Technology Acceptance and the Metaverse: Insights from Malaysia's Educational Landscape

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ABSTRACT

Recent technological advancements have profoundly impacted various sectors, notably the education domain. Among these innovations, the metaverse, a virtual reality-based immersive environment has gained traction as a transformative tool capable of redefining conventional teaching and learning methodologies. This study investigates the factors influencing the acceptance of metaverse technologies within the Malaysian education system, with the objective of identifying key determinants that facilitate or hinder adoption among students and educators. Primary data were obtained via an online survey distributed through a self-administered questionnaire to participants across Malaysian educational institutions. The research was guided by the Unified Theory of Acceptance and Use of Technology (UTAUT) framework, which served to examine behavioral intentions and user attitudes toward the metaverse. The results reveal that perceived usefulness, perceived ease of use, and social influence exert a significant influence on metaverse acceptance in educational settings. These findings underscore the critical need to address technological constraints, enhance infrastructure, and promote awareness among stakeholders to support the effective integration of metaverse platforms into Malaysia's learning ecosystems.

Keywords: metaverse, education technology, Technology Acceptance Model, UTAUT

INTRODUCTION

Although the term *metaverse* gained widespread attention following Facebook's rebranding to Meta, the concept itself has much deeper historical roots. As early as the 1830s, Sir Charles Wheatstone developed the stereoscope, a device that enabled binocular vision and laid the foundation for modern three-dimensional and immersive media (Wade, 2002).

Mystakidis (2022) defines the metaverse as a continuous, multi-user digital environment that exists beyond physical reality, enabled by technologies such as augmented reality (AR), virtual reality (VR), and mixed reality (MR) (Cheng et al., 2022). These technologies collectively enhance digital presence, spatial interaction, and social connectivity (Bojic, 2022). Major technology companies have already established platforms within the metaverse, including Meta's Horizon Worlds, Microsoft's AltspaceVR, and earlier platforms like Second Life. During the COVID-19 pandemic, virtual concerts hosted on Fortnite—featuring artists like DJ Marshmello and Travis Scott—demonstrated the metaverse's potential for large-scale entertainment (Webster, 2019; Tassi, 2020).

Commercial interest in the metaverse is also growing. Brands such as Nike, Louis Vuitton, and McDonald's have experimented with NFTs, virtual merchandise, and digital cultural events, highlighting its emerging economic significance (Nike, 2022; Bodenès, 2022; Vismaya, 2023). According to Zuckerberg (2021), the metaverse represents an "embodied, immersive internet" that blurs the line between physical and digital experiences.

In Malaysia, the integration of metaverse technologies into education holds promise for transforming learning through immersive simulations, interactive environments, and game-based activities. However, widespread adoption remains limited. Early initiatives such as Metaversity™ and Pythaverse suggest initial progress, but several challenges persist. One major issue is the digital divide between urban and rural areas, where access to high-speed internet and specialized hardware is still lacking (Ahmed & Abdul, 2021). Additionally, there is a shortage of culturally relevant and curriculum-aligned content, and strict data privacy regulations under the Personal Data Protection Act 2010 contribute to institutional hesitancy (Wang & Zhao, 2019).

Although the metaverse integrates technologies like VR, AR, blockchain, and artificial intelligence (Kang, 2021), academic research often treats these components separately. This fragmented approach leaves educators without a cohesive pedagogical framework (Guo & Gao, 2022; Park & Jeong, 2022). To address this gap, the present study explores the factors influencing Malaysian students' acceptance of metaverse-based learning, with the goal of informing educational policy and practice in the country's evolving digital landscape.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Acceptance of Metaverse in Malaysian Education

The Technology Acceptance Model (TAM), developed by Davis (1986), remains a foundational framework for analyzing user engagement with new technologies. Grounded in the Theory of Reasoned Action (TRA), TAM emphasizes two primary constructs: perceived usefulness (PU) and perceived ease of use (PEOU), which collectively influence a user's attitude toward technology, behavioral intention (BI), and eventual adoption. While TRA offers insights into general behavioral motivations, TAM focuses more specifically on technology-related acceptance, offering a targeted lens for educational settings (Davis, 1986).

