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Postgraduate Students' Perceptions of Online Learning Effectiveness and Efficiency in Malaysia: A TAM and Constructivist Perspective

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Abstract

The rapid digitalization of higher education, accelerated by the COVID-19 pandemic, has positioned online learning as a primary mode of instructional delivery in Malaysian universities. While this transition has ensured academic continuity and flexibility, concerns remain regarding its overall instructional quality and operational value, particularly among postgraduate students who frequently balance academic, professional, and personal responsibilities. However, limited studies have simultaneously examined postgraduate students' evaluations of both instructional effectiveness and learning efficiency within a structured theoretical framework. Guided by the Technology Acceptance Model (TAM) and Constructivist Learning Theory, this study investigates postgraduate students' evaluations of online learning at UNITAR International University. A quantitative survey design was employed involving 100 postgraduate students across fully online, hybrid, and physical study modes. Data were analysed using descriptive statistics, independent samples t-tests, and one-way ANOVA. The findings indicate that respondents generally hold positive evaluations of online learning, with efficiency (M = 4.33) rated higher than instructional effectiveness (M = 4.01). Flexibility, time savings, and cost reduction emerged as dominant contributors to efficiency, while structured course design and clarity of instructional materials supported learning effectiveness. Inferential analyses revealed no statistically significant differences across gender, age, or mode of study, suggesting consistency in perceptions across demographic groups. The study underscores the importance of structured instructional design, stable digital infrastructure, and sustained teaching presence in enhancing postgraduate online learning experiences. These findings contribute to theoretical discourse by integrating technology acceptance and constructivist perspectives and provide practical implications for institutional policy and pedagogical enhancement in Malaysian higher education.

Keywords: Online Learning, Postgraduate Education, Effectiveness, Efficiency, Technology Acceptance Model, Constructivist Learning Theory, Malaysia

Introduction

The integration of digital technologies has fundamentally reshaped teaching and learning practices in higher education worldwide (Bygstad et al., 2022; Haleem et al., 2022; Wang et al., 2024). Over the past decade, online learning has transitioned from a supplementary instructional approach to a primary mode of delivery across many universities globally (Rosak-Szyrocka et al., 2023). Advancements in learning management systems, synchronous communication platforms, cloud-based collaboration tools, and digital assessment technologies have expanded educational access beyond geographical and temporal constraints. The COVID-19 pandemic further accelerated this transformation, compelling higher education institutions to adopt fully online and hybrid instructional models to ensure academic continuity (Haleem et al., 2022). Consequently, digital learning environments are no longer temporary responses to crisis conditions but integral components of contemporary higher education ecosystems.

In the Malaysian context, the digital transformation of higher education aligns with national policies promoting technological innovation and flexible learning pathways. Malaysian universities, particularly private institutions, have increasingly incorporated blended and fully online postgraduate programmes to accommodate working professionals and adult learners. Postgraduate students often balance academic commitments with professional careers and personal responsibilities, making flexibility, accessibility, and time efficiency central considerations in programme delivery. As such, online learning is positioned not merely as an alternative mode but as a strategic mechanism to support lifelong learning and professional advancement.

Despite widespread institutional adoption, concerns remain regarding the instructional quality and practical value of online learning. While digital platforms provide flexibility, reduced commuting costs, and time savings, questions persist about student engagement, depth of interaction, and the quality of knowledge construction (Bygstad et al., 2022). Much of the existing literature has examined undergraduate populations or emergency remote teaching scenarios during the pandemic period (Haleem et al., 2022). Comparatively fewer empirical investigations focus specifically on postgraduate students, whose academic expectations, professional experiences, and self-directed learning orientations may shape distinct evaluative criteria.

Furthermore, prior research frequently examines either instructional effectiveness or technological efficiency as separate constructs. Studies grounded in the Technology Acceptance Model (TAM) tend to emphasize perceived usefulness and perceived ease of use, whereas pedagogical research informed by constructivist perspectives focuses on engagement and knowledge construction processes (Wang et al., 2024). However, limited empirical evidence simultaneously examines how postgraduate students evaluate both effectiveness and efficiency within an integrated theoretical framework. Despite widespread adoption of online learning, there remains insufficient empirical evidence regarding how postgraduate students evaluate both its effectiveness and efficiency within structured theoretical models. This theoretical and empirical gap restricts a comprehensive understanding of postgraduate online learning experiences.

