

Technological Access, Cognitive Load, and Motivation in University Students' Keyboarding Readiness: A Framework

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ABSTRACT

This paper presents a conceptual framework that examines the influence of technological access, cognitive load, and personal motivation on keyboarding skill readiness among university students in Malaysia. The framework integrates key theories, including the Technology Acceptance Model (TAM), Cognitive Load Theory (CLT), and Self-Determination Theory (SDT), to understand how these factors shape students' ability to develop keyboarding proficiency. Drawing on recent studies, the paper identifies the critical role of technological access in facilitating consistent practice, the importance of managing cognitive load to optimise learning, and the influence of intrinsic motivation in fostering engagement with keyboarding tasks. Despite the growing emphasis on digital literacy in higher education, disparities in technological access and varying levels of keyboarding proficiency remain significant challenges, particularly among students from different socioeconomic backgrounds. By proposing a structured approach that addresses these factors comprehensively, this paper offers actionable recommendations for educational institutions to enhance digital literacy and keyboarding skills, thereby preparing students for academic and professional success in an increasingly digital world. Future research should focus on empirically testing this framework to validate its effectiveness in different educational contexts.

Keywords: keyboarding skills, technological access, cognitive load, personal motivation

INTRODUCTION

In today's digitised global economy, keyboarding skills are now deemed necessary. Known as the ability to efficiently and accurately type using a keyboard, keyboarding is crucial in navigating digital environments. Its indispensability is particularly evident in higher education, where students are expected to complete assignments, research, and communication tasks using digital tools. Accordingly, as universities increasingly adopt technology-enhanced learning and assessments, proficiency in keyboarding becomes critical for academic. Research indicates that proficient keyboarding significantly enhances students' productivity and efficiency, enabling them to perform better in digital assignments, research, and communication tasks [7]. This integration of keyboarding skills is particularly crucial as higher education institutions worldwide shift towards more digital learning models; a trend accelerated by the global COVID-19 pandemic [17]. The growing reliance on online platforms underscores the importance of ensuring that students are well-prepared with the necessary digital literacy, including keyboarding proficiency, to meet the demands of higher education and beyond.

In Malaysia, the higher education sector has also seen a rapid shift towards digital platforms, driven by both global trends and local educational policies. Malaysian universities are increasingly emphasising digital literacy as a primary component of their curricula to ensure that students are equipped with the skills needed for the modern workforce [21]. However, challenges remain, particularly regarding unequal access to

technology and varying levels of keyboarding proficiency among students from different socioeconomic backgrounds [9]. These disparities can hinder students' readiness to fully engage with digital learning tools, particularly in universities where assignments and assessments are increasingly conducted online [2].

As Malaysia continues to expand its digital infrastructure in education, there is a growing need for focused efforts at the higher education level to bridge these gaps and ensure that all students develop the keyboarding proficiency required for academic and professional success. Nevertheless, while socioeconomic disparities can affect students' access to technology, the present study focuses on the broader role of technological access, cognitive load, and personal motivation in shaping students' keyboarding readiness, which contributes to improved learning outcomes. These key factors collectively support students in improving their digital skills, thus narrowing the gap between keyboarding and digital learning proficiencies.

Research in higher education has consistently demonstrated the impact of technological access and cognitive load on students' academic performance. For instance, [10] found that access to digital resources significantly enhances students' engagement and performance in online learning environments. Similarly, [13] emphasised that managing cognitive load effectively is crucial for students to learn and retain information, particularly in complex digital tasks such as keyboarding. Furthermore, studies on motivation, such as the work by [5], have highlighted that students with higher intrinsic motivation are more likely to engage in self-directed learning, which is critical for developing keyboarding proficiency. These findings underline the roles that technological access, cognitive load, and personal motivation play in shaping students' readiness for keyboarding skills.

While there is substantial research on digital literacy and online learning, limited attention has been given to the specific readiness factors for keyboarding proficiency, particularly within the higher education context in Malaysia. To illustrate, although studies like the one by [18] have explored the integration of technology in skill development, particularly handwriting, there remains limited attention on the specific readiness factors for keyboarding proficiency in Malaysian higher education. Furthermore, most existing studies tend to examine digital literacy as a broad concept, without delving into the critical role that keyboarding skills play in academic success. For instance, [1] discuss digital literacy among first-year students but does not explore the specific skills needed for academic tasks like keyboarding. This paper aims to address this gap by examining how technological access, cognitive load, and personal motivation influence keyboarding skill readiness among university students in Malaysia. The key objectives are to: (1) identify the primary factors affecting keyboarding readiness, (2) propose a conceptual framework linking these factors to keyboarding skill readiness, and (3) offer actionable recommendations for educational institutions to enhance students' digital literacy through targeted interventions.

