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Exploring the Impact of E-Learning Initiatives on Students' Self-Efficacy and E-Learning Experiences

Mohammed A. Al Doghan[1]*, Shishi Kumar Piaralal[2]

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ABSTRACT

Purpose: This research endeavours to investigate the intermediary role played by self-efficacy within the context of e-learning, elucidating its mediating influence on the association among multiple factors. These factors include the perceived impact of e-learning, the efficacy of recommendations concerning e-learning, computer usability, alignment with learning styles, motivational dynamics within e-learning, and students' encounters within e-learning environments. **Methodology:** Data were gathered from a cohort of 248 students participating in diverse E-learning programs across multiple universities in Saudi Arabia. In order to address the absence of a definitive roster or enumeration of students enrolled in various E-learning programs, a simple random sampling method was employed to solicit responses from this student population. The quantitative research methodology adopted for this study involved the dissemination of surveys to a subset of students currently engaged in e-learning courses. **Research Findings:** The study revealed that self-efficacy in E-learning serves as a mediator between various factors including perceived impacts on E-learning, computer utilization, learning style adaptation, and learning motivation. However, it does not act as a mediator between the perceived usefulness of E-learning suggestions and students' E-learning experiences. These findings underscore the pivotal role of self-efficacy in shaping students' online learning experiences, emphasizing the importance of fostering positive individual beliefs and attitudes to enhance the effectiveness of online learning endeavours. **Novelty:** This study offers empirical validation concerning the mediating influence of self-efficacy on students' experiences in online learning, thereby augmenting extant scholarly discourse. It furnishes both theoretical insights and practical recommendations for e-learning environment designers and educators, facilitating a comprehensive understanding and application of findings in this domain

[1] Department of Management, College of Business Administration, King Faisal University, Al-Ahsa 31982, Saudi Arabia. Corresponding Author Email: mdoghan@kfu.edu.sa
[2] Director, Open University Malaysia, Menara OUM, Block C, Kelana Centre Point, Kelana Jaya, Malaysia. Email: shishi@oum.edu.my
* Correspondence: mdoghan@kfu.edu.sa

Introduction

Electronic learning, abbreviated as E-learning, encompasses the utilization of electronic technology for disseminating educational content and resources, extending beyond conventional classroom settings. This encompasses various modalities such as online courses, interactive multimedia modules, virtual classrooms, webinars, and tailored tools and platforms aimed at achieving learning objectives. The escalating popularity of e-learning is attributable to its inherent attributes of flexibility, accessibility, and cost-effectiveness, affording learners the opportunity to engage with educational materials at their own pace and convenience, overcoming geographical constraints and fostering continuous learning opportunities. The advent of digitalization has further transformed traditional educational paradigms through the electronic delivery of instruction via internet-enabled devices (Wati et al., 2020). E-learning not only offers learners enhanced flexibility and accessibility but also facilitates access to diverse learning materials (Waghmare, 2021). Its application extends beyond distance education to encompass integration within traditional educational frameworks (Rohendi, 2012). However, the amalgamation of e-learning with traditional instructional methods presents challenges that warrant careful consideration (Xiong et al., 2021). E-learning holds promise for revolutionizing teacher education by augmenting activity-based learning approaches and mitigating geographical barriers (Srikanth, 2024). Moreover, its practical application has demonstrated efficacy in enhancing students' learning outcomes, particularly when aligned with the principles of discovery-based learning (Lestari et al., 2024). Students are increasingly embracing e-learning due to its reliability and expedience, with the convenience of remote learning and self-paced study being notable advantages. However, it is perceived to be less effective than face-to-face instruction (Masalimova et al., 2024). A myriad of e-learning platforms and tools are available, encompassing Learning Management Systems (LMS) such as Moodle and Canvas, along with instructional software tailored to specific subjects or industries. These platforms typically feature functionalities including content management, assessment tools, discussion forums, and analytics aimed at monitoring learner performance.

The student engagement with e-learning manifests as both diverse and genuine. Particularly, international students often perceive e-learning favourably due to its accommodating nature, offering flexibility that aligns with their individual circumstances. The opportunity to tailor their learning schedule around familial and professional obligations is highly valued. This convenience stems from the elimination of commuting requirements, enabling students to economize time and resources while accessing course materials and participating in classes from any location with internet connectivity. Many students express appreciation for the interactive multimedia resources, discussion forums, and online quizzes, which they perceive as engaging avenues for acquiring knowledge. However, some students may lament the absence of physical interaction with instructors and peers, leading to feelings of isolation or detachment. Scholarly contributions by Barth and Burandt (2013) and Nikolova et al. (2005) have focused on the development and delivery of e-learning courses, with the former advocating for the establishment of procedural guidelines and the latter emphasizing considerations pertaining to design and implementation.

