables provide a clearer picture of user preferences for dark and light modes among students in higher education institutions. In all tables, the blue column denotes the most respondents, while the yellow column represents the fewest respondents.

As can be seen in Table 4.16, the majority of respondents, namely N=28 or 93.3%, chose dark mode as their main choice. Only N=2 respondents (6.7%) chose to use light mode. This indicates that dark mode has a higher appeal among students, possibly due to eye comfort factors, lower battery consumption, or aesthetic preferences.

Table 4.17 then addresses the level of agreement among respondents regarding the role of their favorite mode in boosting focus when performing activities or studying. A total of N=28 respondents (93.3%) agreed that their favorite mode aids in concentration, whereas just N=2 respondents (6.7%) disagreed. This shows that the majority of respondents felt that the mode they used played a role in increasing their concentration on a task.

In addition, Table 4.18 shows whether the choice of mode used affects the duration of device use. Based on the data obtained, a total of N=27 respondents (90%) agreed that the mode they chose affected the duration of their device use. On the other hand, only N=3 respondents (10%) disagreed. This shows that the majority of students are aware of the impact of display mode on the duration of their device use, which may be related to eye comfort factors or overall user experience.

Table 4.19 summarizes the respondents' responses to the questions in Tables 4.17 and 4.18 based on the mode they selected. Among the N=28 people who chose dark mode, N=26 (93.3%) agreed that it helps them focus better, whereas N=2 (6.7%) disagreed. For the respondents who chose light mode, which is N=2 (100%), all of them agreed that light mode helps them focus more.

In terms of device usage, N=27 individuals who chose dark mode also stated whether the mode affected the duration of their device usage. Of these, N=24 respondents (88.89%) agreed that dark mode made them use their device for longer periods of time, whereas N=3 respondents (11.11%) disagreed. Meanwhile, of the N=3 respondents who chose light mode, all (100%) agreed that it prolonged the time of their device usage.

Overall, the findings of this study show that almost all respondents who chose dark mode agree with the statements presented in the survey. However, there are still a few respondents who have different views, although the number is small. These differences are still taken into account in the study because each individual has different tendencies and usage experiences based

Table 4.16
Summary of total respondent by their preferred mode

Mode	Frequency (N)	Percent (%)	Cumulative Percent (%)
Dark Mode	28	93.3	93.3
Light Mode	2	6.7	100.0
Total	30	100.0	

Table 4.17
Summary of respondents in their opinions regarding the mode that adds focus to their learning.

Does it help you focus?	Frequency (N)	Percent (%)	Cumulative Percent (%)
Yes	28	93.3	93.3
No	2	6.7	100.0
Total	30	100.0	

Table 4.18
Summary of respondents in their opinions regarding the mode that affects duration to their device use.

Does it affect the duration of device use?	Frequency (N)	Percent (%)	Cumulative Percent (%)
Yes	27	90.0	90.0
No	3	10.0	100.0
Total	30	100.0	

Table 4.19
Summary of respondents in their opinions based on their mode preference

Mode	*Does it help you focus?*	*Frequency (N)*	*Percent (%)*
Dark Mode	Yes	26	93.30
	No	2	6.7

Light Mode	Yes	2	100.0
	No	0	0
Mode	*Does it affect the duration of device use?*	*Frequency (N)*	*Percent (%)*
Dark Mode	Yes	24	88.89
	No	3	11.11%
Light Mode	Yes	3	100.0
	No	0	0

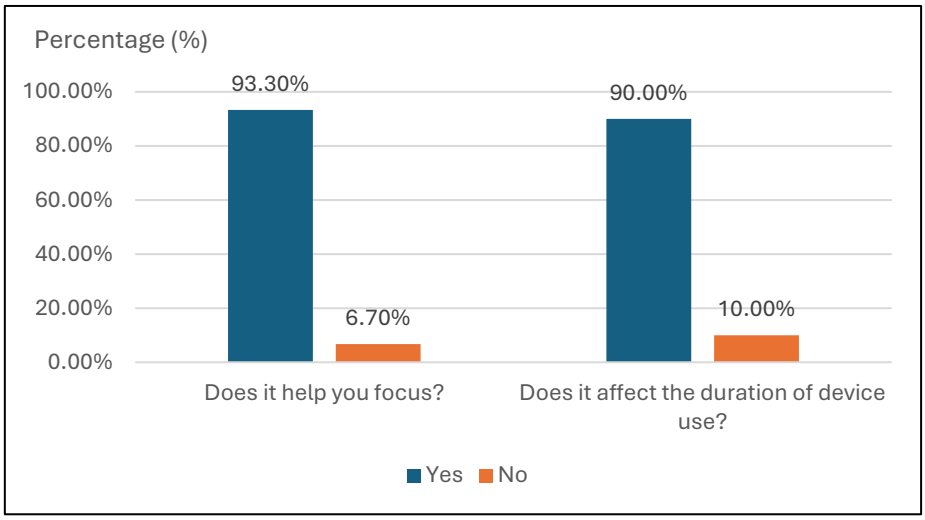

Figure 4.11 Percentage graph of respondent by their opinion on mode choice

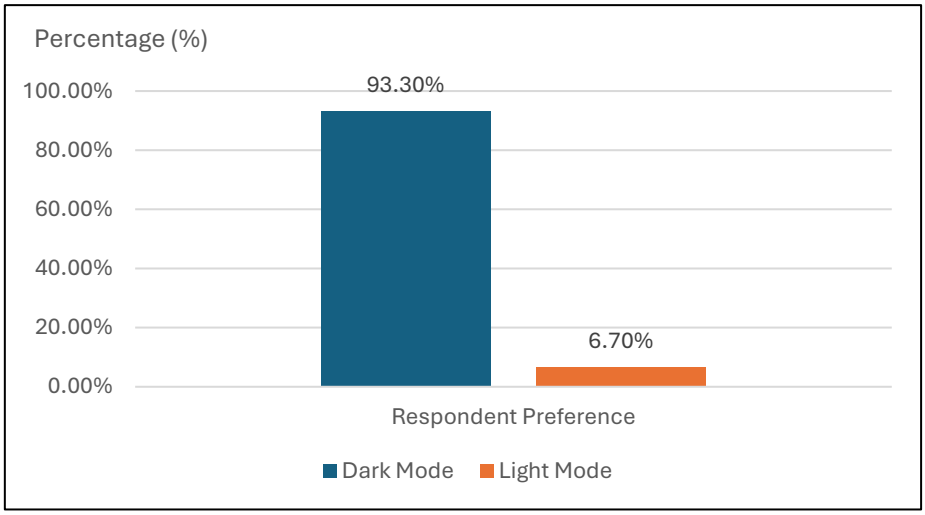

Figure 4.12 Percentage graph of respondent by their preferred mode

4.4.4.2 Factors Influence Mode Choice

Table 4.20 and Figure 4.13 below show the number of respondents divided according to the factors that influence their mode choice. From the total N=30 respondents, four main factors were identified as driving their choices. The eye comfort factor was the main reason influencing the choice of mode, as shown in the blue column with N=20 respondents, equivalent to 66.67%. This component covered a range of responses, including minimizing exposure to intense light and preventing eye strain. Next, with N=4 respondents (13.33%), the health issue was the second most popular answer. Answers about glare and migraines brought on by screen lighting were included in this factor. With N=3 respondents (10%), battery usage and aesthetics were the least popular factors. Those who selected the style because they thought it was more appealing or because they followed trends were included in the aesthetics category. In the meantime, responses about energy conservation and extended battery life were included in the battery consumption factor. Based on this data, it is clear that eye comfort was the main factor influencing the choice of mode among students, indicating that the visual aspect plays an important role in their device usage experience.

Based on the data obtained, out of N=20 students who stated that eye comfort was the main factor in choosing a display mode, N=11 were female students, while N=9 were male students. This finding suggests that female students choose a mode that provides higher visual comfort, and in the context of this study, the majority chose dark mode as their primary option. This minor variation in numbers maintains the tendency that both genders prioritize eye comfort, with slightly more female students choosing

dark mode over light mode. This suggests that dark mode not only helps to alleviate eye fatigue but may also be more appropriate for female users' visual preferences when using digital devices for extended periods of time.

Table 4.20
Summary of total respondent by factor influence mode choice

Factor	Frequency (N)	Percent (%)	Cumulative Percent (%)
Eye Comfort	20	66.67	66.67
Astatic	3	10.0	76.67
Battery Consumption	3	10.0	86.67
Health	4	13.33	100.0
Total	30	100.0	

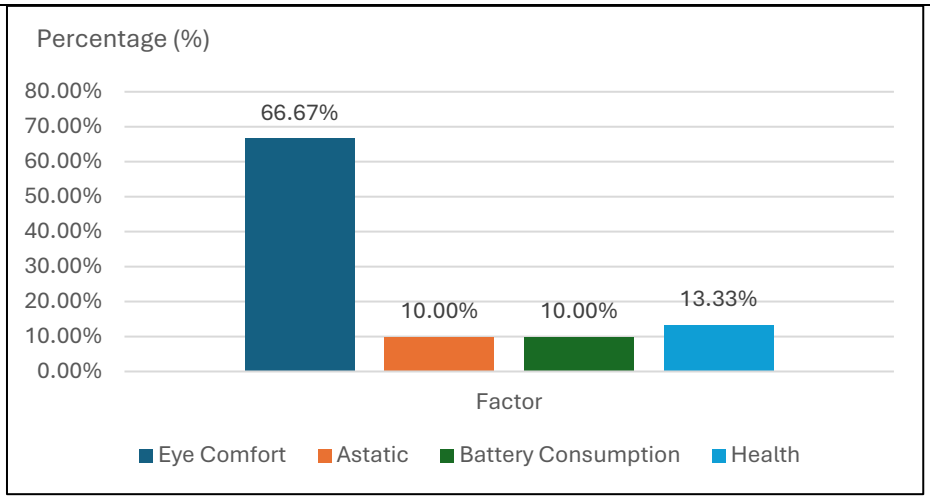

Figure 4.13 Percentage graph of respondent by factor influence of mode choice

4.4.5 Suggestions and Recommendations

The direction of dark mode and light mode usage in relation to user interface (UI) and user experience (UX) is covered in this section. Since all of the responses are UiTM students, the primary goal of this part is to get their opinions on the two modes of the platform that UiTM created. Moreover, participants were requested to express their thoughts and ideas about how to make these two modes more user-friendly using enhancements. In addition to aiding in the comprehension of user requirements, respondent input may also be used as a roadmap for enhancing UI/UX design to make it more user-friendly and efficient while meeting the demands of students.

4.4.5.1 Dark Mode and Light Mode on UiTM Platforms

Table 4.21 and Figure 4.14 discuss the respondents' views on the need to create dark mode and light mode options in UiTM applications or platforms. Based on the data obtained, the majority of respondents are of the view that UiTM platforms and applications need to provide display mode options. This is evidenced by the blue column which recorded the highest number, namely N=24 or 80% of respondents who agreed with the proposal. On the other hand, a total of N=6 respondents, equivalent to 20%, believed that dark and light mode options were not needed. This finding indicates that the need to provide mode options on each UiTM mobile platform or application should be given attention to improve user experience and ensure comfort in long-term use.