In Malaysia's educational landscape, TAM serves as a valuable tool for evaluating the integration of emerging platforms like the metaverse. As part of the nation's push towards Education 4.0 and alignment with the Fourth Industrial Revolution (IR4.0), initiatives such as MetaSkool and SEGi MetaCampus illustrate the growing relevance of immersive technologies. These platforms highlight PU by offering enhanced learning experiences, improved collaboration, and alignment with career preparation. Students and educators perceive increased academic performance and engagement through virtual classrooms, metaverse labs, and industry-linked simulations, all of which reinforce TAM's PU dimension (Dwivedi et al., 2023; Tlili et al., 2022).

Equally important is the PEOU component, especially in contexts where digital literacy and infrastructural limitations may pose challenges. In Malaysia, efforts to minimize barriers include educator training programs and the implementation of intuitive platforms like Spatial.io, used in school-based metaverse initiatives. When users find technologies easy to navigate, their likelihood of adoption increases significantly. TAM's emphasis on ease of use is particularly important for schools in rural or underserved regions where familiarity with advanced digital tools might still be developing (Park & Jeong, 2022).

Social influence also emerges as a significant factor in Malaysian education, particularly through government-endorsed programs and peer-driven motivation. The Ministry of Education and the Ministry of Digital play critical roles in promoting metaverse integration, while teacher ambassadors and student content creators help normalize its usage across classrooms. Drawing from the Theory of Planned Behavior (TPB), social influence within TAM underscores the importance of communal expectations and encouragement, which continue to shape technology adoption in collaborative educational environments (Venkatesh & Davis, 2000; Venkatesh et al., 2003).

Recent literature affirms the continued relevance of TAM in analyzing metaverse engagement. Studies by Dwivedi et al. (2023) and Tlili et al. (2022) highlight how PU, PEOU, and social norms affect technology acceptance across academic and corporate domains. Similarly, Park and Jeong (2022) demonstrate that perceived relevance and usability strongly enhance learner motivation and interaction in virtual environments. These findings reinforce the need for Malaysian stakeholders to design metaverse tools that are meaningful, user-friendly, and socially supported, thereby fostering smoother adoption across the education system.

Perceived Ease of Use (PEOU)

Perceived Ease of Use (PEOU) is a key component of the Technology Acceptance Model (TAM), referring to the degree to which users believe that interacting with a technology will be effortless and uncomplicated (Davis, 1989). In the context of this study, PEOU is used to assess users' perceptions of how easy it is to operate metaverse platforms, focusing on elements such as interface design, navigation clarity, task completion, and overall user experience. When a system is perceived as user-friendly, individuals are more likely to adopt and use it consistently, as it minimizes the cognitive load and frustration typically associated with learning new technologies (Venkatesh & Davis, 2000). Conversely, if a platform is seen as complex or unintuitive, even significant functional benefits may not be sufficient to encourage adoption. Recent studies support the continued relevance of PEOU in evaluating emerging technologies, especially immersive platforms like the metaverse. For example, Zhang et al. (2022) and Dwivedi et al. (2023) found that ease of navigation and clarity in user interaction are critical to increasing user satisfaction and engagement in virtual environments. This study will explore users' perceptions using surveys and interviews, with Likert-scale items such as "I find the metaverse platform easy to navigate" and "Performing tasks in the metaverse requires minimal effort." The findings will help identify usability barriers and inform user-centered design improvements that make metaverse platforms more accessible. Moreover, understanding PEOU is vital for shaping effective training and support strategies, ensuring that users become comfortable and confident in navigating the technology. Simplifying metaverse systems is essential for their broader adoption and successful integration into education, business, and social interaction contexts (Park & Jeong, 2022; Tlili et al., 2023).

Perceived Usefulness (PU)

Perceived Usefulness (PU) is a core construct of the Technology Acceptance Model (TAM), defined as the degree to which a user believes that using a particular technology will enhance their performance (Davis, 1989). In the educational context, PU reflects users' beliefs that digital tools—such as the metaverse—can improve learning outcomes, facilitate academic success, and promote deeper engagement with course material (Venkatesh & Davis, 2000).

The integration of metaverse technologies into education offers immersive, interactive environments that can support experiential learning through 3D simulations, virtual laboratories, and real-time collaboration. Such environments have been shown to enhance students' conceptual understanding and motivation, particularly in complex subject areas (Radianti et al., 2020; Wang et al., 2022). For instance, virtual field trips or simulations in science education can enable learners to explore phenomena that are otherwise inaccessible, thereby enhancing the perceived value and utility of the technology.