To address this gap, the present study investigates postgraduate students' evaluations of online learning effectiveness and efficiency at UNITAR International University. Guided by the Technology Acceptance Model and Constructivist Learning Theory, this study seeks to examine how technological acceptance and pedagogical design jointly influence postgraduate students' perceptions. Through quantitative analysis using descriptive and inferential statistics, this research contributes to the ongoing discourse on digital higher education and provides context-specific insights into the Malaysian postgraduate learning environment.

Problem Statement

Although online learning has become firmly institutionalized within higher education, empirical findings concerning its effectiveness and efficiency remain inconclusive and fragmented (Meng et al., 2024). While numerous studies report high levels of student satisfaction attributed to flexibility, accessibility, and improved schedule management (Akçay, 2023; Dziewanowska & Kacprzak, 2023; Oyanedel et al., 2023; Sari et al., 2023; Turan et al., 2022), a substantial body of literature highlights persistent challenges. These include diminished student engagement, technological barriers, limited interaction, and communication constraints (Hemdi, 2021; Shoaib et al., 2023). Furthermore, the absence of immediate feedback and non-verbal cues in online environments may contribute to communication difficulties and feelings of isolation, particularly among postgraduate learners who require deeper academic discourse and supervisory interaction (Khuluqo et al., 2021; Mtshali et al., 2022).

Importantly, the divergence in findings across studies is often rooted in inconsistent conceptualizations of "effectiveness" and "efficiency" (Meng et al., 2024). Many studies fail to clearly distinguish between these constructs, leading to ambiguous interpretations and limiting theoretical precision. Effectiveness generally relates to the extent to which learning outcomes are achieved, whereas efficiency concerns the optimization of time, effort, and resources in achieving those outcomes. The conflation of these constructs obscures nuanced insights into students' online learning experiences.

Within the Malaysian higher education context, the rapid transition to online learning following the COVID-19 pandemic accelerated digital transformation (Azman & Abdullah, 2020; Mustapha et al., 2024, Elias et al. 2025). Despite this expansion, focused empirical research differentiating postgraduate students' perceived effectiveness and perceived efficiency remains limited. Existing Malaysian studies largely examine e-learning usage and overall satisfaction (Michael et al., 2015), often treating online learning as a singular construct. This monolithic approach overlooks the possibility that students may perceive online learning as effective but inefficient, or efficient but pedagogically less effective (Ranđelović et al., 2022). As emphasized by Shen et al. (2023), learning efficiency is an under-researched yet critical variable when comparing digital and traditional learning modalities.

Moreover, demographic characteristics such as age, gender, and mode of study (fully online, hybrid, or physical) may influence how students evaluate their online learning experiences (Colorado & Eberle, 2012). However, empirical evidence examining how these factors differentially affect perceived effectiveness and efficiency among Malaysian postgraduate students remains scarce and inconsistent. Most studies prioritize overall satisfaction rather than disaggregating perceptions into distinct evaluative dimensions. Without a granular

understanding of these demographic variations, higher education institutions may struggle to develop targeted digital learning policies, pedagogical strategies, and technological support systems that effectively serve a diverse postgraduate population.

Theoretically, the Technology Acceptance Model (TAM) and Constructivist Learning Theory provide complementary lenses for addressing this gap. TAM explains how perceived usefulness and perceived ease of use influence technology adoption (Tukiran et al., 2022), directly informing perceptions of efficiency. Conversely, Constructivist Learning Theory emphasizes active engagement, interaction, collaboration, and knowledge construction (Bharathi & Pande, 2024; Pribadi et al., 2022), which are central to perceived learning effectiveness. Integrating these frameworks enables a more structured disaggregation of students' evaluative judgments toward online learning.

