

IMPACT OF INTERNET CONNECTIVITY, ENVIRONMENT, AND STUDENTS' EMOTIONS ON E-LEARNING

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Abstract: The Coronavirus Disease 2019 (COVID-19) has shifted education from traditional methods to e-learning, which may be influenced by factors such as internet connectivity, learner environment, and student emotions. This study investigates how these factors affect e-learning effectiveness among 350 university students from the Faculty of Business and Communication (FPK) at Universiti Malaysia Perlis (UniMAP). Data was collected through self-administered questionnaires using simple random sampling. Pearson's correlation coefficient and multiple regression analysis were applied to assess the relationships between the variables. The results revealed that internet connectivity ($r = 0.502$) and student emotions ($r = 0.548$) significantly impact e-learning effectiveness, while the learner environment demonstrated no significant influence. Multiple regression analysis confirmed that internet connectivity ($\beta = 0.231$) and student emotions ($\beta = 0.350$) are key contributors to e-learning success, explaining 33.8% of the variance. The findings highlight the importance of ensuring stable internet access and addressing students' emotional well-being for effective online learning. Recommendations include enhancing internet infrastructure and providing emotional support to optimise the e-learning experience. This study offers valuable insights into e-learning challenges during the pandemic, emphasising the need for institutions to prioritise technology and mental health resources to improve learning outcomes.

Keywords: E-learning, Internet connectivity, learner environment, students' emotions.

Introduction

The emergence of the new norm has necessitated a significant shift towards e-learning as a means to continue education (Chung *et al.*, 2020; Radzi & Sulaiman, 2021). Higher education institutions worldwide have transitioned from traditional face-to-face methods to virtual platforms. The adoption of e-learning technologies has become essential in contemporary education. Consequently, Universiti Malaysia Perlis (UniMAP) has embraced e-learning to meet the needs of both students and educators in the wake of the pandemic.

UniMAP established in 2001, is a prominent technical university in Malaysia, known for its focus on engineering, technology, and applied sciences. UniMAP with students

from various locations and a commitment to innovative teaching methods has been at the forefront of incorporating technology into education. The shift to e-learning at UniMAP was a strategic response to the Coronavirus Disease 2019 (COVID-19), aimed at ensuring the continuity of education while adhering to health and safety guidelines.

E-learning is defined as an educational process that leverages the internet to facilitate instruction without requiring face-to-face interaction. Firat and Bozkurt (2020) described this process using terms such as distance learning, network learning, and virtual learning. The proliferation of information technologies has significantly enhanced the accessibility of e-

learning for university students, enabling them to continue their studies remotely. Commonly used platforms for this purpose include Zoom and Google Classroom.

At UniMAP, the transition to e-learning involved the adoption of various digital tools and platforms to support synchronous and asynchronous learning. Faculty members received training to deliver online lectures and engage students in virtual environments effectively. Additionally, the university provided resources and support to ensure students had the necessary technology and internet access to participate in e-learning.

However, the shift to e-learning has not been without challenges. Issues such as decreased attendance, poor academic performance, and lack of effective communication have emerged as significant concerns (Padmini & Ramani, 2023). Therefore, this paper aims to identify the factors influencing the effectiveness of e-learning, specifically focusing on business students from the Faculty of Business and Communication (FPK) at UniMAP.

The COVID-19 pandemic has accelerated the adoption of e-learning in educational practices, marking a significant shift from pre-pandemic norms. E-learning, an internet-based teaching system, encompasses technologies and platforms that facilitate online education, allowing university students to engage in learning activities via the internet (Naveed *et al.*, 2020). With advancements in technology and internet infrastructure, e-learning has become increasingly prominent in academia. Moreover, e-learning initially referred to as distance education (Baber, 2020) has evolved substantially since its inception at the turn of the millennium (Croese, 2017).

Furthermore, educators now have access to a diverse array of online tools and platforms, such as Zoom, Google Classroom, and Webex, which facilitate both synchronous and asynchronous learning. During the COVID-19 pandemic, these applications were crucial in sustaining the educational process, enabling students and

educators to continue their interactions and coursework remotely (Yaacob & Md Saad, 2020). Moreover, e-learning platforms offer flexible methods for teaching and learning, allowing learners to access and engage with educational materials, interact with instructors, and collaborate with peers in ways that were previously impractical.