Educators also perceive the metaverse as useful when it supports differentiated instruction and caters to diverse learning styles. Through customizable virtual spaces, instructors can design learner-centered activities that promote autonomy, interaction, and real-time feedback—key factors associated with improved learning outcomes (Cheng et al., 2023). The alignment between the functionalities of the metaverse and educational objectives further reinforces its perceived usefulness among both students and teachers.

Moreover, PU is often influenced by social validation. When users receive positive feedback from peers or observe successful use cases, their perceptions of a technology's effectiveness are reinforced, thus increasing adoption likelihood (Venkatesh et al., 2003; Alalwan et al., 2018). In Malaysia's educational landscape, both social influence and PU are pivotal. While social influence initiates adoption through peer and institutional encouragement, PU ensures sustained use by highlighting tangible educational benefits (Ningsih et al., 2023).

Social Influence (SI) and Metaverse Adoption in Education

Social influence (SI) has consistently been identified as a key determinant in the adoption of new technologies, particularly within educational settings. Rooted in the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003), SI refers to the degree to which individuals perceive that important others—such as peers, educators, or institutional leaders—believe they should use a particular technology. In the context of the metaverse, this influence becomes especially prominent due to the technology's immersive,

interactive nature and its potential for collaborative learning. Recent studies continue to affirm the relevance of SI. For instance, Nguyen et al. (2023) found that social influence significantly predicted behavioural intention to use metaverse technologies among students and educators in Southeast Asia. Similarly, empirical research in Jordanian universities highlights that extraverted students are more responsive to peer influence in metaverse adoption compared to their introverted counterparts (Alshorman & Al-Samarraie, 2024).

In Malaysia, where collectivist cultural norms are deeply ingrained, the role of social influence is further amplified. Students often look to peers, teachers, and family members when forming decisions about adopting new technologies. The implementation of government-endorsed initiatives, such as the "Metaversity" programme launched in 2024, has further legitimised the integration of metaverse platforms in higher education, encouraging universities and colleges to embrace immersive learning environments (Ministry of Higher Education Malaysia, 2024). When institutions actively incorporate the metaverse into their academic programmes, students and faculty members are more likely to view the technology as both credible and essential to their learning and teaching processes (Venkatesh & Davis, 2000). Moreover, peer engagement and social media visibility also play crucial roles. A recent discourse analysis of metaverse use in education revealed that positive peer experiences, particularly when shared through platforms like TikTok and Instagram, reinforce the social desirability of using the metaverse (Rahman et al., 2025).