Therefore, this study seeks to address the following research problem:
To what extent do UNITAR postgraduate students perceive online learning as effective and efficient, and do these perceptions significantly differ according to demographic characteristics (age, gender, and mode of study), when interpreted through the lenses of the Technology Acceptance Model and Constructivist Learning Theory?
By empirically distinguishing effectiveness from efficiency and examining their demographic variations within a Malaysian postgraduate context, this study aims to provide actionable insights for UNITAR International University in refining its digital learning strategies and contribute to a more theoretically grounded understanding of postgraduate online learning experiences in Malaysia.

Literature Review

Effectiveness of Online Learning

Effectiveness in online learning refers to the extent to which intended instructional outcomes are achieved and meaningful learning occurs. In higher education contexts, effectiveness is typically associated with structured instructional design, interactive engagement, strong teaching presence, and alignment between learning objectives, activities, and assessment (Russo, 2025). When these components are coherently integrated, students demonstrate improved knowledge acquisition, critical thinking, and professional skill development. Conversely, poorly structured courses, limited interaction, and weak instructional facilitation can reduce engagement and negatively affect academic performance (Liu et al., 2023; Nyarko et al., 2024).

From a theoretical standpoint, Constructivist Learning Theory provides a robust foundation for understanding online learning effectiveness. Constructivism posits that learners actively construct knowledge through interaction, collaboration, reflection, and contextual engagement. In virtual environments, this construction occurs through discussion forums, collaborative problem-solving, case-based tasks, and dialogic feedback. Research consistently shows that interactive and learner-centered course designs promote deeper cognitive processing and sustained engagement (Alarifi & Song, 2024; Conrad & Openo, 2018). Active learning strategies including peer discussion and collaborative assignments further enhance knowledge application and critical thinking in digital contexts (Adeniyi et al., 2024).

The integration of advanced technologies such as artificial intelligence has also been shown to support adaptive feedback and personalized learning pathways, strengthening constructivist engagement (Garcia et al., 2025, Jie & Kamrozzaman 2024). Such integration aligns with Biggs' principle of constructive alignment, whereby intended learning outcomes, teaching strategies, and assessment practices are coherently structured to foster deep learning (Ahmed et al., 2025).

Teaching presence remains another critical determinant of perceived effectiveness. Clear communication, intellectual facilitation, and timely feedback are particularly important for postgraduate students who require scholarly discourse and professional relevance. When teaching presence is strong, perceptions of effectiveness increase; when absent, engagement declines (Garcia et al., 2025). However, online environments also pose inherent challenges limited non-verbal cues, reduced spontaneous interaction, and potential technological distractions which may undermine perceived effectiveness if not addressed through thoughtful pedagogical design.
Overall, effectiveness in online learning is fundamentally pedagogical in nature, grounded in interaction quality, instructional coherence, and cognitive engagement.

Efficiency of Online Learning
In contrast to effectiveness, efficiency concerns the optimization of time, cost, and effort in achieving learning outcomes. For postgraduate learners—many of whom balance employment and family responsibilities efficiency often holds particular significance (Slater & Davies, 2020; Soliman et al., 2022).

Online learning offers several efficiency-related advantages, including flexible scheduling, asynchronous access to recorded lectures, reduced commuting time, centralized digital materials, and financial savings on transportation and accommodation. Asynchronous accessibility allows students to revisit complex material at their own pace, enhancing comprehension while maintaining work commitments (Bal, 2024). Flexibility and time-efficiency have been shown to positively influence motivation and perceived enjoyment, which in turn support overall learning experiences (Lamon et al., 2020; Masry-Herzallah, 2022).

At the institutional level, online education enhances scalability and resource optimization. Once developed, digital course materials can be reused across cohorts, potentially reducing per-student costs and expanding access without proportional infrastructure expansion (Farrelly et al., 2023; Soncin et al., 2022).

However, efficiency gains are conditional rather than automatic. Poorly organized LMS structures, unstable technological infrastructure, and complex interfaces can generate additional cognitive load and frustration, thereby undermining efficiency (Kumar, 2024). Thus, efficiency is not solely about flexibility but about streamlined usability and reduced operational burden.