LITERATURE REVIEW

Previous Studies

The studies presented in the Table 1 explore various aspects of readiness for keyboarding skills, focusing on technological access, cognitive load, and personal motivation in educational contexts. Reference [20] conducted an experimental study comparing the keyboarding and handwriting speeds of higher education students, revealing that efficient keyboarding skills are crucial for academic tasks. Building on this, [12] conducted a longitudinal study, highlighting the improvement in students' fine motor skills following keyboarding training, emphasising the importance of targeted instruction to enhance readiness. Reference [8] examined the correlation between keyboarding fluency and writing performance, finding that higher keyboarding fluency reduced cognitive load and was positively associated with better writing performance. Lastly, [14] examined the relationship between motor skill proficiency and overall academic readiness, highlighting that students with better motor skills tended to perform better in tasks requiring fine motor coordination. While the study did not specifically focus on keyboarding, it implies that developing motor skills could indirectly enhance students' keyboarding performance by improving their ability to engage with digital tools more effectively. These studies collectively emphasise the importance of addressing both physical and cognitive factors to enhance students' readiness for keyboarding skills in higher education.

Table 1. Recent Studies on Readiness for Keyboarding Skills

Author & Year	Title	Method	Key Findings
Weigelt-Marom, H., & Weintraub, N. (2018)	Keyboarding versus handwriting speed of higher education students with and without learning disabilities: Does touch-typing assist in narrowing the gap?	Experimental study comparing keyboarding and handwriting speeds among university students	Found that keyboarding speed is generally slower than handwriting speed among students, indicating the need for increased keyboarding practice.
McGlashan, H.L., Blanchard, C. C., Sycamore, N. J., Lee, R., French, B., & Holmes, N. P. (2017)	Improvement in Students' Fine Motor Skills Following Keyboarding Training	Longitudinal study assessing the development of motor skills in relation to keyboarding proficiency in a controlled educational setting	Showed that consistent keyboarding training led to significant improvements in fine motor skills and overall keyboarding proficiency among students.
Gong, T., Zhang, M., & Li, C. (2022)	Association of keyboarding fluency and writing performance in online-delivered assessment	Quantitative study analysing the correlation between keyboarding fluency and writing performance in online assessments	Found a positive correlation between keyboarding fluency and writing scores, suggesting that greater keyboard fluency reduces cognitive load, leading to improved writing performance.
Ramos-Campo, D. J., & Clemente-Suárez, V. J. (2024).	The Correlation between Motor Skill Proficiency and Academic Performance in High School Students	Quantitative study analysing the relationship between motor skills and academic performance, using Functional Movement Screen (FMS) for assessment	Found that students with better- developed motor skills tended to achieve higher academic performance, suggesting that motor skills are a predictor of academic success.

Synergy Between Technological Access, Cognitive Load, and Personal Motivation

Technological access, cognitive load, and personal motivation each contribute to students' readiness for keyboarding skills in higher education. Technological access refers to the availability and usability of digital tools and resources that facilitate learning. The frequency of technology use plays a critical role in developing keyboarding skills, with access to digital resources potentially influenced by socioeconomic contexts [9]. Moreover, when students have reliable access to technology, they are more likely to engage in consistent practice and improve their keyboarding proficiency ([6]; [19]). Cognitive load relates to the mental effort required to learn and apply new skills. Managing cognitive load effectively allows students to retain information and develop their keyboarding skills without becoming overwhelmed by the complexity of tasks [13]. Personal motivation drives students' persistence in learning, with higher intrinsic motivation leading to greater engagement in self-directed activities, such as keyboarding practice [5]. This motivation can be influenced by various contextual factors, including students' learning culture and their interest in technology, which may shape the degree of importance placed on developing digital skills like keyboarding [15]. By focusing on improving technological access, reducing cognitive load, and fostering personal motivation, educational institutions can significantly enhance students' readiness to develop and apply keyboarding skills in academic settings.

Theories and Models Underpinning the Framework

Several key theories offer insights into how technological access, cognitive load, and personal motivation each influence students' readiness for keyboarding skills. The Technology Acceptance Model (TAM), introduced by [3], provides a framework for understanding how students' perceptions of technology affect their engagement and skill development. According to TAM, perceived ease of use and perceived usefulness are crucial in determining students' acceptance and adoption of technology. In the context of keyboarding skills, technological access becomes essential. If students perceive keyboarding tools as easy to use and find them beneficial for academic and professional tasks, they are more likely to engage with these tools regularly, which can lead to improved proficiency.

In higher education, access to well-designed keyboarding software and hardware can enhance students' readiness for keyboarding skills. By ensuring that technological tools are intuitive and accessible, educational institutions can reduce cognitive barriers, thus facilitating students' skill development. The study by [20] supports this by showing that students with access to efficient keyboarding tools performed better in digital tasks compared to those who relied on handwriting.

Cognitive Load Theory (CLT), developed by [16], focuses on optimising the mental effort required during learning. CLT suggests that educational materials and tools should minimise unnecessary cognitive effort, allowing students to concentrate on developing their keyboarding skills. Study by [8] highlights that managing cognitive load is critical for effective keyboarding performance.

When cognitive load is not managed effectively, students may become overwhelmed by the complexity of the keyboarding task, hindering their ability to practice and improve. For example, if a keyboarding program presents too many complex instructions or requires students to multitask excessively, it may increase their cognitive load, reducing their ability to focus on learning the actual skill. By designing learning environments that reduce extraneous cognitive load, educators can better prepare students for keyboarding tasks.