RESEARCH FRAMEWORK

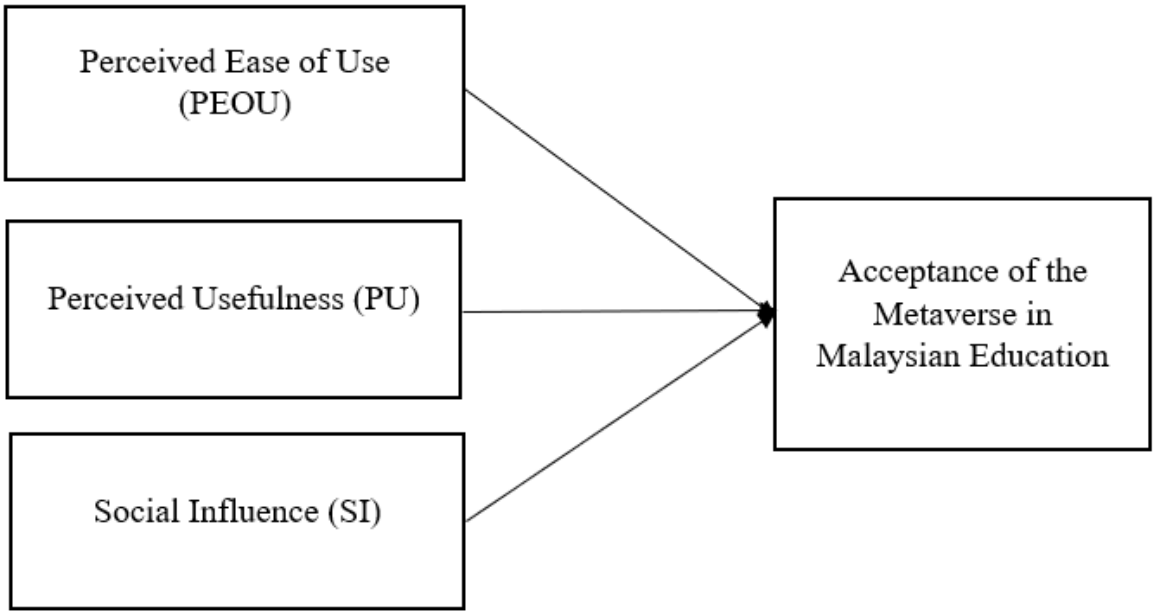

Figure 1: Theoretical Framework

METHODOLOGY

This study employed a quantitative research design to investigate the acceptance of metaverse technologies within Malaysia's education system, guided by the theoretical framework of the Technology Acceptance Model (TAM). The research focused on examining the relationships among three fundamental constructs; *Perceived Ease of Use (PEOU)*, *Perceived Usefulness (PU)*, and *Social Influence (SI)* to enable an objective and empirical assessment of user acceptance patterns (Creswell, 2014). A structured, self-administered questionnaire was developed based on validated instruments from prior studies and comprised closed-ended items measured on a five-point Likert scale. To ensure both content validity and internal consistency, a pilot test was conducted with 30 participants. The results indicated satisfactory reliability, with all constructs exceeding the Cronbach's alpha threshold of 0.70. The final survey instrument was subsequently disseminated via both online and offline platforms.

The sampling frame included students from all educational levels; primary, secondary, and tertiary, including postgraduate, to capture a comprehensive and representative perspective on metaverse adoption across Malaysia's diverse learning environments. A stratified random sampling technique was used to ensure proportional representation from a variety of institutional types, including public and private schools, universities, polytechnics, colleges, and community colleges. In total, 385 valid responses were collected, guided by official enrolment data from the Ministry of Education and higher education institutions. Sampling locations encompassed urban, suburban, and rural areas throughout the country. Participating institutions included Universiti Malaya (UM), Universiti Teknologi MARA (UiTM), Universiti Teknikal Malaysia Melaka (UTeM), along with other public and private education providers. Data collection was conducted using a mixed-mode approach, both online and in-person to ensure inclusivity and accommodate varying levels of technological accessibility across institutions. Data were analyzed using SPSS for descriptive statistics and SmartPLS for Structural Equation Modeling (SEM). Inferential analyses, including correlation, regression, and path analysis, were employed to test the hypothesized relationships among the constructs. This robust methodological approach enabled the study to capture nuanced insights into user acceptance, from early engagement in primary education to sophisticated, goal-oriented usage at the tertiary level.

DISCUSSION

Perceived usefulness has been consistently identified as a pivotal determinant in the acceptance of emerging technologies, including the metaverse. According to Venkatesh et al. (2020), perceived usefulness remains a core construct within both the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). These theoretical frameworks posit that individuals are more likely to adopt new technologies when they believe these tools will enhance their task performance or help achieve their goals. The present study supports this assertion, indicating that users' positive perceptions of the metaverse's utility significantly influence their willingness to adopt the technology in educational contexts.

Recent literature reinforces this perspective. Alalwan et al. (2021) argue that perceived usefulness is instrumental in shaping users' engagement with digital innovations. When users believe a technology can improve productivity, efficiency, or learning outcomes, their intention to adopt and utilize it increases substantially. This is particularly salient in the education sector, where both students and educators prioritize tools that deliver tangible academic benefits and support diverse learning objectives (Cheng et al., 2023; Ningsih et al., 2023).

Empirical findings from this study further affirm the importance of perceived usefulness. Responses to items related to this construct revealed a strong consensus among participants that the metaverse could enhance learning experiences through immersive, interactive, and innovative educational tools. These results align with the study's hypothesis, demonstrating that perceived usefulness is a significant predictor of metaverse acceptance within Malaysia's education system.

Accordingly, this study underscores the strategic importance of emphasizing the functional and pedagogical advantages of the metaverse to foster broader acceptance among stakeholders in education. Future development and implementation efforts should prioritize features that highlight these practical benefits, thereby reinforcing users' perceptions of usefulness and promoting sustained adoption in educational settings.

