International Journal of Modern Trends in Social Sciences
EISSN: 2600-8777
Volume 9 Issue 34 (June 2026) PP 21-34

INTERNATIONAL JOURNAL OF MODERN TRENDS IN SOCIAL SCIENCES (IJMTSS)
www.gaexcellence.com/ijmtss

HOW DO UNIVERSITY STUDENTS LEARN BEST? A VARK MODEL PERSPECTIVE

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Article Info:

Article history:
Received date: 30.03.2026
Revised date: 20.04.2026
Accepted date: 14.05.2026
Published date: 08.06.2026

To cite this document:

Karim, K. M, Mohamad, A. M., Safar, M. R. & Saraih, U. N. (2026). How Do University Students Learn Best? A VARK Model Perspective. *International Journal of Modern Trends In Social Sciences, 9*(34), 21-34.

DOI: 10.35631/IJMTSS.934002

Abstract:

Learning diversity has become a central concern in contemporary higher educations. This study investigates the learning preferences of undergraduate students at a Malaysian institution of higher learning using the VARK model. A cross-sectional survey design was employed, collecting data from students across different academic programmes through a structured questionnaire assessing learning style preferences, preferred learning methods, and preferred learning times. The findings indicate that visual and reading/writing modalities are the most dominant learning preferences, while auditory and kinesthetic styles are less common. Traditional face-to-face instruction and morning learning sessions emerged as the most preferred conditions for learning. These results underscore the importance of multimodal instructional design and provide evidence supporting inclusive pedagogical planning. Implications for teaching practice, curriculum development, and institutional policy are discussed to enhance learner engagement and learning effectiveness.

Keyword:

Higher Education Institution, Learning Method, Learning Time, Learning Styles, VARK Model

International Journal of Modern Trends in Social Sciences
IJMTSS
EISSN: 2600-8777
Volume 9 Issue 34 (June 2026) PP 21-34

Introduction

The acknowledgement of diversity of the learning experience has become a necessary part of the modern educational theory and practice. The issues linked to information processing and retention have become significantly topical among teachers and curriculum developers as colleges and universities start admitting learners with diverse cultural, cognitive and linguistic backgrounds (Vanegas et al., 2024; Silva et al., 2020). The challenge of aligning the heterogeneous learning needs with upholding the high academic standards and pursuing the equitable outcomes has triggered the active research of the learning style constructs and pedagogical consequences of the study (Husmann & O'Loughlin, 2019; Valle-Escobedo et al., 2024).

The learning-style paradigm has received adoption throughout the educative spectrum, resulting in a variety of models in the educational psychology. One of the most popular models has been offered by Neil Fleming in the 1980s, the VARK framework, which received a significant part of a following among higher-education establishments all over the world (Idowu, 2024; Ally et al., 2022). The VARK taxonomy describes four sensory modalities, namely visual (information is delivered via graphs, charts, maps and diagrams), auditory (learning by listening and speaking), reading/writing (learning through written texts) and kinesthetic (experience through physical contact) (Mishra et al., 2025; Dey et al., 2024). This is a highly appealing, easy to grasp classification that has made the VARK model particularly appealing to classroom use and curriculum writing, particularly in relation to more complex cognitive-style theories (Gangadharan et al., 2025; Zapalska & Brozik, 2006).

VARK model is theoretically based on the fact that people have sensory mechanisms, which are better received, processed and retained (Kannappan et al., 2025). Advocates believe that the teaching method that corresponds to the preferred learners helps to increase engagement, decrease the cognitive load, and improve the learning process (Vanegas et al., 2024; Ozeke et al., 2025). It is this alignment hypothesis that has motivated a multiplicity of pedagogical interventions, including adaptive learning technologies, as well as more complicated multimodal course-design techniques (Bazan-Perkins et al., 2024; Zahra et al., 2024).

However, the model has not been free of criticism. Scholars are worried about the lack of empirical substantiation of learning-style-based teaching and fear that the phenomenon of complex cognitive processes may be over-simplified (Husmann & O'Loughlin, 2019; Zapalska et al., 2007). Although there are still discussions about the theoretical validity and practical applicability of learning-style models, the VARK model continues to be a widely used assessment instrument among institutions of higher learning to profile their learners, informing faculty growth and helping to plan instruction (Pincay et al., 2024; Limaico et al., 2024). Over the past years, VARK has been used in a variety of fields such as medical education (Mishra,

2025; Demberel et al., 2025), engineering (Silva et al., 2020), business education (Zapalska & Brozik, 2006) and online learning (Ally et al., 2022; David et al., 2024). The COVID-19 crisis also increased the desire to learn about the preferences of learning as institutions quickly started practicing remote and hybrid education, and researchers sought to examine the ways learners interact with different methods of teaching (Ally et al., 2022; Fikri et al., 2023).