Kropman et al. (2004) highlighted the emergence of e-books within the e-learning domain, emphasizing the imperative for enhanced e-communication facilities to meet evolving student expectations. Green et al. (2017) adopted a comprehensive stance on e-

learning, positioning it as a viable alternative to conventional face-to-face classroom instruction. Conversely, Hariadi and Simanjuntak (2020) identified challenges encountered by students in asynchronous e-learning, including difficulties in self-directed learning and limited teacher interaction. Khan et al. (2020) further underscored the varied experiences of students with e-learning, noting both considerable challenges and appreciation for its multimedia learning environment, particularly in skill development contexts. Peca (2023) emphasized the critical role of structured course design, immersive experiences, instructor training, ongoing feedback mechanisms, and interactive engagement in optimizing e-learning outcomes. Additionally, Guzmán (2020) emphasized the pivotal contribution of teacher engagement and the effective utilization of e-tools in fostering a conducive learning environment. Student motivation and proactive time management are paramount for successful e-learning experiences, although the absence of traditional school structures may pose challenges for many learners. While e-learning presents opportunities for technological adaptation and innovative learning modalities, disparities in digital literacy and technology access may impede some students' progress. Moelans et al. (2024) advocated for self-regulated learning as pivotal in laboratory e-learning support, suggesting personalized and self-correcting instructional approaches to foster high levels of self-regulation and effort management among students.

Literature Review and Hypothesis

Initially, students' perceptions of various factors influencing e-learning, such as its effectiveness, usability, and alignment with learning styles, contribute to the enhancement of their self-efficacy beliefs regarding their capabilities to excel in e-learning environments. This heightened self-efficacy, in turn, fosters superior learning experiences. Similarly, when students perceive e-learning guidance as meaningful, their perceived ability to utilize it effectively increases, thereby promoting positive learning experiences in online contexts. Furthermore, students' perceptions of the reliability of electronic learning platforms and technological solutions also shape their self-efficacy beliefs regarding their proficiency in navigating and utilizing these tools. Robust self-efficacy engenders more favourable learning experiences. Consequently, e-learning materials should be designed to accommodate diverse learning styles, enabling students to feel more confident in their ability to succeed in online learning, thereby further enhancing the learning experience. Lastly, the degree of motivation in e-learning directly impacts students' self-efficacy beliefs concerning their engagement and achievement of learning objectives. Higher levels of self-efficacy are positively associated with more active learning engagement.

Within the realm of e-learning, the association between students' perceptions of its impacts and their actual learning experiences is intricately linked to their levels of self-efficacy. Specifically, the self-efficacy engendered by students' successful navigation and performance in online learning environments serves as a moderating factor between their perceptions of e-learning's effects and their learning outcomes. This hypothesis posits that e-learners' evaluations of e-learning's effectiveness, usability, and alignment with their learning styles shape their self-efficacy beliefs regarding their ability to excel in e-learning. Consequently, these self-efficacy beliefs exert significant influence over the entirety of the electronic learning landscape. In essence, learners who perceive e-learning as enhancing the learning process in terms of effectiveness, user-friendliness, and flexibility are likely to develop heightened self-efficacy

levels, leading to more favourable online educational experiences. Empirical research consistently underscores the mediating role of self-efficacy beliefs in the relationship between perceived learning impacts and student satisfaction. Additionally, scholars such as Asfahani (2023) and Latip et al. (2020) assert that self-efficacy serves as a conduit through which various variables, including learning style and acceptance of e-learning, are interrelated. Moreover, indicators such as self-efficacy, academic motivation, and e-education proficiency, as highlighted by (Rajaratnam, 2023), significantly influence learner performance. (Al Mulhem, 2020) further suggest that cognitive and affective dimensions of learning, which contribute to e-learning satisfaction, also impact performance, Studies by (Hua et al., 2024) and (Lama, 2024) emphasize e-learning self-efficacy as a mediator of learning satisfaction and comfort/satisfaction, respectively. While Moelans et al. (2024) focuses on the significance of self-regulated learning and e-learning engagement and satisfaction, (van der Walt et al., 2024) underscores cognitive benefits, perceived usefulness, and ease of use as factors contributing to students' enjoyment of the online learning experience.

H1: *Self-Efficacy in E-Learning Mediates the Relationship Between Perceived Impacts on E-Learning and Student's Experiences in E-Learning.*

The efficacy of recommendations offered within e-learning environments is poised to influence students' overall experiences primarily through the intermediary role of self-efficacy. Succinctly put, a student's perception of their capacity to effectively utilize e-learning recommendations acts as a mediating factor between their appraisal of the recommendations' utility and their holistic learning experience. This proposition posits that learners' evaluations of the efficacy of e-learning recommendations, encompassing online study techniques or course materials, shape their self-efficacy beliefs regarding their adeptness in employing these recommendations successfully. Consequently, elevated levels of self-efficacy may correspond to enhanced enjoyment and overall experience in the realm of online learning. Indeed, individuals who harbour such attitudes and possess the capability to effectively employ e-learning methods are likely to derive superior learning experiences. Empirical studies underscore the paramount importance of self-efficacy in influencing both satisfaction and performance in e-learning contexts. For instance, Bismala (2022) and Saba (2012) underscore the significance of e-learning quality, self-efficacy, system quality, information quality, and computer self-efficacy as critical determinants of students' outcomes and satisfaction with e-learning. Furthermore, the mediating role of perceived usefulness in the relationship between perceived ease of use and e-learning acceptance, as elucidated by (Huynh & Thi, 2014), reinforces the interplay between these constructs. It follows that self-efficacy in e-learning serves as a mediating mechanism in the linear association between the perceived usefulness of e-learning and students' experiences within e-learning environments. Additionally, Husna (2018) highlights the positive impact of perceived usefulness on students' attitudes toward e-learning, further affirming the salience of this construct. Similarly, (Hanif et al., 2019) corroborates prior findings by delineating the contributions of factors such as self-efficacy, enjoyment, and results demonstrability to the perceived usefulness and ease of use of e-learning systems.