This literature review aims to explore the effectiveness of e-learning on aspects such as internet connection, learner environment, and students' emotions among UniMAP students. Therefore, by examining current research, this review will provide insights into the challenges associated with e-learning and highlight the specific context of its application at UniMAP.

Impact of Internet Connectivity on E-Learning

In e-learning, internet connectivity arises as a fundamental challenge that significantly impacts the educational experience. Notably, reliable internet access is essential for uninterrupted participation in virtual classes and for accessing online resources, such as assignments, information, and notes, across various computing platforms (Naveed *et al.*, 2020; Sia & Adamu, 2020). Students with unstable or inadequate internet connections often encounter interruptions that impede their ability to engage effectively with course materials. Hence, to address these issues, educational institutions should establish robust support mechanisms, including technical assistance and clear guidelines on minimum connectivity requirements, to ensure equitable access for all students (Baber, 2020).

Moreover, internet access remains a significant concern, particularly for students residing in rural areas. For example, in Malaysia, those living in rural regions often struggle with slow or unreliable internet connections, which can severely hinder their e-learning experience (Bestiantono, 2020). Although UniMAP has facilitated better internet access by allowing students from rural areas to return to university dormitories, the issue persists with campus Wi-Fi

systems, where pre-determined data limits may still affect connectivity (Chung, 2020).

Furthermore, the impact of internet connectivity extends to collaborative aspects of e-learning as well. Group discussions and collaborative activities can be impeded by connectivity issues, particularly for students with limited broadband access or inadequate electronic equipment. However, while e-learning systems offer convenience and flexibility, they may fall short in effectiveness if connectivity issues are not adequately addressed. As such, improving internet infrastructure remains a critical agenda for universities adapting to the new norm of online education (Chung, 2020).

Impact of the Learning Environment on E-Learning

The learning environment is a critical factor influencing the effectiveness of online education. Unlike traditional classrooms, e-learning lacks the physical presence of peers and instructors, which can negatively affect students' concentration and productivity (Hassan & Mohd Hassan, 2024). A less-than-ideal home environment, characterised by distractions and inadequate study spaces, can exacerbate these challenges. Consequently, educational institutions can help mitigate these issues by providing guidelines for creating effective study environments at home and offering resources to support students in setting up a conducive learning space (Kamaludin & Sundarasan, 2023). The shift to virtual learning, mandated by educational authorities to curb the spread of COVID-19, has prompted students to adapt to a home-based learning model. This transition has led to concerns about students' motivation and engagement, as the informal home setting contrasts sharply with the structured environment of a university (Hassan, 2021).

Moreover, the prevalence of social media can further undermine students' focus during e-learning. Platforms such as Instagram and YouTube often distract students, making it challenging for them to remain attentive to their

studies (Lim *et al.*, 2023). This distraction, combined with the comfort of studying from home, can contribute to decreased enthusiasm and commitment to learning. Notably, research highlights that students' learning environments significantly impact their academic performance, with inadequate or distracting home settings leading to reduced focus and engagement.

Additionally, the issue of socioeconomic inequality plays a significant role in the e-learning experience. Disparities in access to technology and a conducive home environment can create unequal learning opportunities among students (Condon *et al.*, 2020; Aboagye *et al.*, 2021). Students from low-income families may face challenges such as limited access to modern technology and inadequate study spaces, affecting their ability to participate effectively in online classes (Shahzad *et al.*, 2021). The impact of these disparities is evident in the academic performance of students, with those from less privileged backgrounds experiencing more pronounced difficulties (Pokhrel & Chhetri, 2021). As such, ensuring that all students have access to a suitable learning environment is essential for enhancing the effectiveness of online education during the pandemic (Abd Aziz, 2021).

Research indicates that while naturally motivated students may require minimal supervision, those facing socioeconomic challenges often struggle without additional support (Mirahmadizadeh *et al.*, 2020). Furthermore, the lack of access to a conducive learning environment, coupled with reduced interaction with instructors and peers, can lead to a decline in academic performance, particularly in end-of-year and internal exams (Sintema, 2020). Thus, creating a comfortable and effective e-learning environment is crucial for supporting students throughout the pandemic and beyond.