Table 4.21
Summary of total respondent by their opinion on UiTM Platforms

Opinion	Frequency (N)	Percent (%)	Cumulative Percent (%)
Necessary	24	80.0	80.0
No Need	6	20.0	100.0
Total	30	100.0	

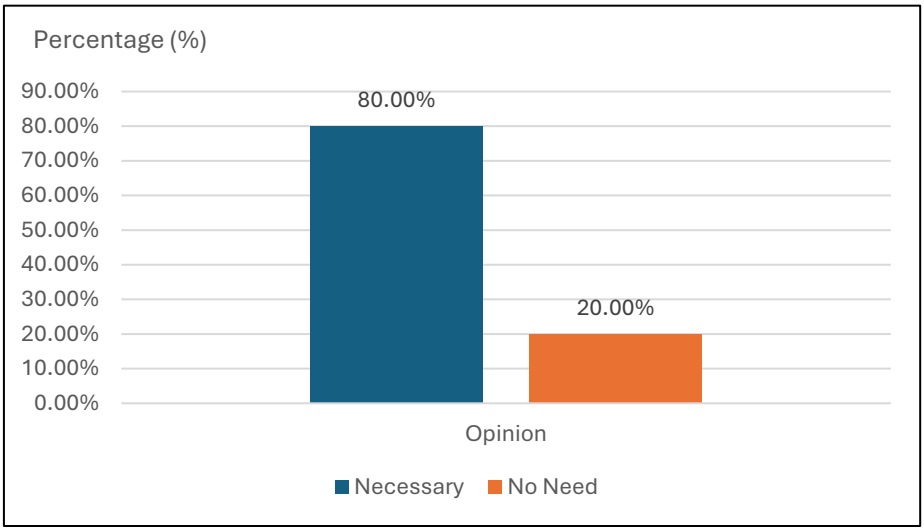

Figure 4.14 Percentage graph of respondent by their opinion on UiTM platforms

4.4.5.2 Suggestions to Improve Dark Mode or Light Mode

In this survey, respondents were also asked to provide suggestions to improve the use of dark mode and light mode to make it more user-friendly. A total of 23

responses were received, and the analysis showed several key aspects that could be improved to improve the user experience. Among the suggestions submitted were aspects of accessibility, visual comfort, user interface (UI) design, as well as additional features that allow users to customize the mode according to their needs. Table 4.22 below displays the frequency breakdown (N) and percentage (%) for each suggestion given by respondents, while Figure 4.15 shows a graphical representation of the data according to the categories that have been identified.

Table 4.22
Summary of total respondents by their opinion on improvement on dark mode and light mode

Category	**Opinion**	**Frequency (N)**	**Percent (%)**
Accessibility & User Control	Makes mode selection buttons more accessible	4	17.39
	Provides dark and light mode options in all apps	4	17.39
Visual Comfort	Using contrasting colors that are not painful to the eyes	5	21.74
	Avoiding too bold or bright mode colors	3	13.04
	Using gray as an alternative for dark or light mode	3	13.04
UI Design	Used easier-to-read fonts in dark mode	2	8.7
Additional Features	Provides adaptive mode that changes according to ambient light	1	4.35
	Provides blue light filter to reduce eye fatigue	1	4.35

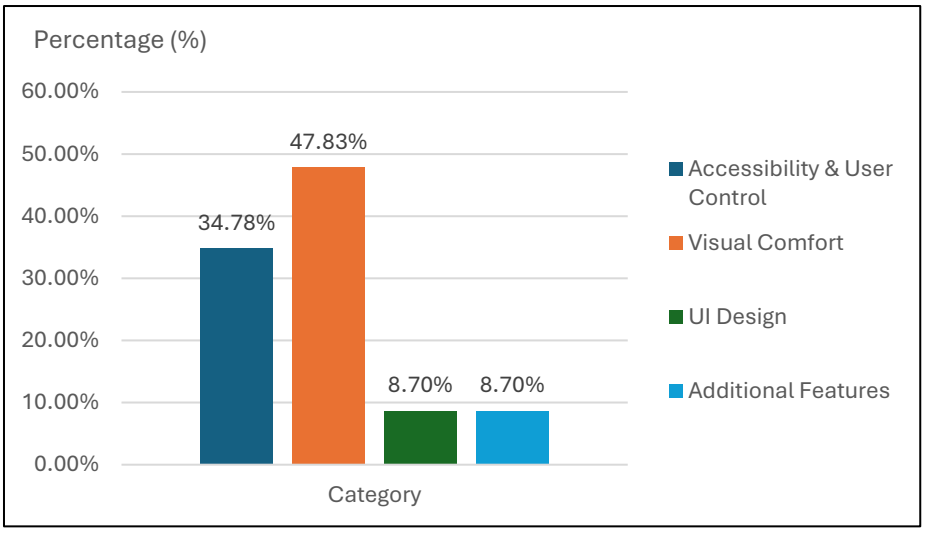

Figure 4.15 Percentage graph of respondent by category of their opinion

Based on the suggestions given by the respondents, there are several key aspects that need to be addressed to improve the user's experience in using dark mode and light mode. All these suggestions have been listed in Table 4.22 and categorized into four main groups, namely Accessibility & User Control, Visual Comfort, UI Design, and Additional Features. This division allows for a more systematic analysis of user needs as well as improvement steps that can be taken.

Referring to Figure 4.15, the Visual Comfort category is the most dominant aspect, with 47.83% of respondents providing suggestions related to this element. Referring to Table 4.22, among the key suggestions in this category is the use of contrasting colors that do not hurt the eyes, which was suggested by N=5 (21.74%) of respondents. This suggestion is very relevant because one of the main reasons for the difference in mode selection among users is the visual discomfort factor. In addition, there are two other suggestions that received the same number of responses, namely N=3 (13.04%). Respondents suggested that the mode colors should not be too intense or too faded and that gray be used as an alternative to dark and light modes. With a balance in the color selection, the reading experience in a particular mode will be more comfortable without causing strain on the eyes. The use of gray as an additional option also provides more flexibility for users who may not be comfortable with the high contrast between dark and light modes.

The second highest category is Accessibility & User Control, which accounts for 34.78% of the total suggestions submitted. In this category, there are two main suggestions, each with a frequency of N=4 (17.39%). One of the suggestions is to ensure that the mode selection button is placed in a more accessible location. By providing this button in a strategic place, users can switch between dark and light modes faster without having to go through a complex settings menu. In addition, respondents also suggested that all applications and platforms provide dark and light mode options by default. Although most digital applications have integrated these two modes nowadays, there are still some applications that do not provide such options. Therefore, this recommendation is very important to ensure that each platform, especially those used by students, is more user-friendly and flexible according to individual needs.

The UI Design category received suggestions from 8.7% of respondents, with one main suggestion having a frequency of N=2 (8.7%). Respondents suggested that the selection of font types in dark mode be more readable. Fonts that are too thin or small can cause difficulty reading, especially in dark mode with a black or gray background. Therefore, selecting fonts that are clearer and easier to read can reduce eye strain and improve the overall user experience.

The last category is Additional Features, which also recorded 8.7% of respondents with two main suggestions, each receiving N=1 (4.35%). One of the suggestions is the provision of adaptive modes that can automatically change according to the ambient light. This is a practical suggestion because it allows users to enjoy a more dynamic experience without having to manually change modes. For example, dark mode can be activated when the user is in a dim or dark environment, while bright mode can be used in high-light conditions. In addition, respondents also suggested that applications provide a blue light filter to reduce eye fatigue. The blue light emitted by digital device screens can cause eye strain, especially when used for long periods of time. With this feature, users can enjoy a more comfortable visual experience, especially when using the device for long periods of time or in low-light environments.

Overall, the results of this survey show that aspects of visual comfort, accessibility, UI design, and additional features play an important role in improving the user-friendliness of dark and light modes. Therefore, platform and application providers are advised to take these factors into account in an effort to improve the overall user experience.

4.5 Findings and Data Analysis of Interview

Three experts in the field of UI/UX were interviewed to validate the survey findings and provide technical perspectives. These experts possess diverse backgrounds: Expert 1 (Hasif) is a UI/UX Designer, Expert 2 (Hanif) is a UI/UX Developer and Apps Developer, and Expert 3 (Farid) is a Front-End Developer and UI Developer. Their combined expertise covers the spectrum from visual design to technical implementation.

The interview data was analyzed using thematic analysis to identify patterns in professional opinions regarding user preference, visual ergonomics, and technical challenges. In addition, there were also spontaneous questions asked depending on the experience and experience of each individual to obtain more in-depth information. The main focus of this session was to see how UI/UX design can be improved to meet user needs, especially in terms of dark mode and light mode. These experts were also asked to provide suggestions for improvements so that these two display modes are more user-friendly and suitable for student needs.

4.5.1 Students' Preference: Dark Mode vs. Light Mode – Expert Insights

When asked about the current trends in user preference, all three experts confirmed the survey finding that Dark Mode is the dominant choice among students. Expert 1 stated that in the current landscape, finding a user who strictly prefers Light Mode is increasingly uncommon.

"Dark mode. Nowadays, most users prefer dark mode. It is rare to find individuals who use light mode." – (Expert 1)

Expert 2 added nuance to this, noting that while Dark Mode is popular, sophisticated users often switch based on context. Expert 3 reinforced that this preference is not just functional but also driven by industry trends.

The researcher gathered professional opinions on the display mode options that are currently being considered by students during the interview process. In general, they thought that dark mode was increasing in popularity and taking over as the primary option for consumers. According to Expert 1, most students and young people now prefer dark mode over light mode, and it is even harder to locate people who still steadfastly utilize light mode as their primary option. If there are young people who dislike using dark mode, he says that's odd.

Additionally, according to Expert 2, some people decide to switch modes depending on specific situations. For instance, because the lighting is brighter during the day, people might utilize light mode; at night, they will switch to dark mode for a more comfortable experience and to lessen eye strain. Expert 3 concurred that dark mode is currently the most popular option among users. Since dark mode is currently the newest trend, he was also taken back by the fact that there are still students or young people who choose light mode.

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4.5.2 Factors Influencing Mode Selection

The experts unanimously agreed with the survey respondents that eye comfort is the primary driver for this preference. Expert 1 emphasized that bright backgrounds cause "glare and discomfort," particularly for long reading sessions. Expert 3 added an important psychological dimension, noting that the preference is a mix of physiological comfort and aesthetic trends.

"Eye comfort and aesthetics – Using light mode in dark environments can cause glare. Additionally, dark mode has become a trend." – (Expert 3)

This validates the survey data where "Eye Comfort" (66.67%) and "Aesthetics" (10%) were key factors.

In terms of display mode selection criteria, eye comfort is the primary reason why most users prefer dark mode. Expert 1 emphasized that bright backdrops might induce glare, particularly when reading text for an extended period. According to him, an overly bright display not only strains the eyes but also disrupts the user's concentration.

Expert 2 concurred with this viewpoint and said that light mode can cause more substantial discomfort, particularly for individuals who use the gadget for extended periods of time. He claimed that many people prefer dark mode since it decreases eye fatigue and is better suited to different lighting conditions. Meanwhile, expert 3 argues that, in addition to comfort, aesthetic considerations influence display mode choices. He stated that dark mode is not only a more aesthetically pleasing alternative, but it has also become a popular trend in modern UI design. He also stressed that using a bright setting in a dark environment can result in glare.

Thus, based on the experts' opinions above, it is evident that they unanimously agree that eye comfort is one of the primary factors influencing the preference for dark mode. They also concur that dark mode is specifically designed to enhance visual comfort and reduce eye strain, making it a more suitable option for prolonged use.

4.5.3 Impact of Dark Mode on Battery Consumption

A notable divergence emerged regarding battery life. While survey respondents believed Dark Mode saves battery, the experts clarified the difference between theory and development priority. Expert 3 noted that logically, less light equals less energy. However, Expert 2 clarified that from a developer's perspective, this is rarely a primary goal.

"Theoretically, yes. However, in UI/UX development, this is not a primary consideration when designing or developing an application." – (Expert 2)

This insight suggests that while battery saving is a factual benefit on OLED screens, it is considered a secondary "bonus" feature rather than a core objective in modern app development.

Experts in the sector have different points of view on battery saving. Expert 1 believes that, in theory, dark mode can help save battery life, particularly on OLED screens, which require less power to display dark colors. However, in terms of UI/UX development, he noted that battery conservation is not the top concern. Instead, the primary focus is on user experience (UX) and application design that is appropriate for its function.

Expert 2, on the other hand, stated that he did not investigate the issue of battery conservation in apps and was more concerned with other aspects of design. However, Expert 3 is more of the view that, logically, the use of dark mode will reduce energy consumption because it requires lower illumination on the screen, thus reducing battery consumption. Despite these differences of opinion, it shows that dark mode may have certain benefits depending on the needs and context of its use in application design.

4.5.4 Mode Selection as a Focused Factor during Learning

The experts offered conflicting views regarding the impact of Dark Mode on concentration, providing critical depth to the analysis. Expert 1 and Expert 2 supported

the students' view that Dark Mode aids focus. Expert 1 cited personal experience conducting workshops:

"I agree. From my experience conducting workshops, many participants reported better focus when using dark mode because a bright background is distracting." – (Expert 1)

In contrast, Expert 3 offered a critical counter-perspective, suggesting that the "focus" attributed to Dark Mode might be placebo or behavioral rather than intrinsic to the design.