In the framework of the Malaysian higher education, where the present inquiry is framed, the notion of diversity in learning takes on a specific significance owing to the fact that the country has a multicultural population of learners and that the adoption of technology-enhanced pedagogies is a constant phenomenon (Nasir et al., 2021). The needs of Malaysian universities are focused on learners representing Malay, Chinese and Indian ethnic orientations and each of them incorporates different cultural conceptions of education and learning (Indriyani et al., 2025). Further, the current fast growth of web based/blended learning frameworks requires an evidence-based knowledge of how learners with different behavioural profiles react to a differentiated form of instruction (Othman & Amiruddin, 2010).

In this respect, the given work will be focused on defining the distribution of VARK learning style preferences among the undergraduate learners in the sample population, the most preferred learning strategies among the learners and to identify the way these preferences can affect the class scheduling and course design. Through the realization of these aims, educators, curriculum designers and administrators will have constructive information through which they can create more inclusive and effective learning infrastructures that are sensitive to heterogeneous needs and interests of learners.

Education and teaching are closely connected with each other, when these two aspects are properly combined, learners will master knowledge better, have a better conceptual and will develop the interest to study new concepts. Teaching approaches which match the favourite cognition styles of learners contribute to the development of secure, interpersonal environment and encourage learners to ask, improvise and accept risks of new ventures (Mohd Karim & Darus@Mat Junus, 2025).

Literature Review

The VARK Model

VARK construct was initially a project of the works of Neil Fleming in the late 1980s, when he proposed an actual tool of identifying the preferred sensory modalities of the learners during the learning process. This model describes four major preferences: visual learners, whose understanding is best supported when presented in the form of graphs, charts, diagrams, and spatial schemata; auditory learners, whose understanding is best developed by listening to lectures, participating in discussions, or having things explained through words; reading-writing learners, whose understanding is best supported by delivery of contents through text channel and supported by written tasks; and finally, the kinesthetic learners, whose understanding is best promoted by using hands-on activities, experiments and manipulation of artefacts (Fleming & Mills, 1992).

The Fleming Mills paradigm is based on the assumption that despite the ability of individuals to perceive data in various modalities, individuals tend to express a strong tendency towards specific sensory channels and, therefore, can better learn (Cowan, 2001). In contrast to ability

frameworks that perceive learning styles as fixed interactions instead of flexible cognitive abilities, this preference-centric viewpoint exists (Kirschner & van Merrienboer, 2017).

Modern theoretical and empirical research has extended the VARK schema to predict multimodal learning tendencies where a significant proportion of learners naturally combine more modalities instead of using one dominant style (Fleming & Mills, 1992; Fleming, 2001; Leite et al., 2010). This position is supported by theories of multimedia learning, which emphasize pedagogical benefits of aligning different representations in the instructional design (Mayer, 2014).

According to Othman and Abduddin (2010), it was postulated that the VARK ought to be understood flexibly in a way that it applies pedagogical, psychological, and practical facets, but should not be understood as a hard and fast taxonomic model. This fine interpretation is consistent with modern constructivist etiology which views learning as a process of (context) specific dynamic (Piaget, 1976). To this end, teaching methods should be adjusted to personal learning patterns of learners to enhance interaction and success in education (Mohamad et al., 2019).

The Application of VARK Learning Preferences in Higher Education

The VARK framework has been used in business, information- technology and engineering programmes, as well as outside the health sciences. Silva et al. (2020) examined the usage of VARK among undergraduate students of Systems Analysis and Development by considering how increased knowledge about learning styles may be used to design a curriculum in technology-driven settings. Valle-Escobedo et al. (2024) focused on learning styles in the first trimester of a group of students attending a Mexican university and provided some insight into the preferences of these participants in the matter during the crucial period of switching between secondary and tertiary levels.