Impact of the Students' Emotion on E-Learning

Students' emotions play a crucial role in determining the effectiveness of e-learning. The transition to online education can evoke feelings of isolation, anxiety, and stress, which adversely

impact students' engagement and academic performance (Seenivasagam *et al.*, 2023). Moreover, the absence of face-to-face interactions and the challenges of adapting to new learning modalities can exacerbate these emotional difficulties. Hence, to support students' emotional well-being, institutions should provide access to counselling services and create opportunities for virtual social interactions. On the other hand, incorporating interactive and supportive elements into online courses can also help mitigate feelings of isolation and improve the overall learning experience (Ghazali *et al.*, 2023).

Technical difficulties and the pressures of managing assignments can exacerbate these emotional challenges. Students often face anxiety over potential connectivity issues, particularly when attempting to submit assignments (Fadzil & Sarah, 2020). Moreover, excessive assignment deadlines and family pressures can create additional stress, affecting students' emotional states and their ability to focus on their studies (Baber, 2020). The variability in emotional responses, such as frustration and boredom, underscores the importance of addressing emotional well-being to enhance motivation and academic performance in an e-learning environment. As noted by Kanuka and Jugdev (2006), distance and disconnection in e-learning can lead to increased dropout rates and reduced motivation. Therefore, students must develop strategies to manage their emotions and maintain motivation to optimise their e-learning experience during this pandemic.

Materials and Methods

Sample

This study examined the effectiveness of e-learning among university students at the FPK, UniMAP. According to the Faculty's main website (<https://fpk.unimap.edu.my/>), there are 2,047 students in the FPK in 2024. Although only 327 respondents were required for this study, according to Krejcie and Morgan (1970), the

researcher managed to collect 350 respondents for the entire study.

This study used a simple random sampling technique to select the sample. Self-administered questionnaires were distributed personally and through online surveys. The questionnaire is divided into two sections. Section A with respondents' background information and Section B for variables such as effectiveness of e-learning, internet connection, learner environment, and students' emotions.

Measurement of Variables

The effectiveness of e-learning consists of seven questions that are adapted from Al-Rahmi *et al.* (2015) and Yusnilita (2020). Among the questions are "E-learning helped me better understand difficult things", "My grades improved as a result of taking online classes", and others. As for internet connection, the instrument was adapted from Bączek (2021). It covers questions such as "The internet connection during the e-learning process affect the effectiveness of e-learning?", "I had stable internet access for online classes in my house/residential college", "In rural areas, internet access is limited, and network coverage is not always available to keep up with the e-learning process", and others. The learner environment, on the other hand, was measured using an instrument by Adnan and Anwar (2020). Six statements were asked of the students regarding the learning environment in their learning area and whether there is any distracting environment around them.

Lastly, the measurement of students' emotions was adapted from Salamat *et al.* (2018) and Bączek *et al.* (2021), consisting of six items to measure the state of students' emotions during the pandemic. All the variables in this study use a Likert scale. A five-point Likert scale ranging from (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, and 5 = Strongly Agree with all Cronbach's alpha values more than 0.6. Statistical analysis, including Pearson's correlation and multiple regression

analysis, was conducted using Statistical Package for the Social Sciences (SPSS).

Results and Discussion

Respondents Background

The number of questionnaires distributed to students for this study is 500, covering various business degree programmes from semester 1 to semester 5 of a public university in Malaysia. Out of 500 questionnaires distributed, only 350 were deemed usable for the study, yielding a response

rate of 70%. The characteristics of the respondents, as illustrated in Figure 1, indicate that most of the respondents were male, with 68.9% and 31.1% female. Half of the respondents are Malay, 21.5% are Indian, while the rest are Chinese (18.4%) and others (1.2%). Most respondents are between 21 years and 23 years old (80.6%), with the oldest respondents being 27 years old and above. Moreover, almost 56% of the respondents were students from the International Business programme, and 48.6% were year 3 students.