"I disagree. Light mode does not necessarily affect focus. It may just be an excuse for students who struggle to concentrate... While light mode can cause glare, it does not significantly impact focus." – (Expert 3)

This disagreement highlights that "focus" is subjective; for some, removing glare improves attention (Expert 1), while for others, a bright environment is necessary for alertness (Expert 3).

4.5.5 Expert Opinions on Gender's Influence on Mode Selection

When presented with the theory that women read faster in Light Mode while men prefer Dark Mode, all experts expressed skepticism, aligning with the survey data that showed no significant gender split.

"Disagree. I have not experienced this personally. As a UX professional, I use dark mode for comfort." – (Expert 2)

Expert 1 also noted that in his experience, gender has never been a defining variable for interface preference, suggesting that individual visual needs override gender-based generalizations.

Experts disagree with the claim that women read faster in light mode than males in dark mode. Expert 1 stated that he had never seen a circumstance where such a disparity happened and questioned the veracity of the notion. Meanwhile, Expert 2 revealed his experience, stating that some men prefer to use bright mode over dark mode, although there is insufficient evidence to support this notion. He believes that individual factors and the environment of use have a greater influence on mode selection than gender.

4.5.6 Expert Opinions on the Use of Modes Based on Time of Day

The concept of "Adaptive Mode"—switching between Dark and Light based on the time of day—received unanimous support. Expert 2 explained the functional logic behind this:

"A good idea. During the day, a bright background is preferable due to surrounding light. At night, a darker background reduces glare and eye strain." – (Expert 2)

Expert 3 expanded on this, noting that using Light Mode in dark environments causes physical pain (glare), whereas daytime usage is more flexible. This supports the recommendation for UiTM platforms to implement automatic theme switching.

There were suggestions from several students who suggested using time-based modes to adapt the user experience to changing environmental conditions. All three experts interviewed agreed that this idea was a good move. Expert 1 thought that during the day, a light background was more suitable because the environment was brighter, making it easier to read and reducing eye strain. However, at night, a dark background was more advisable because it could reduce glare and strain on the more sensitive eyes due to low ambient light.

Expert 2 agreed with this proposal, adding that switching between light and dark modes could benefit users who were drowsy or bored, as dark mode was regarded more comfortable to use in a calmer atmosphere or at night. Meanwhile, Expert 3 agreed with the concept of employing time-based modes, but emphasized that the effect of dark and light modes during the day varied according to the individual. Factors like natural lighting around the user might alter the user experience, with some people preferring dark mode even throughout the day owing to sunshine.

4.5.7 Challenges in Developing Dark Mode from Psychological and Technical Perspectives.

In developing a dark mode, there are several challenges that need to be addressed from both a psychological and technical perspective. Expert 1 says that the biggest problem is color blending, as using dark mode can cause visual alterations to information, such as text or images, affecting the overall user experience. This makes selecting the proper hue critical to ensuring eye comfort while not interfering with user understanding.

Expert 2 emphasizes the aspect of accessibility, which is often an issue in dark mode. Sometimes, icons or other elements on the user interface can be less clear or difficult to see, causing users to experience difficulties. Therefore, thorough accessibility testing needs to be conducted to ensure that the design is accessible to all groups of users regardless of special needs. Expert 3 states that the main challenge is meeting the needs of different users. Each user has unique experiences and preferences, and therefore, one Quality Analyst alone is not enough to represent the entire population. This puts pressure on developers to understand and balance various user perspectives when developing an effective and inclusive dark mode.

i) **Color Blending (Expert 2):** It is difficult to maintain brand identity and visual hierarchy because "content may shift in appearance" when colors are darkened.

ii) **Accessibility (Expert 1):** A critical challenge is ensuring icons and interactive elements remain visible. Expert 1 emphasized the need for "disability testing" to ensure contrast ratios meet accessibility standards.

iii) **Testing Bias (Expert 3):** Expert 3 highlighted the risk of bias, noting that "if only one tester evaluates the dark mode, their feedback may not represent all users' needs."

4.5.8 Adding More Modes

When asked about providing a "slider" for users to manually adjust contrast, all experts rejected the idea, citing performance issues and complexity.

"Not a good idea. It would impact app performance and add unnecessary complexity." – (Expert 2)

Instead, they proposed a specific alternative: Grey Mode. Both Expert 2 and Expert 3 suggested a "middle-ground" mode. Expert 1 alternatively suggested "High Contrast" and "Low Contrast" toggles, which are standard accessibility features, rather than infinite customization.

All three experts contacted disagreed with the notion to allow users to freely modify dark and light modes. Expert 1 stated that introducing this mode customization capability might have an impact on application performance, particularly when the user is presented with too many alternatives. He also underlined that flexible mode options are not a top priority in program development because they have little impact on the

overall user experience. Expert 2, on the other hand, recognized that including too many mode options would make the application more difficult and less user-friendly. With too many options, users may become confused or have difficulties picking on the mode that best meets their needs, thereby affecting the application's operation. Expert 3 had a similar view, stating that providing too many mode choices is not a practical move as it can be overwhelming for the user. According to him, simplicity is the key to developing effective and user-friendly applications.

Rather than employing variable dark and light settings, these experts proposed numerous more practical methods. Expert 1 proposed the establishment of a gray mode as an alternative to dark and light settings. This setting is considered as a means to establish a better balance, providing users with a more comfortable option that is neither too bright nor too dark. Expert 2 also proposed that programs have both high and low contrast options inside each setting. This could help increase accessibility for users with vision issues, such as those who are color blind or have difficulties discriminating between colors. Expert 3 suggested designing a gray mode as a flexible middle alternative that would be acceptable to most users while maintaining application performance and functionality. All of these suggestions show that while flexible adjustment of dark and light modes is not an ideal option, there are simpler and more effective solutions to meet the needs of users with different backgrounds and preferences.

4.5.9 Expert Opinions on Dark Mode Becoming the Standard Without Light Mode

The experts strongly advised against eliminating Light Mode entirely. Expert 2 argued that Light Mode is essential for older demographics.

"Disagree. Light mode is still necessary, especially for older users who tend to prefer it." – (Expert 2)

Expert 1 provided a specific demographic boundary, agreeing that Dark Mode could be the standard "only for users under 35," but noting that older PhD students or staff would struggle without Light Mode. This reinforces the need for choice rather than a single enforced standard.

When asked about the possibility of making dark mode the standard, the experts had different opinions. Expert 1 and Expert 3 disagreed with this idea because they believed that light mode was still very much needed in some contexts, especially

for older people. They suggested that light mode was more suited to this group since strong light allows them to see more clearly, particularly for those who may have vision difficulties. Furthermore, in some applications, such as educational or professional ones, light mode may be more appropriate to ensure that the text is easier to read without interruptions. Expert 2, on the other hand, believes that dark mode may become the norm, but only for younger users, particularly those under 35 years old, who are more inclined to value aesthetics and visual comfort. He did, however, underline that demographic aspects should be considered when developing programs for elderly individuals. Older users may prefer light mode because it provides higher contrast and is easier to read. These different views indicate that the choice of the appropriate mode actually depends on various factors, including age and the purpose of using the application.

4.5.10 Additional Features or Functions to Make Dark Mode and Light Mode More User-Friendly.

To improve the user experience, the experts suggested specific enhancements. Expert 2 recommended "vivid colors or built-in filters," while Expert 3 focused on moderation:

"Keeping both modes moderate—dark mode should not be too dark (pitch black), and light mode should not be excessively bright." – (Expert 3)

To make dark and light modes more user-friendly, several suggestions were given by experts. Expert 1 suggested variations in color options such as "Vivid" which is the selection of warm to cold mode or the addition of filters such as editing images on the screen to reduce eye strain. This addition, according to him, can give users the flexibility to customize their visual experience according to their needs and comfort. Expert 2, on the other hand, emphasized that improvements in dark and light modes should depend on the needs of the user and the target audience of the application itself. For example, applications targeted at professionals may require different features than social or entertainment applications. Expert 3 suggested that the dark mode should not be too dark, and the light mode should not be too bright. He emphasized that a good balance between brightness and darkness is important so that users feel more comfortable and are not prone to eye strain. All these suggestions show that to improve the user experience, dark and light modes need to be adjusted to various factors, including individual needs and the type of application used.

4.5.11 Expert Opinions on Dark Mode and Light Mode in the Context of Education

Finally, specialists in the field of education concur that the decision between dark and light modes can have a substantial impact on how pupils learn. Expert 1 says that the current generation is more focused on appealing and user-friendly UIs, which may influence their motivation in learning. Applications with a design that meets their visual preferences, such as dark mode, can boost their engagement and focus while learning. Expert 2 discusses his experience designing e-learning apps, where many users, particularly students, request that a dark mode function be included because it is thought to be more appealing and less taxing on the eyes when studying for extended periods. Expert 3 provides a more balanced perspective. He agrees that dark mode can be beneficial, especially at night or in low-light environments, but he also emphasizes that light mode is more suitable for learning materials, as it is clearer and easier to read. Therefore, light mode still plays an important role in the context of education, especially when it comes to texts that need to be read clearly and focused for a long time.

"The younger generation is more particular about UI aesthetics. A visually appealing interface may increase engagement, while a poorly designed UI could reduce interest in learning." – (Expert 2)

However, Expert 3 provided a necessary caution, stating that "Light mode remains preferable for readability," suggesting that for heavy text-based learning, Light Mode may still offer superior legibility.

4.6 Conclusion

In this chapter, data obtained from a survey involving 30 students among higher education students at UiTM were analyzed. Demographic factors are also essential in this study because gender is one of the variables to be analyzed. This is to determine whether or not the gender-UIUX theory is correct. Based on the demographics of the respondents, the majority of the respondents were from students aged between 21 and 25 years old with a balanced gender distribution between men and women. The majority of the respondents were students from the Faculty of Applied Sciences. The students involved consisted of those who use primary devices such as smartphones (90%), followed by laptops and tablets. In addition, the use of dark mode was more dominant with 83.3% of the respondents choosing this mode compared to

light mode which was only chosen by 6.7%. This shows that dark mode is the preferred mode nowadays, especially among students who use digital devices for learning purposes.

One of the most important aspects influencing display mode selection is eye comfort, with 80% of respondents believing that dark mode is more eye friendly. This is in line with the views of UI/UX experts who state that dark mode can reduce eye strain and glare, especially when used for long periods of time. Aesthetic factors also play a role in the choice of display mode, with dark mode considered to be more visually appealing. However, some users also change modes according to the time of day and environmental conditions, such as using light mode during the day and dark mode at night for better eye comfort. Kim et al. (2019) found that when participants used dark mode instead of light mode, their visual tiredness levels were much lower. This finding is consistent with prior research, which demonstrated that dark mode could minimize eye strain, particularly in low-light conditions. In an experiment conducted by Jubina Pathari et al. (2024)it was found that eye fatigue tended to be lower when the display used negative polarity compared to positive polarity. This finding was consistent across all participants involved in the study, indicating that dark mode has the potential to reduce eye strain more effectively than bright mode. In addition, this study also found that the participants' choice of dark mode was due to the visual comfort factor, which was their main priority. This shows that the eye comfort aspect plays an important role in determining users' choice of display mode, in line with the findings of previous experiments that emphasized the benefits of dark mode in reducing visual discomfort during prolonged screen use.

Although experts have differing viewpoints on battery performance, the majority agree that dark mode can assist save energy, particularly on OLED panels, albeit it is not a high focus in UI/UX development. However, the choice of display mode has an impact on focus during studying, with most experts suggesting that dark mode can assist reduce distractions and improve concentration, particularly in darker situations. However, another viewpoint holds that personal factors, such as fatigue level, have a bigger influence on focus than the mode used.

The primary development hurdles in designing a dark mode are color balancing and accessibility requirements to ensure that all items in the interface can be easily viewed without interfering with the user experience. Furthermore, experts urge

that the display mode system be provided flexibility over time, such as suggesting mode changes based on time of day and night, in order to improve the user experience. Although there are suggestions to add more modes such as gray or high contrast mode, most experts believe that too many options can complicate the user and degrade the application's performance. Therefore, it is necessary for every UIUX designer to do more research on their target audience so that the UI designer meets the user's taste and comfort.