Perceived Ease of Use (PEOU) is a central construct in the Technology Acceptance Model (TAM) and has been widely recognized as a key determinant in the adoption of new technologies, including the metaverse. Al-Adwan et al. (2023), in their extension of TAM to predict university students' intentions to utilize metaverse-based learning platforms, found that PEOU significantly influences users' behavioral intentions. This aligns with the findings of the present study, which demonstrate that students' perception of the metaverse as an easy-to-use platform positively contributes to its acceptance in educational environments.

However, the relationship between PEOU and other acceptance variables remains nuanced. Misirlis and Munawar (2023) investigated the applicability of TAM in understanding university students' behavioral intentions toward metaverse adoption and observed that while factors such as self-efficacy and subjective norms positively impacted attitude and perceived usefulness, PEOU did not exhibit a strong correlation with

either construct. This suggests that while ease of use is important, it may not always directly influence learners' attitudes or perceptions of usefulness, especially in contexts where familiarity with technology is high or where educational benefits outweigh usability concerns.

Nonetheless, empirical data from this study indicates that respondents generally perceive the metaverse as intuitive and straightforward to use. Participants expressed confidence in their ability to navigate and integrate metaverse tools into their learning activities, confirming the study's hypothesis that ease of use is a significant predictor of acceptance in the Malaysian educational context.

These findings underscore the importance of ensuring that metaverse platforms are designed to be user-friendly, requiring minimal cognitive effort or technical training. As highlighted by Venkatesh et al. (2020), simplicity and usability remain vital to reducing resistance and fostering technology acceptance, especially in learning environments where users vary in digital literacy. Therefore, educational institutions and developers should prioritize interface simplicity, accessibility, and seamless integration to encourage broader adoption of metaverse technologies in teaching and learning.

Social Influence (SI) is a critical determinant in the acceptance and adoption of emerging technologies, particularly within the framework of the Unified Theory of Acceptance and Use of Technology (UTAUT). It refers to the extent to which individuals perceive that important others such as peers, educators, or institutional figures that believe they should use a particular technology (Venkatesh et al., 2003). The present study confirms the significance of this factor, demonstrating that social influence has a substantial impact on users' acceptance of the metaverse in educational contexts.

Recent empirical studies reinforce this assertion. Almarzouqi et al. (2022) found that social influence significantly affects the intention to adopt metaverse technologies in medical education, underscoring the influence of peer groups and social norms in shaping technology-related behaviors. Similarly, Alshammari (2024) reported that social influence is a strong predictor of university students' intention to engage with metaverse platforms, particularly when endorsement comes from respected figures such as educators or fellow students.

Additional evidence from contemporary research further highlights the role of social dynamics in digital technology adoption. For example, Alshehri et al. (2023) noted that institutional encouragement and peer endorsement positively influence metaverse adoption in blended learning environments. Moreover, Iqbal and Ahmad (2023) emphasized that when students perceive metaverse use as socially desirable or professionally advantageous, their likelihood of adoption increases significantly.

Findings from this study as shown in Figure 2, align with these insights. Responses to items related to Social Influence revealed that students are positively influenced by the opinions and encouragement of their peers and instructors regarding the use of metaverse technologies. These perceptions contribute to a higher likelihood of acceptance and usage, confirming the hypothesis that social influence plays a significant role in promoting the adoption of the metaverse in Malaysia's educational sector.

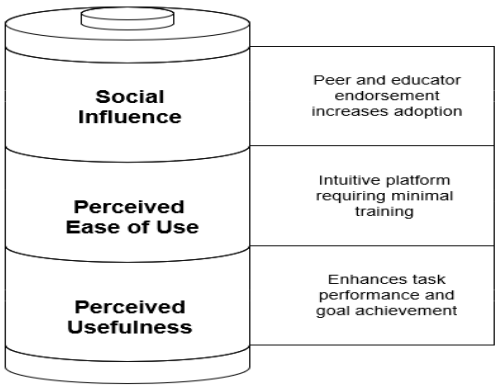

Figure 2: Factors Influencing Metaverse Acceptance in Malaysian Education

Given these findings, it is essential for educational institutions to cultivate a socially supportive environment that promotes the use of innovative digital tools. By leveraging the power of social influence through peer advocacy, instructor-led initiatives, and institutional campaigns, stakeholders can facilitate the integration of metaverse platforms into teaching and learning practices. Establishing positive social norms around metaverse use may serve as a catalyst for wider adoption and sustained engagement.