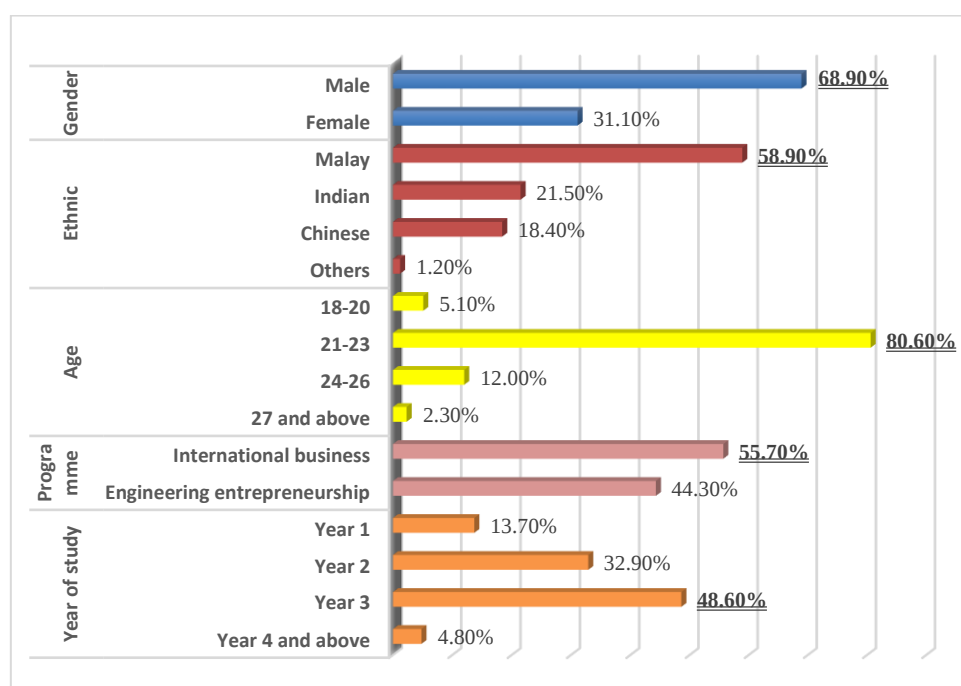


Figure 1: Respondents' characteristics

Correlation with Effectiveness of E-learning

Pearson's correlation coefficient was used to test the relationship between internet connection,

learner environment, and students' emotions with e-learning.

Table 1: Correlations of internet connection, learner environment, and students' emotion with E-learning

Variables	Pearson's Correlation (r)	p
Internet connection	.502**	.000
Learner environment	.464**	.000
Emotion university students	.548**	.000

**Significant $p < 0.01$

The results above (Table 1) demonstrate a positive relationship between internet connection [$r = 0.502^{**}$, $p < 0.000$], learner environment [$r = 0.464$, $p < 0.000$], and students' emotion [$r = 0.548^{**}$, $p < 0.000$].

Generally, an internet connection is considered a crucial factor in the effectiveness of e-learning. The results demonstrate a relationship between the internet connection and the effectiveness of e-learning. Additionally, previous researchers also supported the finding that the use of information technology plays a crucial role in implementing distance learning amid the COVID-19 pandemic. The learning process can run smoothly with the rapidly evolving information technology. Moreover, internet networks can connect educators and university students effectively, even though at a long distance. The teaching-learning process can run smoothly even during the COVID-19 pandemic (Pakpahan & Fitriani, 2020; Bahasoan *et al.*, 2020). During the COVID-19 pandemic, access to the internet has become an essential tool for protecting our health and completing various important tasks in employment or education. At the same time, our daily movements in a public area are under control (Bahasoan *et al.*, 2020).

Furthermore, the learner environment was also an important predictor of the effectiveness of e-learning among university students. Unconducive home conditions cause university students to have difficulty receiving lessons (Purwanto, 2020). However, the results obtained from the distributed questionnaires are contrary to

most of the previous studies conducted by the researchers. From the results, the learner environment is not a significant factor influencing the effectiveness of e-learning among university students. Occasionally, it can lead to adverse learning effects. There is evidence that students are sometimes assigned household chores when they are at home. As a result, their studies are affected, leading to feelings of frustration and hopelessness (Mishra *et al.*, 2020).