Finally, while dark mode is growing more popular, there is no significant consensus on making it the exclusive norm in applications. Experts believe that light mode is still useful in certain situations, particularly for older people or in applications that demand clear and bright text reading. In the context of education, dark mode should be adopted in all apps and digital platforms to make them more appealing to students and, to some extent, boost their attention and concentrate while studying. Therefore, UI/UX designers need to pay attention to the needs of various users and usage contexts in determining the most appropriate display mode. It is worth noting that the survey and interviews in this study were conducted to obtain the views of students and experts in the field of UIUX. This study did not involve any health experts, so each opinion cannot be used as a reference for any health problem. Overall, this study shows that both dark and light modes have their own advantages and disadvantages, and their implementation should take into account factors such as eye comfort, usage context, and individual user characteristics.

CHAPTER 5
CONCLUSION

5.1 Introduction

This study aims to examine user preferences between dark mode and light mode among students of higher education institutions, particularly at UiTM Shah Alam. With the development of technology and the increasing use of digital devices, display modes play an important role in user experience. Therefore, this study focuses on how each mode affects eye comfort, readability, cognitive load, and user satisfaction.

A qualitative approach was used in this study, involving two main methods, namely surveys and interviews. A total of 30 UiTM Shah Alam students were selected as respondents for the survey, while three experts in the field of UI/UX were also interviewed to gain a deeper perspective. The data obtained from these two methods were analyzed to identify user preferences towards dark mode and light mode.

In addition, demographic factors such as age, gender, and academic background were also taken into account in the analysis. This aims to understand whether there is a certain pattern in the selection of display modes based on these factors. This is also intended to validate several theories. By combining the findings from the surveys and interviews, this study can provide a comprehensive picture of user preferences in choosing between dark mode and light mode.

The results of this study are expected to provide guidance to UI/UX designers and educational institutions in developing more user-friendly interfaces. By taking into account user comfort and preferences, more suitable interface designs can be produced to enhance students' experiences in digital learning environments.

5.2 Student Preference of Dark Mode and Light Mode Interface

This study has identified several key findings regarding display mode choices among UiTM Shah Alam students. Based on survey and interview analysis, factors such as eye comfort, focus and learning efficiency, user demographics, and the need for flexibility in mode selection play an important role in determining the preference for

dark mode or light mode. These findings provide a clear picture of user preferences and can be a reference for UI/UX designers in developing more user-friendly interfaces.

5.2.1 Mode Choice Based on Eye Comfort

One of the main factors influencing display mode choices is the level of eye comfort. The majority of students stated that they were more likely to choose dark mode, especially when using the device in low-light conditions. Dark mode was found to reduce glare from the screen and reduce eye strain, making it the top choice for students who often use the device at night or in poorly lit environments.

However, in the context of longer reading, such as reading academic articles or lecture notes, many students felt that light mode was more suitable. A bright background with dark text was found to be easier to read, especially for materials containing long text. This shows that the choice of mode depends not only on eye comfort, but also on the type of content being read and the duration of use.

5.2.2 Impact on Focus and Learning Efficiency

Apart from eye comfort, display mode also plays an important role in determining the level of focus and efficiency in learning. The results of the study showed that students who use dark mode tend to spend more time in front of the screen without experiencing significant fatigue. This may be due to the lower screen brightness level in dark mode, which is able to reduce visual stress and allow users to focus for a longer period of time. Furthermore, darker background colors can reduce glare, thus helping users maintain their visual endurance while reading or doing tasks.

On the other hand, bright mode was discovered to be more helpful in enhancing focus, particularly in bright learning situations. Bright backgrounds and great text-to-background contrast make it easier for consumers to capture the content being read. This indirectly contributes to enhancing information processing speed and minimizing cognitive fatigue. As a result, selecting the right mode is determined by the context of use and the individual's needs for adjusting to their learning environment. For some people, adjusting both modes based on natural illumination conditions may be a more practical way to improve the overall learning experience.

5.2.3 Influence of Demographic Factors

Demographic factors also play a role in shaping users' preferences for dark mode or light mode. Based on the survey findings, there is no significant difference in

mode selection between genders, as both male and female students generally prefer dark mode. Additionally, the widespread use of dark mode in video game applications and design software may contribute to this preference, as users become more accustomed to its visual aesthetics and functionality.

In addition, age factors also influence mode selection. Younger students, especially those in the 18 to 20 age group, were found to be more flexible in switching between the two modes according to the situation. They are more open to adjusting the display mode according to the lighting conditions and the type of activity being performed. This flexibility indicates that the younger generation is more likely to tailor their digital experience according to current needs. Younger users also choose modes according to trends and they feel they are more beautiful.

5.2.4 The Importance of Flexibility in Mode Selection

In addition to eye comfort, focus, and demographic factors, flexibility in mode selection was also identified as an important aspect of the user experience. Respondents highlighted that the ability to automatically switch between modes according to lighting conditions is a very useful feature. For example, if the user is in a bright environment, the screen automatically switches to bright mode, while in low-light conditions, dark mode is activated. Such a feature not only improves user comfort but also helps in reducing eye strain without the need for manual switching.

The study findings also show that more flexible mode options can improve the user experience in the long run. Students who frequently use digital devices in a variety of situations, whether for learning, entertainment, or work, appreciate the ability to customize the interface according to their needs. Therefore, providing mode options that can be customized according to the user's situation

5.3 Implication of Study

The findings of this research extend far beyond theoretical debates on UI preferences, offering critical practical implications at four distinct levels: the user level, the institutional level, the industry level, and the policy level.

5.3.1 User Level

For the primary end-user—the student—the implications of this study are directly tied to physiological well-being and academic sustainability. By understanding the correct usage and limitations of display modes, students can significantly reduce the

risk of developing Computer Vision Syndrome. The findings imply that students must be educated on the fact that while Dark Mode is excellent for reducing glare in low-light environments, Light Mode often remains superior for reading long-form academic texts during the day to ensure optimal information retention. Empowering students with this knowledge allows them to make informed decisions that protect their vision and enhance their learning capabilities.

The results of this study prove that flexibility in interaction is actually the key to learning efficiency. When students are given full control over the interface (such as choosing Dark or Light Mode), they can adapt their digital environment to their own contextual needs. In line with expert feedback from Hasif and Hanif, this feature is not just aesthetic, but is a critical function for 'User Control and Freedom'. Technically, this capability helps reduce glare and visual fatigue, while ensuring that students' focus or 'cognitive load' remains focused on the learning content without technical distractions from screen lighting.

5.3.2 Institutional Level (UiTM Platform)

At the institutional level, the results carry significant weight for the digital infrastructure of Universiti Teknologi MARA (UiTM). With a substantial majority of students (approximately 80%) demonstrating a strong preference for Dark Mode, there is a clear imperative for the university to upgrade its digital ecosystems, such as the Student Portal and UFuture platforms. The implication is that Learning Management Systems (LMS) must offer a native, easily accessible Dark Mode toggle. Furthermore, the development of these platforms should adhere to clean and minimalist design principles, which prioritize essential functionality by eliminating visual distractions, thereby streamlining the user experience and enhancing cognitive focus (Santoso, 2024). This ensures that students can navigate academic content more effectively without being hindered by unnecessary interface complexity. Failure to accommodate this preference may result in lower student engagement durations on these platforms due to visual discomfort, potentially affecting their overall academic interaction.

5.3.3 Industry/Monetary Level (Cost and Development)

For software developers and the UI/UX industry, the implication is largely economic and operational. Implementing a high-quality dual-mode interface inevitably increases development time and testing costs, as designers must rigorously check

contrast ratios and asset visibility for both modes. However, the existence of the "Preference Paradox" suggests that investing in Dark Mode is no longer an optional luxury but a mandatory market requirement. Applications that fail to provide this feature risk losing a significant portion of their user base to competitors who prioritize visual ergonomics, directly impacting the commercial success and user retention rates of the software.

5.3.4 Policy Level (Digital Health Guidelines)

Finally, on a broader policy level, this study advocates for the formal inclusion of "Digital Wellbeing" guidelines within the university's academic framework. The findings suggest that academic policies should encourage lecturers and content creators to design teaching materials—such as slide presentations and lecture notes—that are compatible with both display modes. For instance, policies could mandate the use of backgrounds and fonts that remain legible regardless of the student's interface choice. This ensures that educational content remains accessible and inclusive for all students, aligning with global standards for digital accessibility.

5.4 Implications for UI/UX

The study's conclusions have significant implications for UI and UX design. The findings demonstrate that the decision between dark and bright modes is influenced not just by aesthetic considerations, but also by usability, visual comfort, and environmental compatibility. As a result, a more dynamic and flexible UI/UX design approach must be considered in order to provide a better and more inclusive user experience.

Among the key aspects that need attention include the need for adaptive design that allows users to automatically change display modes according to the ambient lighting. In addition, digital accessibility should also be strengthened by providing a wider range of customization options to meet the needs of different users, including individuals with vision problems. In addition, the continuity between UI/UX design and user satisfaction levels should be emphasized, because a comfortable visual experience can increase productivity and reduce eye fatigue. Therefore, a user-centered design approach is an important element that needs to be implemented to ensure that each individual gets a more friendly and efficient user experience.

In addition, this study also provides room for improving the limitations of existing Adaptive User Interfaces (UI) which usually only rely on time-based triggers. The results of qualitative interviews with Expert 3 (Ayed) show that a more effective adaptive model needs to prioritize the aspects of 'Visual Moderation' and 'Content-Aware' over random mode switching. The main problem with the current system is the failure to detect the type of content; therefore, this study suggests that the UI intelligently switches to Light Mode for dense text reading to maintain legibility, while Dark Mode is maintained for navigation and multimedia to maintain eye comfort. By integrating ambient light sensors with specific task parameters, developers can produce UIs that are more ergonomic and responsive to the physiological and academic needs of students.

5.4.1 Adaptive Design Needs

In the context of modern UI/UX, adaptive design plays an important role in improving user experience. Based on the results of the study, it was found that students have different tendencies towards dark mode and light mode depending on the ambient lighting conditions and the type of activity being performed. Therefore, providing an automatic mode feature that can adjust the background and text colors based on ambient lighting is an approach that can improve overall user comfort.

One of the proposals that can be implemented is the development of "Adaptive UI", an interface that can intuitively switch between light and dark modes according to the user's environmental conditions. Technologies such as light sensors that detect ambient lighting and machine learning algorithms can be used to automatically adjust the display mode. With a system that can act adaptively, users do not need to manually change modes, thus reducing cognitive load and increasing efficiency of use.

In addition, the need for this adaptive design can also be extended to flexibility in the selection of themes and colors. For example, some users may have a preference for certain colors that are more comfortable for their eyes. Therefore, allowing users to adjust the background and text colors according to individual needs can increase their level of satisfaction with the interface used.

5.4.2 Implications for Digital Accessibility

Digital accessibility is an important aspect of UI/UX design, especially for users with vision problems or special needs. The study findings show that the contrast between text and background plays an important role in determining user readability and comfort. Therefore, in developing an inclusive interface, factors such as contrast level, text size, and font type need to be considered so that it can meet the needs of various categories of users.

For example, individuals with vision problems such as nearsightedness or color blindness may have difficulty reading text in dark mode if the contrast is not sufficient. In this case, providing the option to manually adjust the contrast level can help them get better user experience. Similarly, users with high sensitivity to light may be more comfortable using dark mode in most situations. Therefore, ensuring that each mode has appropriate contrast adjustment options is a step that can improve digital accessibility.

Apart from the readability aspect, additional features such as "text-to-speech" or "high contrast mode" can also help users with special needs. This not only improves the usability of the system but also ensures that the developed UI can be used by all groups without any technical barriers.

5.4.3 Continuity Between UI/UX Design and User Satisfaction

The results of this study also prove that the choice between dark and light mode is not just a matter of aesthetics, but more of usability in different contexts. Students choose a mode based on factors such as eye comfort, focus, and learning needs, which shows that UI/UX elements have a direct impact on the level of user satisfaction. Therefore, UI/UX designers need to ensure that the resulting interface not only follows current trends but is also user-friendly based on empirical evidence.