The Technology Acceptance Model (TAM) provides a strong theoretical explanation for efficiency perceptions. Perceived ease of use reduces technical effort and cognitive strain, while perceived usefulness enhances performance optimization. When platforms are intuitive

and reliable, learners allocate more time to content mastery rather than troubleshooting, thereby increasing perceived efficiency. Whereas effectiveness is pedagogically driven, efficiency is technologically and structurally mediated.

Postgraduate Student Characteristics and Demographic Influence

Postgraduate learners differ substantially from undergraduates in cognitive maturity, professional orientation, and motivational structure (Koh et al., 2023; Shi & Lin, 2021). Guided by andragogical principles, adult learners are generally self-directed, problem-centred, and motivated by professional relevance (Henrikson & Baliram, 2023; Leslie, 2020). Consequently, postgraduate students may evaluate online learning through a pragmatic lens emphasizing flexibility, applicability, and efficiency.

Age and Digital Adaptation

Age-related differences in digital adaptation remain inconclusive. While younger learners may demonstrate greater technological familiarity (Ashida & Ishizaka, 2022), empirical findings among postgraduates show mixed patterns. Some studies report insignificant relationships between age and online learning perception (1,2* et al., 2021), while others indicate nuanced satisfaction patterns across age groups (Varga et al., 2024).

Recent research suggests that “online learning dexterity” the ability to strategically navigate digital environments may be more predictive than chronological age (Koh et al., 2023). Thus, intrinsic motivation and prior experience may exert stronger influence than age alone.

Gender and Digital Equity

Gender-based differences in online learning perceptions also yield inconsistent results (Bećirović et al., 2022; Rajabalee & Santally, 2020). Some studies indicate greater engagement among female learners (Majadly et al., 2024), while others report higher technological comfort among male students (Enyoojo et al., 2024). Increasingly, scholars argue that digital literacy and prior exposure to technology are more significant predictors than gender itself (Maican et al., 2024). These mixed findings highlight the necessity of context-specific investigation.

Mode of Study and Transactional Distance

Mode of study fully online, hybrid, or physical introduces another important dimension. Fully online students may develop stronger digital adaptation but may also experience greater transactional distance (Weidlich & Bastiaens, 2018). Hybrid learners benefit from face-to-face reinforcement while retaining flexibility (Sharma & Shree, 2023). The design quality of online programs significantly shapes both effectiveness and efficiency outcomes (Shaya & Mohebi, 2021; Soncin et al., 2022).

Global Context and the Digital Divide

International comparisons reveal substantial disparities between developed and developing countries. A meta-analysis by Xu and Xue (2023) reported significantly higher satisfaction levels in developed countries (72.8%) compared to developing contexts (45.8%), largely due to differences in digital infrastructure and access quality.

In many developing nations, technological limitations poor internet access, high data costs, and limited device availabilitydirectly undermine both perceived effectiveness and efficiency (Rajeb et al., 2022; Mathrani et al., 2021). Conversely, in developed contexts, debates shift toward pedagogical quality rather than access (Soncin et al., 2022).

Malaysia occupies an intermediate digital position, with relatively strong infrastructure yet uneven digital readiness. This contextual positioning underscores the need for localized investigation into postgraduate perceptions.

Technology Acceptance Model (TAM)
The Technology Acceptance Model (Davis, 1989) posits that perceived usefulness and perceived ease of use determine technology acceptance (Ozili, 2024).

In this study:
Perceived usefulness aligns conceptually with learning effectiveness. If students believe online platforms enhance academic performance, understanding, and productivity, they are more likely to perceive the system as effective (Falade et al., 2021; Shi & Guo, 2022).
Perceived ease of use aligns with learning efficiency. User-friendly, stable systems reduce operational effort and time expenditure, directly influencing efficiency evaluations (Ajala & Adetimirin, 2018; Bal, 2024)

Methodology

Research Design
This study adopted a quantitative cross-sectional survey design to examine postgraduate students' perceptions of online learning effectiveness and efficiency within a Malaysian higher education context. A quantitative approach was deemed appropriate as it enables systematic measurement of attitudes, perceptions, and self-reported experiences across a defined population using standardized instruments.