Conversely, respondents admitted that their emotional state struggled with e-learning due to inadequate equipment and an environment that was not conducive to learning (Nur Salina *et al.*, 2020). University students' emotions were influenced by e-learning, especially in uncomfortable environments. The results indicate that this hypothesis is accepted, which means the learning environment affects the cognitive, emotional, and motivational aspects of learning (Stephan *et al.*, 2019). In general, university students' emotions are considered an important factor in the effectiveness of e-learning. Anyone can be exposed to emotions during e-learning, such as anxiety, which can cause depression (Elengoe, 2020).

Factors Influencing the Effectiveness of E-learning

Table 2 explains the multiple regression results of variables that may contribute to e-learning among students.

Table 2: Factors influencing the effectiveness of e-learning

Variables	B	Beta	t	Sig.
Constant	1.056		5.993	.000
Internet connection	.224	.231	3.771	.000
Learner environment	.063	.066	1.006	.315
Emotion in university students	.348	.350	5.240	.000

$R = .582$; $R^2 = .338$; Adjusted $R^2 = .332$; $F = 58.945$; Sig. $F = 0.000^{**}$; $p \leq 0.05$; $p \leq 0.001$

Based on the multiple regression results in Table 2, three variables explain 33.8% of the variance in e-learning effectiveness, suggesting other potential factors that may contribute to this

model. The values of beta demonstrate the strongest unique contribution to the prediction of e-learning among students, whereas the values depicted in the table above present positive rates

of change for the dependent variables (0.231, 0.066, 0.350). Among the three variables, only two variables were significant: Internet connection and students' emotion, with beta values of ($\beta = 0.231$ and $\beta = 0.350$). Note that students' emotion contributes the most towards the dependent variable, that is, the effectiveness of e-learning among students in the FPK. The students' environment, on the other hand, did not contribute to the variance.

E-learning is one of the magnificent tools in delivering the material, especially in the education system. It provides full accessibility regardless of location and time. Thus, it explained the contribution towards effective e-learning. According to Yusnilita (2020), one of the benefits of using e-learning is that it is cost-effective and provides world-class education to anyone with a broadband connection. On the other hand, students' emotions are fragile, as Rashid *et al.* (2022) noted that pleasant emotions within students are linked with students' motivation, which supports their learning process and outcome.

However, the students' environment does not contribute to the effectiveness of e-learning. Respondents view that the learner environment is not a significant factor influencing the effectiveness of e-learning among university students during the COVID-19 pandemic. In some cases, it can lead to adverse learning effects. There is evidence that some university students accept that they do not have a conducive learning environment at home, and they are assigned household chores. Consequently, their studies are affected and cause them to feel frustrated and hopeless (Mishra, 2020). Respondents admitted that their emotional state struggled with e-learning due to inadequate equipment and an environment that was not conducive to learning (Nur Salina *et al.*, 2020).

Conclusions

This study utilised quantitative research methods to determine the factors that affected the e-learning of the FPK students in UniMAP. The

findings reveal that internet connection and the emotions of students are the influential factors, while the learner environment factor has no significant effect on the effectiveness of e-learning. In this regard, internet connection and the emotions of students should be monitored closely by the institution's management. Notably, most proponents of internet-based education are "positive" and "optimistic" about the system's inherent shortcomings. Educators, on the other hand, have numerous worries regarding the effectiveness of online education. Specifically, using e-learning and online classrooms to prolong the learning process is a significant problem for governments and academic institutions (Obeidat *et al.*, 2020).

In general, the effectiveness of e-learning in Malaysia needs to be explored more during a pandemic because the effectiveness of e-learning during a pandemic among university students in Malaysia is a relatively new phenomenon that warrants further explanation. The effectiveness of e-learning needs to be studied for several reasons (Johnson *et al.*, 2000; Obeidat *et al.*, 2020). Moreover, different people will have different perceptions about the effectiveness of e-learning.

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Conflict of Interest Statement

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare absence of conflicting interests with the funders.

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