In some applications or platforms, dark and light mode options are only provided as a side feature without considering the actual effectiveness for users. This causes some users to experience difficulties when using certain modes in inappropriate situations. Therefore, a more research-based approach, such as testing the effectiveness of each mode in various usage situations, needs to be done to ensure better user experience.

Furthermore, the balance between aesthetics and functionality should be paid attention to in UI/UX development. For example, some modern designs may emphasize

visual appeal, but neglect readability or user comfort. Therefore, in ensuring continuity between UI/UX design and user satisfaction, ergonomics, color psychology, and user needs need to be taken into account at every stage of design.

5.4.4 User-Centered Design (UCD)

User-Centered Design (UCD) is an increasingly important approach in modern UI/UX development. The findings of this study show that students have different needs in selecting display modes, depending on their situations and preferences. Therefore, the resulting UI needs to provide users with more dynamic options in adjusting modes based on their needs.

One way to apply UCD principles in UI design is to provide more interactive options in adjusting display modes. For example, in addition to the option to switch between dark and light modes, users can also be given control to adjust brightness levels, color temperature, and color schemes according to their preferences. With this flexibility, users can customize the interface according to individual needs, thus increasing their level of satisfaction with the system used.

In addition, ongoing research needs to be conducted to understand user needs in a broader context. Field studies, usability testing, and feedback from real users can be used to evaluate the effectiveness of a UI/UX design in improving user experience. By adopting a user-centered design approach, UI/UX designers can create interfaces that are more intuitive, flexible, and easy to use in various situations.

5.4.5 Conclusion

Overall, this study shows that the choice of display mode in UI/UX is not just a technical or aesthetic issue, but also involves various factors such as eye comfort, focus, learning effectiveness, and accessibility needs. Therefore, developing a more adaptive, accessible, and user-centered UI based on user-centered design principles is crucial in ensuring a better user experience. By taking into account the findings of this study, UI/UX designers and educational institutions can develop more user-friendly systems, while supporting the growing needs of digital learning.

In conclusion, this study emphasizes that the choice between dark mode and light mode is not just a matter of aesthetics, but also involves aspects of usability, visual comfort, and compatibility with the environment. Therefore, a more flexible and dynamic UI/UX design approach is needed to improve the user experience.

The need for adaptive design is one of the main factors in ensuring that users can automatically change display modes according to the ambient lighting, thus reducing cognitive load and increasing efficiency of use. In addition, digital accessibility also needs to be improved by providing more customization options, such as contrast control and text size, to meet the needs of various categories of users, including individuals with vision problems.

At the same time, the continuity between UI/UX design and user satisfaction levels should be paid attention to because good visual comfort can improve focus and reduce eye fatigue. Therefore, user-centered design (User-Centered Design, UCD) needs to be applied by providing more interactive control in the selection of display modes, including brightness levels and color temperature. By prioritizing these elements, UI/UX design can be more intuitive, user-friendly, and effective in various usage situations.

5.5 Challenges in Actual Implementation

While this study demonstrates that consumers prefer dark mode and that numerous factors influence their selection, adopting it in a real-world scenario is not easy. Several important problems must be addressed, including the possibility of increased development costs if the present system is not designed to accommodate both display modes. In addition, technical requirements such as customizing UI elements, selecting appropriate colors, and thorough testing to ensure readability and a consistent user experience are also aspects that cannot be ignored. From an accessibility perspective, not all users benefit from dark mode, especially those with certain vision problems. As a result, display settings must be flexible in order to provide the best possible experience to all user groups. Furthermore, psychological considerations come into play, with some users preferring light mode in certain scenarios, such as reading long texts or working in a bright setting. Collaboration among UI/UX designers, software developers, and other stakeholders is critical to ensure that dark mode is implemented thoroughly and efficiently. This procedure is more than just altering the background color; it necessitates a more comprehensive strategy to ensure that each change made actually improves the user while preserving the functionality and aesthetics of the original design.

5.5.1 Cost and Technical Resource Implications

The possibility of expensive development expenses is one of the biggest obstacles to adopting a full-scale dark mode, especially for platforms or systems that weren't built to support it in the first place. In order to maintain consistency in usability and aesthetics, customization involves altering certain UI components in addition to changing the background and text colors. In addition, substantial testing is required to verify that the dark mode functions properly without harming the user experience. This procedure has numerous steps, including accessibility testing, color contrast modifications, and an examination of the influence on user eyestrain. All of this takes time and money, making establishing a dark mode difficult, particularly for enterprises with limited budgets or small development teams.

5.5.2 Compatibility with Existing Designs

Not all systems or programs are designed with the ability to handle dark modes. Many UI components, such as icons, images, and pictures, are created primarily for bright backdrops, rendering them ineffective or impossible to view when dark mode is set. Changes to the color palette need extensive study to ensure that each visual element stays clear and useful without jeopardizing readability or design aesthetics. Adapting the UI to accommodate dark mode might be a difficult task for extensively used outdated systems. This procedure not only includes altering the source code, but it also necessitates an evaluation of user interaction to ensure that any changes do not disrupt established workflows. As a result, dark mode implementation must be handled carefully, particularly for platforms that have been in use for a long time and have a large user base.

5.5.3 Accessibility Issues

Not every user benefits equally from dark mode, despite the fact that it is frequently linked to less eye strain and improved visual comfort. Some people may find it difficult to read in dark mode because of the lack of contrast, particularly those who have visual issues like astigmatism or color blindness. Software developers must provide users with more tools to overcome this obstacle, including manual controls to change contrast levels or the ability to personalize colors to suit individual preferences. To guarantee a more inclusive user experience, these modifications necessitate greater work in system development and thorough accessibility testing.

5.5.4 Consistence of User Experience

It can be difficult to maintain a consistent user experience between dark and bright modes on platforms that span several apps or systems. When moving between platforms, users could notice visual discrepancies if just a portion of apps or websites support dark mode. In addition to decreasing dark mode's usefulness, this can also make users who are used to a consistent user interface feel confused and uneasy. Furthermore, dark mode customization must be done carefully in an ecosystem that includes a variety of devices, including laptops, smartphones, and tablets, to guarantee that the user experience is consistent across all platforms. Users may feel uneasy and decide not to utilize dark mode if different programs or systems implement it differently. As a result, creating a successful dark mode necessitates a comprehensive strategy in which the user interface design is uniform across all platforms and devices.

5.5.5 Requirements for Collaboration with Software Developers

Software developers and UI/UX designers must work closely together to tackle the issues raised. This is due to the fact that introducing dark mode necessitates both design and technology adjustments rather than only cosmetic modification. Therefore, to guarantee a balance between aesthetics, accessibility, and user experience, a comprehensive conversation between stakeholders is necessary. To properly enable dark mode, significant modifications to the source code or system architecture may be necessary. This necessitates a significant investment of time and money, as well as a defined approach during the development stage. As a result, the efficient implementation of dark mode requires not only a thorough understanding of user demands, but also meticulous technological preparation to ensure that it is done correctly and benefits all users.

5.6 Research Contribution

This research contributes significantly to understanding the function of light and dark modes in modern UI/UX design, particularly in higher education. By assessing user preferences based on eye comfort, learning focus, and readability, this study demonstrated that display mode selection is more than just an aesthetic consideration; it also affects the total user experience. As a result, the findings of this study might serve as a valuable resource for UI/UX designers as they work to create interfaces that are more intuitive, flexible, and sensitive to user needs.

In the context of the digital design industry, this study provides empirical data that UI/UX designers can use to understand user preferences in more depth. With a clear reference on the impact of display modes on comfort and effectiveness of use, application and website developers can make more informed decisions in producing user-friendly interfaces. This includes integrating automatic mode switching features, adjusting text and background contrast according to user needs, and providing a wider choice in display mode customization.

In addition, this study also provides benefits to higher education institutions, especially in determining the use of more user-friendly digital technologies to support online learning. With the increasing number of digital learning platforms used by students today, understanding user preferences for dark and light modes can help educational institutions develop more comfortable systems for students. For example, e-learning platforms can provide more flexible mode options to ensure a more comfortable learning experience and reduce eye fatigue due to prolonged screen use.

The contribution of this study can also help improve the quality of the overall digital learning environment. By providing guidance to UI designers and educational institutions, the use of more appropriate display modes can help reduce the problems faced by students and can also improve their learning effectiveness. In addition, a deeper understanding of the effects of mode use on students can also help in formulating more effective policies or guidelines in managing the use of digital technology in education.

Overall, this study not only contributes to the progress and benefits of the UI/UX field but also has broader implications in the aspects of educational technology and the well-being of digital users. By applying the findings of this study in designing digital interfaces, the user experience can be improved, thus providing benefits to various parties including UI/UX designers, educational institutions, and end users.

5.7 Research Limitation

Although this study provides useful information about user preferences for dark and light modes among higher education students, certain limitations should be acknowledged. One of the study's key constraints is that it is only open to UiTM Shah Alam students. Since the study respondents only involved students from one institution, the results obtained may not be generalizable to students from other universities,

especially those pursuing different academic fields or in different learning environments.

In addition, this study does not take into account external factors that could potentially influence user preferences for display modes, such as cultural background, screen usage habits, and device specifications used. For example, students who frequently use devices with OLED panels may be more likely to choose dark mode to save battery life than those who use LCD screens. Similarly, students from different countries or cultures may have distinct visual preferences for screen colors and lighting due to psychological and physiological considerations. Furthermore, this study did not look at long-term implications, such as how user preferences for display modes may alter depending on the context of use or sustained exposure. As a result, the findings of this study should be viewed with caution and not as representative of all higher education students. However, these findings provide a helpful starting point and can be utilized to inform larger, more diverse investigations.

The limitations of Chapter 2, which is the literature review, also affect a more comprehensive understanding of user preferences for dark and light modes. One of the main challenges identified is the existence of conflicting results from previous studies. The differences in the findings of this study indicate that user preferences for display modes are subjective and influenced by various individual factors. Therefore, it is difficult to establish universal UI guidelines because user preferences cannot be fully standardized. This situation makes it difficult for UI designers to formulate an approach that can meet the needs of all users without causing certain compromises. In addition, this literature review is also limited to short-term research that does not include longitudinal studies. Most of the studies referenced are more focused on experiments and surveys over a short period of time, making the understanding of the long-term effects of using dark and light modes still not clear enough. This means that aspects such as how user preferences may change over time or how prolonged exposure to a display mode can affect user comfort and efficiency cannot be accurately determined.

In addition, this literature review focuses more on the field of education and does not pay close attention to health implications. While some studies focus on cognitive load, the majority of the research cited does not particularly investigate the influence of UI choices on eye health or the level of visual fatigue experienced by users over time. As a result, the relationship between display modes and health conditions

that may impact student productivity and learning effectiveness cannot be thoroughly established. Overall, these constraints suggest that more research is needed, particularly to better understand how long-term use of display modes affects user experience, visual comfort, and academic and cognitive performance. More in-depth research is required to acquire a more complete understanding of the benefits and drawbacks of each display mode in a larger context.

In Chapter 4, which covers data analysis, many constraints must be acknowledged to ensure that the study conclusions are taken with caution. One of the most significant drawbacks is the use of theme analysis, which is based on study participants' and experts' judgments. This method, although useful in identifying patterns and themes in the data collected, is still at risk of being influenced by the researcher's subjectivity in interpreting the information obtained. Since the interpretation of data depends on the perspective of the individuals involved, there is a possibility of bias in analysing and drawing conclusions from the data obtained.

In addition, environmental factors that can affect user choices are not taken into account in this analysis. For example, the brightness level of the screen, the type of device used, and the ambient lighting conditions can affect a person's comfort and preference in choosing between dark and bright modes. Users who operate in low-light circumstances may prefer dark mode, whereas those who work in bright environments are more likely to choose bright mode. Similarly, variances in device screen specs, such as OLED or LCD technology, can create distinct visual experiences and influence consumer preferences. Because of these limitations, the study's findings should be regarded with caution and not considered representative of all users in all circumstances. While the analysis provides a general picture of user preferences, additional research that considers ambient elements and technological features may yield more thorough and accurate results.