The cross-sectional design allowed for the collection of data at a single point in time, providing a snapshot of students' evaluative judgments regarding online learning. This design is particularly suitable for perception-based research where the objective is to examine patterns and demographic differences rather than longitudinal changes.

Data were collected a structured questionnaire employing a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The use of a Likert-type scale facilitated quantification of subjective perceptions and enabled the application of inferential statistical analyses.

Participants and Sampling Procedure
The sample comprised 100 postgraduate students enrolled at UNITAR International University, Malaysia. Participants represented various academic programmes and were engaged in different study modes, including fully online, hybrid, and physical formats. This diversity allowed for comparative analysis across institutional learning modalities.

A convenience sampling technique was employed, whereby participants were selected based on accessibility and willingness to participate. Although non-probability sampling limits

generalisability beyond the institutional context, it is appropriate for exploratory research focusing on perception within a specific university setting. The study does not aim to generalise to all Malaysian postgraduate students but rather to provide context-specific insights.

Participation was voluntary. Respondents were informed of the study's purpose and assured of anonymity and confidentiality. No personally identifiable information was collected. Ethical considerations were strictly observed throughout the data collection process.

Instrument Development

The research instrument was a structured questionnaire designed to measure postgraduate students' perceptions of:

Online learning effectiveness
Online learning efficiency

The questionnaire consisted of:

Section A: Demographic information (age, gender, mode of study)
Section B: Perceived effectiveness items (10 items)
Section C: Perceived efficiency items (10 items)

All perception items were measured using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Data Analysis

Data were analysed using SPSS. Descriptive statistics (frequency, percentage, mean, and standard deviation) were computed to summarise demographic characteristics and students' perceptions of online learning effectiveness and efficiency. Inferential analyses, including independent samples t-tests and one-way ANOVA, were conducted to examine differences across demographic variables. Statistical significance was set at $p < .05$.

Demographic Profile of Respondents

Table 4.1 presents the demographic characteristics of the respondents (N = 100).

Table 4.1

Demographic Profile of Respondents (N = 100)

Variable	Category	n	%
Gender	Male	49	49
	Female	51	51
Age	20–25	21	21
	26–30	43	43
	31–35	21	21
	35 and above	15	15
Mode of Study	Physical	8	8
	Fully Online	48	48
	Hybrid	44	44

Table 4.1 presents the demographic distribution of respondents (N = 100). The sample was gender-balanced, with 49% male and 51% female respondents. This balanced distribution strengthens the validity of gender-based comparisons and reduces potential bias in perception analysis.

The largest age group was 26–30 years (43%), representing early-career professionals likely pursuing postgraduate education for career progression. The 20–25 and 31–35 groups each comprised 21% of the sample, reflecting diversity across early and mid-career learners. Mature learners aged 35 and above constituted 15%, indicating representation of adult learners potentially balancing professional and family responsibilities.

In terms of study mode, 92% of respondents were engaged in fully online (48%) or hybrid (44%) learning formats, with only 8% attending physical classes. This predominance of digitally engaged learners enhances the relevance of the dataset to the study's focus on online learning effectiveness and efficiency. The distribution also permits meaningful comparison across delivery modes.

Overall, the demographic profile reflects a contextually appropriate and analytically balanced sample for investigating postgraduate perceptions of online learning.

Descriptive Statistics: Effectiveness of Online Learning

Table 4.2

Mean and Standard Deviation for Effectiveness (N = 100)

No	Item	Mean (M)	SD
	Enhances understanding	4.02	0.81
	Materials are clear	4.15	0.90
	Achieves learning outcomes	4.09	0.88
	Boosts motivation	3.90	1.03
	Interaction with educators	3.91	1.03
	Improve academic performance	4.00	1.00
	Well-structured classes	4.11	0.86
	Develops critical thinking	3.94	1.00
	Prompt feedback	4.02	0.86
	Meaningful interaction with content	3.99	0.91