The VARK model has gained extensive usage in the heterogeneous environment of higher education and particularly in the health sciences programs. There are a number of studies that explored the VARK preferences among medical trainees, and they have reported various distributions in different institutions and cultural contexts (Mishra et al., 2025; Kannappan et al., 2025). As an example of utilizing this, Mishra et al. (2025) studied the preferences of first-year MBBS students in terms of learning styles and attempted to outline their relationship with academic performance in the first-year medical courses. At the same time, the VARK model was used by Kannappan et al. (2025) in first-year medical students, thus adding to the evidence base on the topic of learning preferences in medical education.

The model has also taken centre stage in distance and online learning environments, where learning preferences view requires an insight into the learning preferences to be able to design teachings successfully (Ally et al., 2022). Zapalska & Brozik (2006) analyzed learning styles in the context of online learning settings and outlined the ways in which the preferences of modality may be utilized in the digital. Moreover, in the article by Ally et al. (2022), challenges of education during the COVID-19 pandemic are examined. It is clear that it is essential to address multimodal preferences of students in emergency remote teaching.

The VARK preferences discussed by Dey et al. (2024) were addressed to the cohorts of Open and Distance Learning (ODL) and addressed the implications that individualized pedagogy could have on the learner achievement in the non-traditional environment. Their results

highlighted the peculiarities of challenges and opportunities related to accommodating the range of learning styles in the environment in which face-to-face interaction will be limited or be non-existent.

Applications of the VARK model to institutions have included learner orientation programmes, faculty development workshops, academic advising and learning-support services (Fleming & Mills, 1992). Other institutions have also used VARK testing in first-year experience programmes to promote metacognitive awareness of learning style and consequently promote the adoption of more effective learning strategies (Kirschner & van Merrienboer, 2017).

Effectiveness Studies and Academic Performance

Sufficient body of research has already been conducted on the intersection of VARK learning preferences and academic performance with findings that appear to either support or refute each other. Positive correlations between learning-style cognizance and academic performance have been a few times reported in empirical studies (Vanegas et al., 2024; Mishra et al., 2025; Ozeke, 2025), although other studies have reported weak or non-significant relationships (Husmann & OLoughlin, 2019; Zapalska et al., 2007).

Mishra et al. (2025) assessed the relationship between learning-style proclivity and academic achievement among first-year MBBS students, which reported that the knowledge of individual preferences was associated with more effective study strategies, but had a small direct impact on final grades. A comparison of the relationships between the preferred mode of learning and the undergraduate performance in the health-sciences with other students studying in a Middle Eastern university showed patterns of discipline-specificity in the manner the learning preference is mediated through performance measures (Gangadharan et al., 2025).

Bazan-Perkins et al. (2024) also investigated the correlation between learning outcomes and VARK preferences among School of Medicine and Health Sciences students using both pre- and post-test designs to reflect the true amount of knowledge gained instead of using grade-based indices to understand it. This is as a result of their findings which show that the relationship between learning styles and learning gains is complex and moderated by the quality of instruction, learner motivation and previous knowledge.

Indriyani et al. (2025) specifically examined VARK styles in the context of an instructional media course and found that the alignment between the design of the instruction and the preferences of the learners had a positive correlation with satisfaction and engagement, although this alignment did not always result in better scores in tests. These two divisions into affective (satisfaction, motivation) and cognitive (knowledge acquisition, performance) outcomes have become a relevant factor in effectiveness studies (Andrade-Arenas et al., 2023).

On the other hand, the pedagogical importance of learning-style-based instruction has been criticized by critical research. According to Husmann and O'Loughlin (2019), there were expectations of variations between undergraduate anatomy learners in strategies of study, performance in classes, and declared VARK preferences. Their results have shown that learners who used strategies that were consistent with their reported VARK profiles did not do any better as compared to those who did not, which invalidated the practical utility of learning-style-based pedagogy.

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EISSN: 2600-8777
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Ozeke et al. (2025) made an excellent study of the ability of learning styles or study approaches to better predict academic success in medical schools. The results of the study supported study approaches, not VARK preferences. This finding is consistent with the overall literature of educational psychology that highlights the importance of learning strategies over learning styles (Septiani et al., 2024).

Methodology

The study utilized a cross-sectional survey research design to explore the VARK learning-style preferences and other learning features in a group of undergraduate learners. In order to collectively tabulate standardized data of a relatively large group, a quantitative method was considered suitable. Cross-sectional designs are especially crucial to descriptive research purposes and have been widely used in previous studies of higher-education variables of learning styles (Mishra et al., 2025; Kannappan et al., 2025; Demberel et al., 2025).