CONCLUSIONS

The findings of this study hold valuable implications for several key stakeholders involved in Malaysia's educational ecosystem. First, educational institutions; including universities, polytechnics, colleges, and schools, stand to benefit by better understanding the factors that influence the acceptance of metaverse technologies. Insights into perceived usefulness, ease of use, and social influence can help these institutions develop strategic approaches for integrating metaverse platforms into teaching and learning. By addressing these factors, they can enhance student engagement, improve digital literacy, and promote meaningful use of immersive technologies aligned with Malaysia's Education 4.0 vision.

Secondly, technology developers and service providers who design educational metaverse solutions can use the study's findings to tailor their platforms to Malaysian educational contexts. Prioritizing intuitive interfaces, collaborative tools, and culturally relevant virtual content can support more effective adoption. These features must cater to the diverse needs of Malaysian students and educators, ensuring both usability and pedagogical value in urban and rural settings alike.

Government bodies and policymakers also play a critical role. The study offers evidence-based insights into how social influence and perceived usefulness affect metaverse acceptance in Malaysian classrooms. This can inform the creation of policy frameworks, funding mechanisms, and digital innovation grants that support nationwide adoption. Awareness programs and training initiatives can further reinforce positive perceptions of the metaverse, encouraging widespread institutional support across public and private sectors.

Finally, this research highlights the importance of addressing digital inequalities. Ensuring equitable access to metaverse technologies for students from varied socioeconomic backgrounds is essential to fostering an inclusive and future-ready education system. By narrowing the digital divide, stakeholders can empower all learners to benefit from immersive, interactive, and innovative educational experiences supported by the metaverse.

IMPLICATIONS OF THE RESEARCH

The findings of this study have significant implications for several key stakeholders involved in the integration of metaverse technologies in education.

Firstly, educational institutions, including universities and schools, stand to benefit by gaining a deeper understanding of the factors influencing the acceptance of metaverse technologies, such as perceived usefulness, perceived ease of use, and social influence. These insights can guide institutional strategies aimed at promoting the adoption and effective implementation of metaverse platforms. By addressing these factors, institutions can enhance students' learning experiences through more immersive and interactive digital environments.

Secondly, technology developers and solution providers focused on educational applications of the metaverse can utilize these findings to design more user-centric platforms. The research underscores the need for intuitive, engaging, and pedagogically sound features, such as collaborative tools, accessible interfaces, and immersive simulations that cater to the expectations of both educators and learners. These insights serve as a practical reference for enhancing usability and educational value in metaverse-based learning solutions.

Thirdly, policymakers and governance bodies can leverage the study's insights to inform national or institutional digital education agendas. Recognizing the influence of social norms and perceived benefits in technology adoption, policy efforts can include targeted funding schemes, infrastructure investments, and

awareness campaigns to encourage widespread adoption of metaverse technologies. For example, government initiatives may focus on subsidizing the implementation of metaverse platforms in public and underserved educational institutions or developing policy frameworks to support training and capacity-building for educators.

Finally, this study highlights the pressing need to address the digital divide to ensure equitable access to metaverse learning environments. Ensuring inclusivity in access to digital infrastructure and tools is essential to prevent exacerbating existing educational inequalities. Stakeholders must prioritize initiatives that support marginalized or under-resourced communities, thereby enabling all students to benefit from the transformative potential of metaverse-based education.

In summary, this research provides actionable insights for multiple stakeholders to support the meaningful and equitable integration of metaverse technologies within educational ecosystems.

To build upon the current findings, future studies are encouraged to employ longitudinal designs to capture changes in user attitudes and acceptance over time. Additionally, adopting mixed-methods approaches could yield deeper insights into user experiences by complementing quantitative data with rich, contextual qualitative findings.

Ethical Considerations

This study is voluntarily participation, and the respondents agreed to take part in the study. Information gathered during this study is confidential.

Conflict of Interest

The authors declare that they have no conflict of interest.

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