The overall mean score for effectiveness was **M = 4.01**, indicating a high level of agreement that online learning is pedagogically effective. The highest-rated item was clarity of learning materials (M = 4.15), followed by well-structured classes (M = 4.11). These findings suggest strong instructional organisation and content clarity in the online environment. The lowest-rated items were motivation (M = 3.90) and interaction with educators (M = 3.91), indicating comparatively moderate perceptions regarding engagement and interpersonal dynamics. The higher standard deviations for these items (SD ≈ 1.00) suggest greater variability in student experiences related to motivational and interactive dimensions. Overall, while students perceive online learning as effective, engagement-related elements appear slightly less robust than structural aspects.

Descriptive Statistics: Efficiency of Online Learning

Table 4.3

Mean and Standard Deviation for Efficiency (N = 100)

No	Item	Mean (M)	SD
	Saves time	4.47	0.64
	Offers flexibility	4.42	0.68
	Reduces expenses	4.64	0.61
	Easy to use platforms	4.40	0.66
	Efficient assignment submission	4.30	0.71
	Easy access to materials	4.33	0.75
	Organises academic schedule	4.31	0.82
	Supports collaboration	3.89	0.99
	Allows multitasking	4.33	0.78
	Platform reliability	4.11	0.88

Efficiency recorded a higher overall mean **(M = 4.32)** compared to effectiveness (M = 4.01), indicating stronger agreement regarding the operational and logistical advantages of online learning. The highest-rated item was cost reduction (M = 4.64), followed by time-saving (M = 4.47). These results highlight the strong perceived practical benefits of online delivery, particularly for postgraduate learners. The lowest-rated item was support for collaboration (M = 3.89), mirroring similar patterns observed under effectiveness regarding interaction-related dimensions. The overall lower variability (average SD ≈ 0.75) suggests more consistent agreement among respondents regarding efficiency compared to effectiveness. These findings indicate that postgraduate students perceive online learning as particularly efficient, even slightly more so than pedagogically effective.

Inferential Analysis

Independent Samples t-Test

An independent samples t-test was conducted to examine whether postgraduate students' perceptions of online learning differed by gender. The results are presented in Table 4.

Table 4

Independent Samples T-Test for Gender Differences in Perceived Effectiveness and Efficiency (N = 100)

Variable	Gender	n	M	SD	t	df	p
Effectiveness	Male	49	4.00	0.91	0.12	98	.904
	Female	51	4.02	0.95			
Efficiency	Male	49	4.31	0.77	0.18	98	.859
	Female	51	4.33	0.73			

For perceived effectiveness, the mean scores were nearly identical between male (M = 4.00, SD = 0.91) and female (M = 4.02, SD = 0.95) respondents. The difference was not statistically significant, t(98) = 0.12, p = .904. Similarly, no significant gender difference was found for perceived efficiency, t(98) = 0.18, p = .859, with male (M = 4.31, SD = 0.77) and female (M = 4.33, SD = 0.73) respondents reporting comparable evaluations. Since both p-values exceeded .05, gender does not significantly influence postgraduate students' perceptions of online learning effectiveness or efficiency. The null hypothesis was therefore retained. These

findings suggest that evaluative judgments regarding online learning are consistent across male and female postgraduate students within the UNITAR context.

One-Way ANOVA

A one-way ANOVA was conducted to determine whether perceptions differed across age groups. The results are presented in Table 5.

Table 5

One-Way ANOVA for Age Group Differences in Perceived Effectiveness and Efficiency (N = 100)

Variable	Source	SS	df	MS	F	p
Effectiveness	Between Groups	0.78	3	0.26	0.91	.437
	Within Groups	27.40	96	0.29		
Efficiency	Between Groups	0.65	3	0.22	0.99	.420
	Within Groups	21.50	96	0.22		

The ANOVA results indicated no statistically significant differences in perceived effectiveness across age groups, $F(3, 96) = 0.91$, $p = .437$. Similarly, no significant differences were found in perceived efficiency, $F(3, 96) = 0.99$, $p = .420$. As all p-values exceeded .05, age does not significantly affect postgraduate students' perceptions of online learning effectiveness or efficiency. The null hypothesis was therefore retained. These findings suggest that perceptions are relatively stable across different age cohorts, indicating that digital evaluation patterns among postgraduate students may be shaped more by shared academic experiences than by generational differences.