The research sample included 84 undergraduate learners who belong to a government institution in Malaysia. Convenience sampling was used to recruit the participants in diverse academic programmes. The resulting sample included learners across a wide range of their undergraduate years, thus offering a cross-sectional representative sample of learners of the university.

A structured questionnaire that was broken down into three separate sections was used to get the data. The first section involved the collection of demographic factors. The second part took VARK questionnaire test to identify individual preferences of learning methods. Learning styles were categorized into Visual, Auditory, Reading/Writing and Kinesthetic were in the third section. Time preferences also include in the third section.

Findings

Learning Style Preferences

The study of the learning style preferences of the 84 learners showed that Visual learning preference was well dominant, closely followed by Reading/Writing preference and Auditory and Kinesthetic preferences were found to be significantly less prevalent among the 84 learners as shown in **Figure 1**.

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IJMTSS
EISSN: 2600-8777
Volume 9 Issue 34 (June 2026) PP 21-34

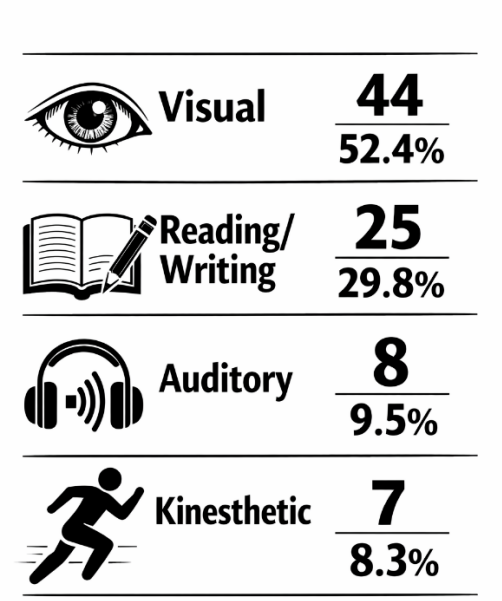

Figure 1: VARK Learning Styles Preferences

Source: Author

The sample was dominated by visual learners (52.4% or 44 individuals), which means that over half of the participants lean towards using graphs, charts, maps, diagrams and other visual aids as the means of learning. The observation is consistent with a lot of literature in the higher education setting which has reported Visual Preference as the prevalent mode of learning between higher education learners (Mishra et al., 2025; Gangadharan et al., 2025; Demberel et al., 2025).

Reading/writing learners were the second-largest cohort with 29.8 percentage (n=25) indicating that almost a third of learners favoured the reading and analysis of written text. the percentage of the visual and reading/writing learners (82.2%) is rather high, so it is possible to state that an overwhelming majority of the learners in this sample preferred the visual or text-based learning modalities.

Conversely, auditory learners were the fewest 9.5 percent of the sample and kinesthetic learners were the fewest 8.3 percent of the sample. The comparatively low scores in auditory or kinesthetic modalities among the learner population can be attributed to trends in most studies on higher education, but the extent to which this difference manifests itself depends on context and subject (Bazán-Perkins et al., 2024; Kannappan et al., 2025; Demberel et al., 2025).

Learning Method Preferences

The preference of various learning approaches by learners showed that there was a high tendency of learners to use traditional face-to-face instruction, although there were significant minorities who preferred online and activity-based learning. The result of the learning method preferences as shown in **Figure 2.**

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EISSN: 2600-8777
Volume 9 Issue 34 (June 2026) PP 21-34