Also, for your information, this study includes UI improvement ideas based on qualitative findings, but they have not been tested in the context of real use. This implies that, while the analysis results provide a clear picture of user preferences and proclivities toward dark and light modes, the efficacy of the suggestions has yet to be empirically tested. Since this study does not include practical tests or more in-depth case studies of the proposed UI prototypes, the level of effectiveness and usability of the recommended improvements is still theoretical.

In addition, the sample scope in this study is limited to UiTM Shah Alam students, who may not represent the wider user population. Factors such as the usage environment, the device utilized, and other demographic backgrounds can all have an impact on how users perceive and interact with various interfaces. Therefore, the conclusions of this study should be regarded with caution, especially if they are to be used in a larger context. To improve the accuracy of the study results, future research could broaden the sample breadth by include users from various institutions or professional backgrounds. Furthermore, more detailed research methods, such as controlled studies or user testing in real-world settings, can be used to assess the direct impact of the UI ideas offered. With a more thorough set of approaches, the study's findings can provide more accurate and practical direction for building UI enhancements that are actually effective and relevant to user needs.

5.8 Novelty of Research

This study introduces a new perspective in understanding how users, especially students of higher education institutions, choose between dark and light modes in the use of digital interfaces. In contrast to previous studies that focused more on technical analysis or general user preferences, this study took a qualitative approach by combining findings from student surveys and professional views in the field of UI/UX. This allowed this study to offer a deeper understanding of how psychological and physiological factors influence users' decisions in choosing a display mode that suits their needs.

The uniqueness of this study also lies in its holistic approach that balances the aspects of comfort, readability, and effectiveness of using digital interfaces. By analyzing the responses of students and UI/UX experts, this study proves that the choice of display mode does not only depend on aesthetic factors alone, but is also influenced by the level of lighting, cognitive load, and overall user experience. Therefore, the findings of this study not only provide useful information to UI/UX designers but also to educational institutions in planning more user-friendly digital experiences.

Furthermore, this is the first study that combines the perspectives of users and experts in assessing the balance between design and functionality in UI/UX. Most previous research has focused on only one perspective, either from the user or the designer, but this study connects both groups to obtain a more comprehensive picture.

In this way, this study not only contributes to the enrichment of the existing literature but also opens up space for further research in the field of designing digital interfaces that are more adaptive and responsive to the needs of real users.

5.9 Conclusions

This study proves that there is no single display mode that can be considered the best choice for all users. Instead, the effectiveness of dark mode and light mode depends entirely on the context of use and individual needs. Among students in higher education institutions, dark mode tends to be used in low-light conditions because it can reduce eye strain and provide a more comfortable experience when staring at the screen for long periods. On the other hand, light mode is preferred in environments with bright lighting, especially for activities such as reading long texts, as the high contrast between the text and the background helps improve readability.

Apart from the lighting factor, this study also identified that demographic factors play a role in determining user preferences towards display modes. Younger people are more likely to use dark mode than older people. Younger students show a higher level of flexibility in switching between the two modes according to the current situation and needs. However, this study cannot prove several theories that say men are more inclined to dark mode while women are more inclined to light mode. This is because, men and women mostly choose dark mode due to several factors such as eye comfort and health.

The findings of this study have important implications for the field of UI/UX, especially in designing more user-friendly interfaces. UI/UX designers should not rely solely on current trends or personal preferences in determining the best display mode choice. Instead, designs should take into account factors such as eye comfort, color contrast, and different user needs. More flexible interface customization, such as features to automatically change modes according to ambient lighting or giving users full control to adjust the display mode according to their comfort, can improve the overall user experience.

In addition, the results of this study can also be used as a guide for educational institutions in providing more effective digital experiences for students. With the increasing use of digital learning platforms, understanding how display modes affect user comfort and focus has become increasingly important. Educational institutions can

take the initiative by ensuring that their systems offer dark and light mode options so that students can choose the mode that is most suitable for them. This step can not only increase student engagement in digital learning but also help reduce the negative effects of screen use in the long term.

Overall, this study provides a deeper understanding of the role of dark and light modes in UI/UX and how they affect the user experience. With these findings, it is hoped that more digital applications and platforms will take a more adaptive approach to their UI design. This approach will not only improve user comfort but also improve the efficiency of using digital interfaces in various contexts. Therefore, this study is not only relevant to UI/UX designers but also to software developers, educational institutions, and researchers in the fields of technology and human-computer interaction.

5.10 Recommendation for Future Research

Based on the findings of this study, future research can focus on evaluating the effectiveness of adaptive modes that can automatically change according to the ambient lighting. This feature consists of a dark mode that will gradually change to a bright mode. This feature has the potential to improve user comfort because it can adapt the digital interface to the surrounding conditions without requiring manual changes. Further research can assess the extent to which this technology can help reduce eye strain and improve the user experience in long-term use, especially in educational and work contexts.

In addition, further research can examine in more depth how psychological and physiological factors influence users' tendencies towards display mode selection. This study can assess aspects such as visual fatigue, concentration rate, and the emotional impact of users when using dark mode and bright mode in various situations. This study needs to take into account demographic background, so as to also understand the psychological and physiological factors of different demographic backgrounds. By understanding how physiological and psychological reactions differ according to individuals, UI design can be improved to be more responsive to user needs.

Future research can also be expanded to a more diverse group of users, including professional workers who rely on screens for long periods of time and mobile device users from various backgrounds. By taking into account the needs of these

groups, the study can provide a broader picture of the effectiveness of each display mode in various usage contexts. This includes the corporate sector, the creative industries, and the broader education sector.

In addition, more in-depth studies on the long-term effects of using dark and light modes on eye health could be conducted to improve UI design in the future. Research involving ophthalmologists could provide a more scientific perspective on the impact of display modes on eye fatigue and long-term risks such as computer vision syndrome. Studies should also include equal numbers of genders, to ensure that each gender experiences the same or different effects. With this information, UI/UX designers can create more user-friendly designs and reduce the risk of negative effects from prolonged screen use.

REFERENCES

Ayton, Darshini., Tsindos, Tess., & Berkovic, Danielle. (2023). *Qualitative research : A practical guide for health and social care researchers and practitioners*. Monash University Library.

Bhandari, P. (2020, June 19). *What Is Qualitative Research? | Methods & Examples*. Scribbr. https://www.scribbr.com/methodology/qualitative-research/

Bingham, A. J. (2023). From Data Management to Actionable Findings: A Five-Phase Process of Qualitative Data Analysis. *International Journal of Qualitative Methods*, *22*. https://doi.org/10.1177/16094069231183620

Brag, G., & Gulamhusein, K. (2023). *The Perception of Dark Mode on E-commerce*.

Chen, C. H., & Zhai, W. (2023). The Effects of Information Layout, Display Mode, and Gender Difference on the User Interface Design of Mobile Shopping Applications. *IEEE Access*, *11*, 47024–47039. https://doi.org/10.1109/ACCESS.2023.3274575

Dash, P., & Hu, Y. C. (2021). How much battery does dark mode save?: An accurate OLED display power profiler for modern smartphones. *MobiSys 2021 - Proceedings of the 19th Annual International Conference on Mobile Systems, Applications, and Services*, 323–335. https://doi.org/10.1145/3458864.3467682

David A, S., & Alan R, T. (2019). Survey Research. *Anesthesiology*, *130, 192–202*. https://doi.org/https://doi.org/10.1097/ALN.0000000000002436

Döringer, S. (2021). 'The problem-centred expert interview'. Combining qualitative interviewing approaches for investigating implicit expert knowledge. *International Journal of Social Research Methodology*, *24*(3), 265–278. https://doi.org/10.1080/13645579.2020.1766777

Dr. Pilyugina, S. (2023, September 21). *The Gender Health Gap: Do Women Have Worse Vision?* AGEI Blog. https://assileye.com/blog/gender-eye-health-gap/

Dunwoodie, K., Macaulay, L., & Newman, A. (2023). Qualitative interviewing in the field of work and organisational psychology: Benefits, challenges and guidelines for researchers and reviewers. *Applied Psychology*, *72*(2), 863–889. https://doi.org/10.1111/apps.12414

Eisfeld, H., & Kristallovich, F. (2020). *The Rise of Dark Mode: A qualitative study of*

an emerging user interface design trend. https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1464394&dswid=5652

Elhami, A., & Khoshnevisan, B. (2022). Conducting an Interview in Qualitative Research: The Modus Operandi. *Mextesol Journal*, *46*(1), 1–7. https://doi.org/10.61871/mj.v46n1-3

Erickson, A., Kim, K., Bruder, G., & Welch, G. F. (2020). Effects of Dark Mode Graphics on Visual Acuity and Fatigue with Virtual Reality Head-Mounted Displays. *2020 IEEE Conference on Virtual Reality and 3D User Interfaces (VR)*, 434–442. https://doi.org/10.1109/VR46266.2020.00064

Erickson, A., Kim, K., Bruder, G., Welch, G., & Welch, G. F. (2020). *Dark/Light Mode Adaptation for Graphical User Interfaces on Near-Eye Displays*. https://www.researchgate.net/publication/344955973

Erickson, A., Kim, K., Lambert, A., Bruder, G., Browne, M. P., & Welch, G. F. (2021). An Extended Analysis on the Benefits of Dark Mode User Interfaces in Optical See-Through Head-Mounted Displays. *ACM Transactions on Applied Perception*, *18*(3). https://doi.org/10.1145/3456874

Evon, A.-T., Abdelkrim, E. M., & Issam H., A. H. (2020). *Cyberspace*. Book on Demand (BoD).

Fuad, M. B. (2024). *METODOLOGI PENYELIDIKAN: Panduan Menulis Tesis* (M. D. Farah & Z. Siti Noor Aishah, Eds.; 2nd ed.). UUM Press.

Furidha, B. W. (2024). COMPREHENSION OF THE DESCRIPTIVE QUALITATIVE RESEARCH METHOD: A CRITICAL ASSESSMENT OF THE LITERATURE. *Journal Of Multidisciplinary Research*, 1–8. https://doi.org/10.56943/jmr.v2i4.443

Gao, B., Xie, H., Wang, Y., & Xie, Z. (2024). Principles of environmental and social psychology in UI/UX design for metaverse social games: A case study of Horizon Worlds. *Environment and Social Psychology*, *9*(1). https://doi.org/10.54517/esp.v9i1.1871

Harefa, N. S. K., Manik, G. K., Marpaung, I. K. Y., & Batubara, S. A. (2020). Dasar Pertimbangan Hakim terhadap Tindak Pidana Korupsi yang Dilakukan oleh Pegawai Negeri Sipil (PNS): Studi Kasus Putusan Pengadilan Negeri Medan Nomor: 73/Pid.Sus-TPK/2018/PN.Mdn. *SIGn Jurnal Hukum*, *2*(1), 30–42. https://doi.org/10.37276/sjh.v2i1.68

Hasan, S. (2020). Armchair Survey Research: A Possible Post-COVID-19 Boon in Social Science. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3720564

Hasan, T. I., Silalahi, C. I., Rumagit, R. Y., & Pratama, G. D. (2024). UI/UX Design Impact on E-Commerce Attracting Users. *Procedia Computer Science*, *245*, 1075–1082. https://doi.org/https://doi.org/10.1016/j.procs.2024.10.336

Heriyanto, H. (2018). Thematic Analysis sebagai Metode Menganalisa Data untuk Penelitian Kualitatif. *Anuva*, *2*(3), 317. https://doi.org/10.14710/anuva.2.3.317-324

Humble, N., & Mozelius, P. (2022). Content analysis or thematic analysis. *European Conference on Research Methodology for Business and Management Studies*, *21*(1), 76–81. https://doi.org/10.34190/ecrm.21.1.316

Jessica G., M. (2024, March 16). *Survey Research Design: A Simple Introduction*. SuperSurvey. https://www.supersurvey.com/Research

Jubina Pathari, F., Nielsen, Y., Ingrid Andersen, L., & Marentakis, G. (2024). *Dark vs. Light Mode on Smartphones: Effects on Eye Fatigue*. https://www.thinkmind.org