Self-Determination Theory (SDT), developed by [4], emphasises the importance of intrinsic motivation in driving learning and skill development. In the context of personal motivation and readiness for keyboarding skills, SDT suggests that when students feel autonomous and competent in their learning environment, they are more likely to engage in self-directed practice, leading to greater proficiency.

The longitudinal study in [12] shows that students who were intrinsically motivated to improve their fine motor skills demonstrated higher readiness for keyboarding tasks. Similarly, study by [11] found that students with a positive attitude towards learning keyboarding skills were more likely to engage in regular practice, leading to better outcomes. SDT posits that by fostering a learning environment that supports students' autonomy, competence, and relatedness, educators can enhance students' intrinsic motivation, leading to better readiness for keyboarding.

In summary, the integration of these theories, TAM, CLT, and SDT, provides a comprehensive understanding of the variables influencing readiness for keyboarding skills. Technological access is linked to TAM, highlighting the importance of perceived ease of use and usefulness in engaging students with digital tools. Cognitive load is addressed through CLT, emphasising the need to design instructional materials that minimise mental overload and enhance learning efficiency. Finally, personal motivation is grounded in SDT, which emphasises the role of intrinsic motivation in fostering continuous practice and skill development. These theories collectively provide a foundation for understanding how technological access, cognitive load, and personal motivation contribute to shaping students' readiness for mastering keyboarding skills in higher education contexts.

CONCEPTUAL FRAMEWORK

Overall, the conceptual framework (Fig. 1) explores the factors influencing keyboard skill readiness among students in higher education. The framework integrates three core components: technological access, cognitive load, and personal motivation, and illustrates their importance in shaping students' readiness for keyboarding

skills. Technological access refers to the availability and usability of digital tools and resources that facilitate learning. It encompasses how often students engage with technology, with the frequency of use potentially varying due to different levels of access. Cognitive load involves managing the mental effort required for learning and skill development, with lower cognitive load contributing to better skill acquisition. Personal motivation relates to students' intrinsic motivation to engage in self-directed activities like keyboarding practice, with factors such as cultural attitudes towards digital literacy potentially shaping motivation. This motivation fosters consistent improvement in keyboarding skills, contributing to overall digital proficiency.

The relationships within this framework suggest that greater technological access, effective cognitive load management, and strong personal motivation contribute to improved keyboarding skill readiness. These three elements work together to determine how students interact with digital tools and how prepared they are for academic and professional environments that require proficient keyboarding skills.

Building on this understanding, the proposed framework offers a structured approach for examining how technological access, cognitive load, and personal motivation influence keyboarding proficiency in higher education. Future research could explore how specific socioeconomic and cultural factors further contextualise each of these variables. By addressing these factors holistically, educational institutions can better support students in developing the keyboarding proficiency needed in increasingly digital academic and professional contexts.

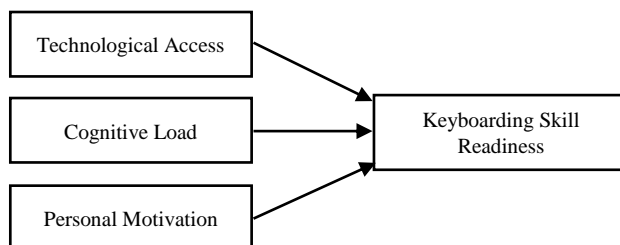


Fig. 1 Conceptual Framework

CONCLUSION

This paper proposes a conceptual framework for understanding the factors influencing keyboarding skill readiness among students in higher education. The framework integrates three core components: technological access, cognitive load, and personal motivation, each grounded in established theories such as the Technology Acceptance Model (TAM), Cognitive Load Theory (CLT) and Self-Determination Theory (SDT). These variables suggest that keyboarding skill readiness involves multiple factors, requiring consideration of technology, cognitive demands, and student motivation. These components illustrate how keyboarding skill readiness is shaped by multiple factors, requiring a comprehensive approach that considers access to technology, cognitive demands, and the motivation to engage in learning.

By addressing these variables in an integrated manner, educational institutions can better equip students with the digital literacy skills essential for both academic success and professional competence. The framework highlights the importance of creating learning environments that provide adequate technological access, minimise cognitive load, and foster intrinsic motivation, ensuring that all students can develop the keyboarding skills necessary for navigating the increasingly digital landscape of higher education. This can also emphasise the need for early educational institutions to adapt their curricula, ensuring that students develop foundational keyboarding skills before entering higher education.

Future research could empirically test the current framework to validate its effectiveness in shaping students' readiness for keyboarding skills. In addition, expanding the framework to incorporate broader contextual factors, such as socioeconomic conditions influencing technology use and cultural values affecting personal motivation, could provide a more detailed understanding of how these external elements interact with the key factors of technological access, cognitive load, and personal motivation. This would allow for more targeted strategies to enhance students' keyboarding readiness, ultimately equipping them to meet the demands of

increasingly digital academic and professional environments.

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