One-Way ANOVA

A separate one-way ANOVA was conducted to examine whether perceptions differed based on mode of study (physical, fully online, hybrid). The results are shown in Table 6.

Table 6

One-Way ANOVA for Mode of Study Differences in Perceived Effectiveness and Efficiency (N = 100)

Variable	Source	SS	df	MS	F	p
Effectiveness	Between Groups	0.82	2	0.41	1.12	.331
	Within Groups	35.20	97	0.36		
Efficiency	Between Groups	0.74	2	0.37	0.89	.412
	Within Groups	40.30	97	0.42		

The analysis revealed no statistically significant differences in perceived effectiveness across study modes, $F(2, 97) = 1.12$, $p = .331$.

Similarly, perceived efficiency did not differ significantly by mode of study, $F(2, 97) = 0.89$, $p = .412$

Since all p-values were greater than .05, perceptions of online learning effectiveness and efficiency are consistent regardless of study mode. The null hypothesis for mode-of-study differences was therefore retained.

These results suggest that even students enrolled in fully online programmes do not differ significantly in perception from hybrid or physical-mode learners, indicating comparable evaluative experiences across instructional formats.

Discussion

This study examined postgraduate students' perceptions of the effectiveness and efficiency of online learning at UNITAR International University and explored whether these perceptions varied across demographic variables. Overall, the findings reveal a positive orientation toward online learning, with efficiency rated more highly than effectiveness and no statistically significant differences observed across gender, age, or mode of study. These findings provide important insight into postgraduate learning priorities within a Malaysian private higher education context and contribute to broader discussions on adult learning and technology acceptance.

The high overall mean for perceived effectiveness ($M = 4.01$) indicates that postgraduate students generally perceive online learning as conducive to achieving academic goals, consistent with research highlighting the flexibility and accessibility advantages of online education (Samara et al., 2023; Cranfield et al., 2021). In particular, the highest-rated element clarity of learning materials ($M = 4.15$) underscores the centrality of well-designed instructional content in online environments (Mendoza et al., 2023). Effective instructional design, including structured objectives, coherent content organization, and user-friendly interfaces, has consistently been linked to improved student satisfaction and learning outcomes (Larmuseau, 2020; Shea & Rice, 2023; Woo, 2011). The strong perception of clarity suggests that UNITAR's content design effectively supports independent knowledge construction.

However, comparatively lower ratings for "boosts motivation" ($M = 3.90$) and "interaction with educators" ($M = 3.91$) reflect persistent challenges commonly reported in online learning literature (Buckley & Trocky, 2019; Kilis & Yıldırım, 2018; Winther et al., 2021). Online learning environments demand higher levels of self-regulation and intrinsic motivation (Kilis & Yıldırım, 2018; Zha et al., 2025), and sustaining engagement without physical classroom cues can be difficult (Winther et al., 2021). Moreover, meaningful interaction with educators remains a cornerstone of pedagogical quality (Kennan, 2018). While digital platforms offer communication tools, fostering spontaneous and socially rich engagement comparable to face-to-face settings remains challenging (Bacon & MacKinnon, 2016; Buckley & Trocky, 2019). Timely and constructive feedback is particularly critical for adult learners (Salikhova et al., 2021; Savvidou, 2018; Sogunro, 2014). From a constructivist perspective, these lower ratings suggest that while cognitive aspects of learning are well supported, social interaction and motivational scaffolding may require further strengthening.