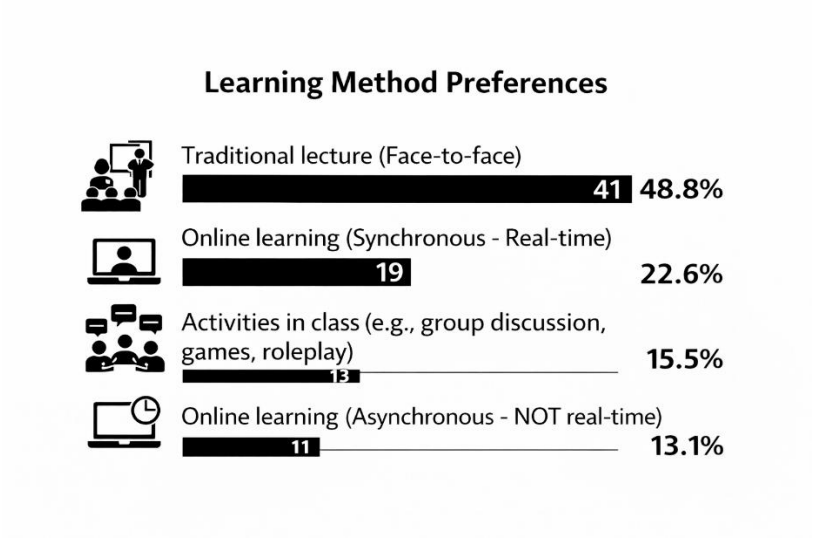

Figure 2: Learning Method Preferences

Source: Author

The most favoured learning method was the traditional face-to-face lectures, which were chosen by 48.8 percent of the learners. This result implies that even in the face of the growing number of opportunities and advertisements on online learning programs, almost 50 percent of learners still prefer traditional approaches to learning, where the classroom setting is adopted.

The second most preferred mode was online synchronous learning (real-time) 22.6 percent which means that one out of five learners prefer live online learning where there is a time link between the instructors and learners. Learners favoured in-class tasks (group discussions, games, role-play) the most (15.5% of learners), whereas online asynchronous learning (not real-time) was the least favourite (13.1% of learners).

The overall preference of face-to-face approaches (traditional lecture and in-class activities) amounted to 64.3 percent and overall preference of online approaches (synchronous and asynchronous approaches) amounted to 35.7 percent. This distribution indicates that even though online learning has been accepted, physical classroom presence is still appreciated by most of the learners in this sample.

Learning Time Preferences

The study of preferred time of learning indicated that morning classes were very popular with other timeframes being significantly less favoured as shown in **Figure 3**.

International Journal of Modern Trends in Social Sciences
IJMTSS
EISSN: 2600-8777
Volume 9 Issue 34 (June 2026) PP 21-34

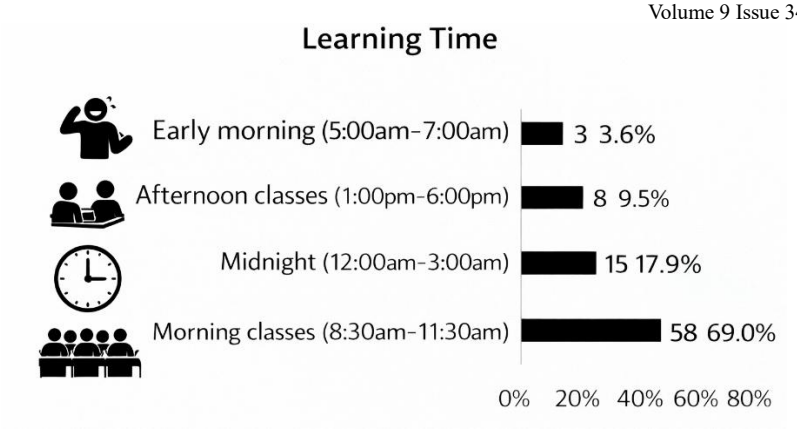

Figure 3: Learning Time Preferences

Source: Author

Classes in the morning (8:30am to 11:30am) were by far more popular with 69 percent of learners having this time as their choice. This observation has significant implications on scheduling the classes and indicates the conventional morning schedule of classes fits well in the chronobiology of learners and daily habits. Interestingly, the second most popular time interval at 17.9 percent was midnight study (12:00am to 3:00am) (which also means that the proportion of late-night learners is quite significant). This trend could be an indication of learners who labour during the day, their family commitments or even the circadian response that suits their brain to work during the later hours of the day. Only 9.5 percent of learners preferred evening classes (1:00pm to 6:00pm) indicating that the post-lunch time might not be the most suitable time to learn among most of the learners, perhaps because of post prandial slumps in alertness or conflicting engagements. Learning very early in the morning (5:00am to 7:00am) was least preferred (3.6%) which means that not many learners prefer learning before dawn.

Discussion

To begin with, the fact that the most common learning preferences are the visual ones confirms that in the modern higher education, the visual representations are still the most popular channel through which knowledge can be gained. The percentage of visual learners who are 52.4 is also high and therefore the data indicate that learners can process information better when presented in a diagram, chart, graph, and other visual formats. This trend is consistent with the existing empirical studies that suggest the strong inclination towards the use of visual-mediated learning environment among university learners (Mishra et al., 2025; Gangadharan et al., 2025; Demberel et al., 2025). Also, the fact that the percentage of reading and writing learners (29.8%) is rather high supports the importance of the text-based academic activity, i.e. academic reading, taking notes and written analysis. Collectively, the visual and reading/writing modalities cover 82.2 percent of the learners which means that the engagement by cognitive learners to visual and textual data still remains dominant in learning orientation among scholars in universities.