Kim, K., Erickson, A., Lambert, A., Bruder, G., & Welch, G. F. (2019, October 19). Effects of dark mode on visual fatigue and acuity in optical see-Through head-mounted displays. *Proceedings - SUI 2019: ACM Conference on Spatial User Interaction*. https://doi.org/10.1145/3357251.3357584

Koning, L., & Junger, M. (2021). Dark user interface, dark behavior? The effect of 'dark mode' on honesty. *Computers in Human Behavior Reports*, *4*, 100107. https://doi.org/https://doi.org/10.1016/j.chbr.2021.100107

Kudlak, H. (2024, July 18). *Dark Mode vs. Light Mode: The Battle for Eye Health and Work Productivity*. SaasJet. https://saasjet.com/blog/dark-mode-vs-light-mode/

Kudriashova, M. (2023). *Light Mode vs Dark Mode in UI/UX Design*. Bootcamp. https://bootcamp.uxdesign.cc/ui-ux-design-a-beautiful-dance-of-light-and-dark-a94b1cbc0634

Lewandowska, A., & Olejnik-Krugly, A. (2022). Do background colors have an impact on preferences and catch the attention of users? *Applied Sciences (Switzerland)*, *12*(1). https://doi.org/10.3390/app12010225

Lochmiller, C. R. (2021). Conducting thematic analysis with qualitative data. *Qualitative Report*, *26*(6), 2029–2044. https://doi.org/10.46743/2160-3715/2021.5008

Löffler, D., Giron, L., & Hurtienne, J. (2017). Night Mode, Dark Thoughts: Background Color Influences the Perceived Sentiment of Chat Messages. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *10514 LNCS*, 184–201. https://doi.org/10.1007/978-3-319-67684-5_12

Lunn, E. (2022, March 24). *What Is Dark Mode – And Should You Be Using It?* Forbes. https://www.forbes.com/uk/advisor/mobile-phones/what-is-dark-mode-and-should-you-be-using-it/

Ma, S., Chen, C., Khalajzadeh, H., & Grundy, J. (2023). A First Look at Dark Mode in Real-world Android Apps. *ACM Transactions on Software Engineering and Methodology*, *33*(1). https://doi.org/10.1145/3604607

Mantzios, M. (2023). *Dark Mode vs. Light Mode: The UX debate settled*. Fast Company. https://www.fastcompany.com/90961802/dark-mode-vs-light-mode-ux-debate-settled

McCombes, S. (n.d.). *Survey Research | Definition, Examples & Methods*. Retrieved February 28, 2025, from https://www.scribbr.com/methodology/survey-research/

Mohamed, B., Ismail, S., & Abdullah, D. (2020). *Industrial Revolution (IR4.0) Impact on Management*. 104–109. https://doi.org/10.5220/0009865501040109

Mohd Noor, H., Mazlan, S. A., & Amrin, A. (2021). Computerized Maintenance Management System in IR4.0 Adaptation - A State of Implementation Review and Perspective. *IOP Conference Series: Materials Science and Engineering*, *1051*(1), 012019. https://doi.org/10.1088/1757-899x/1051/1/012019

Nagao, M., Broadhurst, J. L., Edusah, S., & Awere, K. G. (2019). *Sustainable Development in Africa: Concepts and Methodological Approaches* (M. Nagao, J. L. Broadhurst, S. Edusah, & K. G. Awere, Eds.). Spears Media Press LLC. https://books.google.com.my/books?id=aV-nDwAAQBAJ&printsec=frontcover#v=onepage&q&f=false

Nassaji, H. (2015). Qualitative and descriptive research: Data type versus data analysis. *Language Teaching Research*, *19*(2), 129–132. https://doi.org/10.1177/1362168815572747

Nissen, A. (2020). *Psychological and Physiological Effects of Color Use on eCommerce Websites: a Neural Study Using fNIRS*.

Nur Amirah, A. R. (2021, November 8). *Waspada penggunaan gajet terlalu beri*

kesan pada mata. BH Online. https://www.bharian.com.my/hujung-minggu/sihat/2021/11/885078/waspada-penggunaan-gajet-terlalu-beri-kesan-pada-mata

Palmén, H., Gilbert, M., & Crossland, D. (2023, April 19). How bold can we be? The impact of adjusting font grade on readability in light and dark polarities. *Conference on Human Factors in Computing Systems - Proceedings*. https://doi.org/10.1145/3544548.3581552

Pedersen, L. A., Einarsson, S. S., Rikheim, F. A., & Sandnes, F. E. (2020). User interfaces in dark mode during daytime – improved productivity or just cool-looking? *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *12188 LNCS*, 178–187. https://doi.org/10.1007/978-3-030-49282-3_13

Ravindran, V. (2019). Data Analysis in Qualitative Research. *Indian Journal of Continuing Nursing Education*, *20*(1). https://journals.lww.com/ijcn/fulltext/2019/20010/data_analysis_in_qualitative_research.9.aspx

Renwick, D. (2019). *How many participants do I need for qualitative research?* Optimal Workshop. https://blog.optimalworkshop.com/how-many-participants-do-i-need-for-qualitative-research/

Saleh, N. I., & Ijab, M. T. (2023). Industrial Revolution 4.0 (IR4.0) Readiness Among Industry Players: A Systematic Literature Review. *Artificial Intelligence and Applications*. https://doi.org/10.47852/bonviewAIA2202336

Salsabila, M. (2022, April 5). *Catat! 4 Perbedaan Data Sekunder & Data Primer dalam Ana...* Dqlab.Id. https://dqlab.id/catat!-4-perbedaan-data-sekunder-and-data-primer-dalam-analisis-data

Santoso, M. F. (2024). Implementation Of UI/UX Concepts And Techniques In Web Layout Design With Figma. *Jurnal Teknologi Dan Sistem Informasi Bisnis*, *6*(2), 279–285. https://doi.org/10.47233/jteksis.v6i2.1223

Schwab, K. (2016). *The Fourth Industrial Revolution*. Crown Business.

Scott, B. (2024, April). *Qualitative Research*. Physiopedia. https://www.physio-pedia.com/Qualitative_Research#cite_note-Merriam-2

Sethi, T., & Ziat, M. (2023). Dark mode vogue: Do light-on-dark displays have measurable benefits to users? *Ergonomics*, *66*(12), 1814–1828.

https://doi.org/10.1080/00140139.2022.2160879

Shona, M., & Tegan, G. (2022, August 25). *What Is a Research Methodology? | Steps & Tips*. Scribbr. https://www.scribbr.com/dissertation/methodology/

Shrestha, A., Shrestha, S., Paneru, B., Paneru, B., Paudel, S., Adhikari, A., & Chhetri Sapkota, S. (2024). *An Exploration of Effects of Dark Mode on Students: a Human Computer Interface Analysis*. https://doi.org/10.2139/ssrn.4974428

Sprabary, A. (2023). *Is Dark Mode Better For Your Eyes?* All About Vision. https://www.allaboutvision.com/digital-eye-strain/is-dark-mode-better-for-eyes/

Steinbrinck, K. (2021, October 20). *Dark Mode for Email Survey: What Do Marketers Think?* Mailjet. https://www.mailjet.com/blog/email-best-practices/dark-mode-for-email-survey/

Subedi, K. R. (2021). Determining the Sample in Qualitative Research. *Scholars' Journal*, *4*, 1–13. https://doi.org/10.3126/scholars.v4i1.42457

Takona, J. P. (2024). Research design: qualitative, quantitative, and mixed methods approaches / sixth edition. *Quality & Quantity*, *58*(1), 1011–1013. https://doi.org/10.1007/s11135-023-01798-2

Tammy, X. (2023). *Is Dark Mode Better Than Light Mode for Coding? | Built In*. Built In. https://builtin.com/software-engineering-perspectives/dark-mode

Tewari, P. (2025). *UX Principles for Modern UI/UX Design and Their Measurement: A Framework for Digital Product Excellence*. https://doi.org/10.32996/jcsts

Tri Marhendra Rahardyan, Bakri, M. R., & Anastasya Utami. (2023). Generation gap in fraud prevention: Study on generation Z, generation X, millennials, and boomers. *International Journal of Research in Business and Social Science (2147- 4478)*, *12*(3), 361–375. https://doi.org/10.20525/ijrbs.v12i3.2566

Ugwu, C., & Eze, V. (2023). *Qualitative Research*. *8*, 20–35.

Undari, S., & Muhamad, M. (2024). MEMAHAMI SUMBER DATA PENELITIAN : PRIMER, SEKUNDER, DAN TERSIER. *Jurnal Edu Research: Indonesian Institute For Corporate Learning And Studies (IICLS)*, *5*, 110–116.

Vinciunas, M., & Kapocius, K. (2023). Impact of Dark and Light Graphical User Interface Modes on System Usability: Preliminary Findings of an Experimental Study. In A. Lopata, T. Krilavicius, I. Veitaite, & A. Garc\'{\i}a-Holgado (Eds.), *Proceedings of the 28th International Conference on Information Society and University Studies (IVUS 2023), Kaunas, Lithuania, May 12, 2023* (Vol. 3575,

pp. 141–151). CEUR-WS.org. https://ceur-ws.org/Vol-3575/Paper15.pdf

Von Soest, C. (2023). Why Do We Speak to Experts? Reviving the Strength of the Expert Interview Method. *Perspectives on Politics*, *21*(1), 277–287. https://doi.org/10.1017/S1537592722001116

While, Z., & Sarvghad, A. (2024). *Dark Mode or Light Mode? Exploring the Impact of Contrast Polarity on Visualization Performance Between Age Groups*. https://doi.org/10.48550/arXiv.2409.10841

Wiratna, S., & Dimas Agung, T. (2020). *BAB III METODOLOGI PENELITIAN*.

Xie, X., Song, F., Liu, Y., Wang, S., & Yu, D. (2021). Study on the effects of display color mode and luminance contrast on visual fatigue. *IEEE Access*, *9*, 35915–35923. https://doi.org/10.1109/ACCESS.2021.3061770

APPENDICES

APPENDIX

Set of Interview Question and Answer

Interview Transcript with UI/UX Experts

Expert 1: Hasif (UI/UX Designer)
Expert 2: Hanif (UI/UX Developer & Apps Developer)
Expert 3: Farid (Front-End Developer & UI Developer)

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1) What are your thoughts on students' current mode preference?
   a) Hasif: Dark mode. Nowadays, most users prefer dark mode. It is rare to find individuals who use light mode.
   b) Hanif: Dark mode. However, some users prefer to switch modes according to the time of day (day or night).
   c) Farid: Dark mode.
2) What are the factors influencing this preference?
   a) Hasif: Eye comfort – Reading on a bright background causes glare and discomfort.
   b) Hanif: Eye comfort – Light mode is more straining on the eyes.
   c) Farid: Eye comfort and aesthetics – Using light mode in dark environments can cause glare. Additionally, dark mode has become a trend.
3) Respondents mentioned eye comfort as a key factor. Was dark mode specifically designed to reduce eye strain?
   a) Hanif: Yes.
   b) Hasif: Yes.
   c) Farid: Yes.
4) Respondents believe dark mode conserves battery life. What are your thoughts on this?
   a) Hanif: Theoretically, yes. However, in UI/UX development, this is not a primary consideration when designing or developing an application.
   b) Hasif: Not sure, as I have not explored this aspect in depth.
   c) Farid: Logically, it makes sense. Since dark mode requires less light, it may reduce energy consumption.
5) The majority of respondents agreed that dark mode improves focus while studying. What is your opinion?

a) Hanif: I agree. A dark background makes reading easier, which is one of the reasons dark mode was introduced.

b) Hasif: I agree. From my experience conducting workshops, many participants reported better focus when using dark mode because a bright background is distracting.

c) Farid: I disagree. Light mode does not necessarily affect focus. It may just be an excuse for students who struggle to concentrate. While light mode can cause glare, it does not significantly impact focus.

6) Respondents suggested an adaptive mode that changes based on time (dark mode at night, light mode during the day). What are your thoughts?

a) Hanif: A good idea. During the day, a bright background is preferable due to surrounding light. At night, a darker background reduces glare and eye strain.

b) Hasif: I agree. Users might also switch modes depending on their level of alertness or boredom.

c) Farid: I agree. Using light mode at night or in dark environments causes discomfort. However, during the day, the choice of mode depends on individual preference, as both modes are equally viable.