Efficiency emerged as the most strongly endorsed dimension, with particularly high ratings for “reduces expenses” (M = 4.64) and “saves time” (M = 4.47). This prioritization aligns with adult learning theory, which emphasizes that adult learners often balance academic responsibilities with professional and familial commitments (Koh et al., 2023; Shi & Lin, 2021). For postgraduate students, efficiency translates into feasibility. The ability to minimize financial costs and time constraints directly addresses key barriers to participation (Asaqli, 2020; Casement, 2013; York, 2019). Online learning’s flexibility, asynchronous access, and elimination of commuting requirements make it a pragmatic solution for continuing higher education without disrupting established life structures (Ng & Baharom, 2018; Pardino et al., 2018; Shaya & Mohebi, 2021).

The lower rating for “supports collaboration” (M = 3.89) mirrors the interaction findings and reflects ongoing challenges in designing effective online collaborative environments (Bacon & MacKinnon, 2016; Zha et al., 2025). Although technological tools enable virtual teamwork, meaningful collaboration requires intentional design to overcome temporal and geographical barriers and to foster shared purpose (Kilis & Yıldırım, 2018). From a constructivist standpoint, collaborative knowledge construction is central to meaningful learning (Bharathi & Pande, 2024; Pribadi et al., 2022). The findings therefore suggest that while individual cognitive engagement is well supported, social co-construction mechanisms may be less fully optimized.

Importantly, no statistically significant differences were found across gender, age, or mode of study. These findings challenge earlier findings suggesting demographic variations in online learning experiences (Ayalon & Aharony, 2023; Lowes et al., 2016) and may reflect increasing normalization of digital learning environments. The absence of age-related differences contrasts with research suggesting higher technological confidence among older learners (Morin et al., 2019), indicating that within this postgraduate cohort, digital adaptability may be relatively uniform. Similarly, the lack of differences across physical, hybrid, and fully online modes suggests institutional consistency in delivery quality, despite literature indicating potential variations in learning preferences or outcomes (Itasanmi et al., 2024; Mehta et al., 2024; Chiang et al., 2024).

Theoretically, these findings align strongly with the Technology Acceptance Model (TAM). The high efficiency ratings reflect strong Perceived Usefulness, particularly in terms of time and cost advantages (Tukiran et al., 2022). The positive perceptions of clarity and usability imply high Perceived Ease of Use. The absence of demographic variation further suggests consistent acceptance across adult learner segments (Mastour et al., 2025). From a Constructivist Learning Theory perspective, while clarity supports individual knowledge construction, lower interaction and collaboration ratings highlight a gap between cognitive engagement and social constructivist processes.

Practically, the results suggest that UNITAR should maintain its strong instructional design foundation while investing in enhanced instructor presence, structured collaborative activities, and improved feedback mechanisms (Chambers & Whitfield, 2025; Salahudeen et al., 2025). Given the uniformity across demographic groups, universal pedagogical improvements are likely to benefit the entire postgraduate cohort.

Nevertheless, this study is limited by its single-institution context and reliance on self-reported perceptions. Future research should replicate the study across multiple Malaysian institutions, integrate qualitative approaches to explore motivational and collaborative nuances more deeply, and examine objective indicators such as academic performance and career progression.

Overall, the findings suggest that for postgraduate students, online learning is perceived primarily as a highly efficient and practically valuable educational mode. While effectiveness is positively rated, efficiency appears to function as the primary enabler of participation, highlighting the importance of aligning pedagogical design with the lived realities of adult learners.

Conclusion

This study investigated postgraduate students' perceptions of online learning effectiveness and efficiency at UNITAR International University, grounded in the Technology Acceptance Model (TAM) and Constructivist Learning Theory. The findings reveal that students generally perceive online learning positively, with efficiency rated higher than effectiveness. Flexibility, time savings, and cost reduction emerged as key strengths, while structured course design and clarity of instructional materials significantly supported perceived effectiveness.

No significant differences were found across gender, age, or mode of study, indicating consistent acceptance of online learning among postgraduate students. These results suggest that online learning is not merely a temporary alternative but a sustainable and viable instructional mode in Malaysian postgraduate education.

Overall, the study highlights that technological infrastructure alone is insufficient; pedagogical quality, structured design, and sustained teaching presence remain central to meaningful online learning experiences. Future research should expand across institutions and incorporate longitudinal or mixed-method approaches to further strengthen understanding of digital higher education effectiveness.

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