Auditory and kinesthetic preferences were significantly less frequent. Only 9.5 percent of the cohort was made up of auditory learners and 8.3 percent was made up of kinesthetic learners. In spite of the commonly emphasized role of these modalities in the context of active learning, the relatively low proportion reflects the tendencies in the literature of higher education (Bazanavan et al., 2024; Kannappan et al., 2025; Demberel et al., 2025). However, the

existence of these styles confirm that diversity in instruction is vital to support diverse needs of the learners.

The information concerning the favourite approaches to learning also supports the persistence of the relevance of the traditional classroom environment. Almost half of the participants (48.8%) stated that they would choose the experience of face-to-face lectures, highlighting the long-term importance of direct interaction with the instructor and formal classroom settings. Online learning was the second most preferred (22.6%) and was followed by asynchronous learning (13.1%). Face-to-face approaches in an aggregate form were approximated to be 64.3 percent of the learner choices versus 35.7 percent of the learner choices of online modalities. This dispersion implies that even though the digital learning platforms are still growing, physical classroom interactions are central in influencing the effectiveness of learning as perceived by learners.

Lastly, the results about the desired learning times indicate that the preference was to academic schedules in the morning. Most of the learners (69%) preferred between 8.30am and 11.30am which means that this time is suitable concerning the cognitive alertness of learners and their day-to-day activities. Interestingly, midnight study sessions became the second most desired (17.9%) time which showed that there was a separate group of late-night learners. This kind of variation underscores the role of individual circadian rhythms and lifestyle in studying habits. On the other hand, afternoon classes (9.5%) and very early morning sessions (3.6%) were significantly less popular probably because of reduced alertness in the after-lunch hours and reduced preparedness to engage in pre-dawn learning activities.

Conclusion

The current research provides clear information on the learning preferences, modalities and time proclinations of higher education learners, which demonstrate the prevalence of the visual and textual modes. The strong tendency of learners towards visualization (diagrams, charts, and graphs) and the participation in the reading and writing activities suggests that the methods of education that involve the said aspects are likely to be the most effective, in turn. Even though auditory and kinesthetic preferences can be identified, they are relatively uncommon, which is why it is imperative to use a diversified approach to teaching to embrace all types of learners. As far as the learning methodologies are concerned, the learners portray a conspicuous inclination towards traditional face-to-face learning, which proves the persistence of the primary importance of real-time instructor-mediated learning and real-time classroom interaction. On the other hand, online learning fashions, both synchronous and asynchronous, are recognized as a feasible option but they tend to be given the second order concerning face-to-face interaction. In regard to the learning schedules, the conventional morning schedules are widely supported, which is in line with the cognitive availability and daily habits of learners. All these observations highlight the urgency of differentiating the higher-education practices to suit the dominant learning modalities, institutional desired forms of learning and time-related trends in order to maximize learner learning and engagement.

Acknowledgements: The authors would like to express their sincere gratitude to University Utara Malaysia for providing the necessary resources and support throughout the course of this research. Special appreciation is extended to colleagues and peers who contributed valuable insights and constructive feedback, which greatly enhanced the quality of this paper.

Funding Statement: No Funding

Conflict of Interest Statement: The authors declare that there is no conflict of interest regarding the publication of this paper. All authors have contributed to this work and approved the final version of the manuscript for submission to the International Journal of Modern Trends in Social Sciences (IJMTSS)

Ethics Statement: This study did not involve any human participants, animals, or sensitive data requiring ethical approval. The authors confirm that the research was conducted in accordance with accepted academic integrity and ethical publishing standards.

Author Contribution Statement: All authors contributed significantly to the development of this manuscript. Khofizhoah Mohd Karim and Ani Munirah Mohamad were responsible for the conceptualization, methodology, and overall supervision of the study. Mohd Rizal Safar handled data collection, analysis and interpretation of results. Ummi Naiemah Saraih contributed to the literature review, drafting, and critical revision of the manuscript. All authors read and approved the final version of the manuscript prior to submission.

International Journal of Modern Trends in Social Sciences
IJMTSS
EISSN: 2600-8777
Volume 9 Issue 34 (June 2026) PP 21-34

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