7) What are the psychological and technical challenges in developing dark mode?

a) Hanif: Color blending – It is difficult to achieve a balanced color palette in dark mode. Content may also shift in appearance when dark mode is applied.

b) Hasif: Accessibility – Icons may become less visible. It is essential to conduct disability testing to ensure the design supports all users.

c) Farid: Meeting user expectations is challenging. If only one tester evaluates the dark mode, their feedback may not represent all users' needs.

8) Respondents suggested allowing users to adjust brightness levels between extreme dark and bright modes. What are your thoughts?

a) Hanif: Not a good idea. It would impact app performance and add unnecessary complexity.

b) Hasif: Unnecessary. Offering too many options complicates the user experience.

c) Farid: Not a good idea. Instead of multiple modes, a single "grey mode" between dark and light modes would be sufficient.

9) If you disagree with the previous suggestion, what alternative solutions do you propose?

a) Hanif: Introducing a middle-ground mode between dark and light, such as a grey mode.

b) Hasif: Providing contrast adjustment (high contrast and low contrast) within dark and light modes.

c) Farid: Implementing a grey mode as an intermediary option.

10) What are your thoughts on dark mode becoming the default standard, potentially replacing light mode?

a) Hanif: Disagree. Light mode is still necessary, especially for older users who tend to prefer it.

b) Hasif: Agree, but only for users under 35. However, applications used by older demographics, such as PhD students aged 45 and above, must accommodate different preferences.

c) Farid: Disagree. Not all applications are suited for dark mode.

11) What additional features could enhance the usability of dark and light modes?

a) Hanif: Providing more customization options, such as vivid colors or built-in filters.

b) Hasif: It depends on user needs. Enhancements should align with the target audience's expectations.

c) Farid: Keeping both modes moderate—dark mode should not be too dark, and light mode should not be excessively bright to prevent discomfort.

12) In the context of education, how do dark and light modes impact students' learning experiences?

a) Hanif: Yes. The younger generation is more particular about UI aesthetics. A visually appealing interface may increase engagement, while a poorly designed UI could reduce interest in learning.

b) Hasif: Yes. In my experience developing e-learning apps, users consistently request dark mode, which enhances their learning experience.

c) Farid: Yes, but dark mode is not necessary in all cases. Light mode remains preferable for readability, as it is brighter and may create a more cheerful reading environment.

13) Some studies suggest that women read faster in light mode, while men read faster in dark mode. What is your opinion?

a) Hanif: Disagree. I have not experienced this personally. As a UX professional, I use dark mode for comfort.

b) Hasif: Disagree. Based on my experience, some men also prefer light mode over dark mode.

Set of Survey

A Comparative Study of Dark Mode and Light Mode: Perspective of Higher Education Students / *Kajian Perbandingan Dark Mode dan Light Mode: Perspektif Pelajar Pengajian Tinggi*

Thank you for participating in this study. The purpose of this survey is to identify the choices and experiences of UiTM students in using dark mode and light mode on digital devices such as smartphones or computers. The information you provide will be used for my thesis research and is guaranteed confidentiality and anonymity.

This survey will take approximately 5-10 minutes. Your answers are very important to help me get a deeper insight into this topic.

If you agree to participate, please continue by answering the following questions. Thank you for your cooperation!

Terima kasih kerana menyertai kajian ini. Tujuan survey ini adalah untuk mengenal pasti pilihan dan pengalaman pelajar UiTM dalam menggunakan dark mode dan light mode pada peranti digital seperti telefon pintar atau komputer. Maklumat yang anda berikan akan digunakan untuk kajian tesis saya dan dijamin kerahsiaan serta anonimitinya.

Survey ini akan mengambil masa lebih kurang 5-10 minit. Jawapan anda sangat penting untuk membantu saya mendapatkan pandangan yang lebih mendalam tentang topik ini.

Sekiranya anda bersetuju untuk menyertai, sila teruskan dengan menjawab soalan-soalan berikut. Terima kasih atas kerjasama anda!

* Indicates required question

Demographic Information / *Maklumat Demografi*

Please complete your demographic information. This information will be used to understand how demographic factors may influence the choice of using dark mode and light mode. / *Sila lengkapkan maklumat demografi anda. Maklumat ini akan digunakan untuk memahami bagaimana faktor-faktor demografi mungkin mempengaruhi pilihan penggunaan dark mode dan light mode.*

1. Age / *Umur* *

Mark only one oval.

- 18-20
- 21-25
- 26-30
- 31 and above / dan keatas

2. Gender / *Jantina* * Dropdown

Mark only one oval.

- Male / Lelaki
- Female / Perempuan

3. Field of Study / *Bidang Pengajian* * Dropdown

Mark only one oval.

- ARSHAD AYUB GRADUATE BUSINESS SCHOOL (AA)
- ACCOUNTING RESEARCH INSTITUTE (AR)
- MITRANS (LT)
- FACULTY OF ACCOUNTANCY (AC)
- FACULTY OF ADMINISTRATIVE SCIENCE AND POLICY STUDIES (AM)
- ACADEMY OF LANGUAGE STUDIES (APB)
- FACULTY OF APPLIED SCIENCES (AS)
- FACULTY OF PLANTATION AND AGROTECHNOLOGY (AT)
- FACULTY OF DENTISTRY (DS)
- FACULTY OF EDUCATION (ED)
- FACULTY OF HOTEL AND TOURISM MANAGEMENT (HM)
- FACULTY OF HEALTH SCIENCES (HS)
- ACADEMY OF CONTEMPORARY ISLAMIC STUDIES (IC)
- FACULTY OF LAW (LW)
- FACULTY OF COMMUNICATION AND MEDIA STUDIES (MC)
- FACULTY OF MEDICINE (MD)
- FACULTY OF PHARMACY (PH)
- FACULTY OF SPORTS SCIENCE AND RECREATION (SR)
- FACULTY OF BUSNIESS MANAGEMENT (BA/BM)
- COLLEGE OF COMPUTING, INFORMATICS AND MATHEMATICS (CD)
- COLLEGE OF ENGINEERING (CE)
- COLLEGE OF BUILT ENVIRONMENT (CF)
- COLLEGE OF CREATIVE ARTS (CA)

4. Study level / *Peringkat pengajian* *

Mark only one oval.

- ◯ Diploma
- ◯ Bachelor's Degree / Ijazah Sarjana Muda
- ◯ Master's Degree / Ijazah Sarjana
- ◯ PhD

Device Use / *Penggunaan Peranti*

Please answer the following questions about the device you use regularly to access apps or websites. / *Sila jawab soalan berikut mengenai peranti yang anda gunakan secara kerap untuk mengakses aplikasi atau laman sesawang.*

5. What primary device do you use? / *Apakah peranti utama yang anda gunakan?* *

Mark only one oval.

- ◯ Smartphone / Telefon Pintar
- ◯ Laptops / Komputer Riba
- ◯ Tablets / Tablet
- ◯ Desktop
- ◯ Other: _____

6. What operating system is used on your primary device? / *Apakah sistem operasi yang digunakan pada peranti utama anda?* *

Mark only one oval.

- ◯ Android
- ◯ iOS
- ◯ Windows
- ◯ macOS
- ◯ Other: _____

7. How often do you use the device each day? / *Berapa kerap anda menggunakan peranti setiap hari?* *

Mark only one oval.

- ◯ Less than 1 hour / Kurang dari 1 jam
- ◯ 1-3 hours
- ◯ 4-6 hours
- ◯ 7-9 hours
- ◯ More than 9 hours / Lebih dari 9 jam

Experience with Dark Mode and Light Mode / *Pengalaman dengan Dark Mode dan Light Mode*

This question aims to understand your experience in using dark mode and light mode on your device. / *Soalan ini bertujuan untuk memahami pengalaman anda dalam menggunakan dark mode dan light mode pada peranti anda.*

8. What mode do you often use when accessing mobile apps or software (Example: WhatsApp, Chrome, Microsoft, etc.) on your device? / *Apakah mode yang sering anda gunakan ketika mengakses aplikasi mudah alih ataupun software (Contoh: WhatsApp, Chrome, Microsoft, dsb.) pada peranti anda?* *

Mark only one oval.

- ◯ Dark mode / Mod gelap
- ◯ Light mode / mod terang
- ◯ As appropriate / Mengikut kesesuaian

9. Is the choice of dark or light mode important in the situation when studying or reading?/ *Adakah pemilihan mod gelap atau terang penting dalam situasi ketika belajar atau membaca?* *

Mark only one oval.

- ◯ Yes
- ◯ No

10. Which mode do you think is more friendly to the eyes? / *Mod mana yang anda rasa lebih mesra pada mata?* *

Mark only one oval.

- ◯ Dark mode / Mod gelap
- ◯ Light mode / mod terang
- ◯ Both / Kedua-duanya

Untitled Section

11. Do you prefer dark mode or light mode? / *Anda lebih suka dark mode atau light mode?* *

Mark only one oval.

- ◯ Dark mode / Mod gelap
- ◯ Light mode / mod terang

12. What factors most influence your choice of mode in the question above? (example: eye comfort, aesthetics, text clarity) / *Apakah faktor yang paling mempengaruhi mod pilihan anda pada soalan diatas? (contoh: keselesaan mata, estetik, kejelasan teks)* *

_____

13. Do you think the mode selected above helps you focus while doing assignments or studying on the computer/phone? / *Adakah anda rasa mod pilihan diatas membantu anda fokus semasa melakukan tugasan atau belajar di komputer/telefon?* *

Mark only one oval.

- ◯ Yes
- ◯ No

14. Does the mode you choose above affect how long you use an application? */ Adakah mod pilihan anda diatas mempengaruhi tempoh anda menggunakan sesebuah aplikasi?*

Mark only one oval.

- ◯ Yes
- ◯ No

Suggestions and Recommendations / *Saranan dan Cadangan*

Please share your suggestions or opinions regarding the use of dark mode or light mode, as well as how it can be improved for a better experience. */ Sila kongsikan cadangan atau pendapat anda mengenai penggunaan dark mode atau light mode, serta bagaimana ia boleh diperbaiki untuk pengalaman yang lebih baik.*

15. In your opinion, should dark mode and light mode be established on UiTM applications/platforms (Example: Student Portal, UPTrack, etc.)? */ Pada pendapat anda, adakah mod gelap dan mod terang sepatutnya diwujudkan pada aplikasi/platform UiTM (Contoh: Student Portal, UPTrack, dsb.)?* *

Mark only one oval.

- ◯ Necessary / Perlu
- ◯ No need / Tidak perlu

16. What are your suggestions to improve dark mode or light mode to be more user friendly? */ Apakah cadangan anda untuk memperbaiki dark mode atau light mode supaya lebih mesra pengguna?*

AUTHOR'S PROFILE

Ahmad Haikal Fikri bin Hazadi was born on 7 July 1996 in Bentong, Pahang. He graduated from Universiti Teknologi MARA (UiTM), Puncak Alam campus, in 2021 with a bachelor's degree in graphic design. Driven by a passion for expanding his knowledge and exploring the evolving role of interface design (UI) and user experience (UX), he pursued further studies at the postgraduate level. He is a dedicated educator and researcher, currently serving as a Lecturer in Graphic and Multimedia at Kolej Poly-Tech MARA, Batu Pahat. Alongside his professional role, he is pursuing a Master of Arts at Universiti Teknologi MARA (UiTM), Shah Alam, specializing in UI/UX design. His current research, titled 'Visual Ergonomics and User Preference: A Comprehensive Comparative Study of Dark Mode and Light Mode Interfaces on the Learning Experience of Higher Education Students,' explores the intersection of interface design and pedagogical outcomes, aiming to provide critical insights into how visual ergonomics impact the modern student experience.

LIST OF PUBLICATION

A. H. Fikri Hazadi and M. F. Kamaruzaman, "Exploring User Experience: Theoretical Insights into Dark and Light Mode Interfaces," *2024 IEEE 13th International Conference on Engineering Education (ICEED)*, Kanazawa, Japan, 2024, pp. 1-5, doi: 10.1109/ICEED62316.2024.10923779.