H2: *Self-Efficacy in E-Learning Mediates the Relationship Between Perceived Usefulness of E-Learning Suggestions and Student's Experiences in E-Learning.*

The nexus between computer usability and students' experiences within the realm of online learning is influenced not only by their levels of self-efficacy but also by various other

psychological determinants. In essence, computer usability stands out as the primary determinant of e-learning quality, significantly shaping students' confidence in utilizing computer-based learning tools. From this perspective, learners' perceptions of the usability of e-learning platforms and technologies directly impact their self-efficacy beliefs regarding their ability to proficiently navigate and utilize these resources. Consequently, as the level of self-efficacy increases, so do the positivity and effectiveness of e-learning experiences. Succinctly stated, individuals who exhibit confidence in their capacity to engage with e-learning technologies are more inclined to achieve favourable learning outcomes within online learning environments. Building upon this notion, (Jashapara & Tai, 2006) elucidated how self-efficacy and computer anxiety mediate individual differences in the perceived ease of use of e-learning systems. Moreover, the study conducted by (Syara & Andayani, 2022) underscored e-learning quality, self-efficacy, and interaction as significant factors positively influencing student satisfaction. Similarly, Chahal (2022)revealed that learners' levels of computer and internet self-efficacy significantly shape their perceptions of e-learning quality, mediated by perceived usefulness and ease of use. Yasin et al. (2020) established that self-efficacy, attitude, and online media serve as mediators in the relationship between technology access and usage, which, in turn, are positively associated with readiness for blended learning. Additionally, Udin et al. (2022) emphasized the pivotal role of self-efficacy in online learning, particularly in relation to task completion and communication proficiency within online learning contexts.

H3: *Self-Efficacy in E-Learning Mediates the Relationship Between Computer Usability and Student's Experiences in E-Learning.*

Students' adaptation to diverse learning styles within e-learning contexts is significantly influenced by their capacity for self-directed learning. This implies that students' belief in their ability to excel in adapting to learning styles conducive to e-learning serves as a mediator between changes in course delivery methods and the quality of learning experiences. The current hypothesis posits that modifications in e-learning content undoubtedly impact learners' self-efficacy beliefs regarding their ability to succeed in online learning environments. Elevated levels of self-efficacy are positively associated with enhanced learning experiences in e-learning. Generally, individuals who perceive e-learning materials as aligned with their preferred learning styles tend to achieve better outcomes within online learning environments. Furthermore, Moussaoui (2024) underscores the importance of e-learning in student learning outcomes, particularly highlighting the role of self-efficacy in utilizing e-learning systems. Abdulaal1 et al. (2024)emphasizes the utility of authentic assessment in fostering self-directed learning, autonomy, and self-worth, which are foundational principles of self-efficacy. Mathur et al. (2024) observed that neither academic stream nor class level significantly influenced students' satisfaction or learning outcomes. The focus of this study was to investigate the relationship between student satisfaction and teaching methodologies. Pishchik et al. (2024) advocated for cognition-based personalization in educational practices to enhance learning outcomes. Similarly, Zhou et al. (2020) corroborated this notion, highlighting the mediating role of learning style in the relationship between experiences of self-directed learning.

H4: *Self-Efficacy in E-Learning Mediates the Relationship Between Learning Style Adaptations and Student's Experiences in E-Learning.*

Within the realm of e-learning, the nexus between students' motivation levels and their overall learning experiences is mediated by their self-efficacy beliefs. Succinctly put, the perception of

participants regarding their competence to fulfil e-learning tasks serves as an intermediary between their motivation levels and the quality of their e-learning encounters. This hypothesis asserts a direct linkage between online learners' motivation levels—whether extrinsic, driven by goal attainment, or intrinsic, stemming from personal interest and enjoyment in learning—and their self-efficacy beliefs in the domain of online learning. Consequently, learners exhibiting higher levels of self-efficacy are more likely to perceive their e-learning experiences favourably compared to those with lower levels. Indeed, individuals who possess confidence in their ability to effectively allocate time, maintain commitment, and achieve learning objectives within online learning environments tend to experience more positive learning outcomes. This phenomenon is particularly relevant in less regulated technological domains, where educators may play a pivotal role in fostering motivation by leveraging prior technology-related experiences (Fryer & Bovee, 2016). Additionally, individual characteristics such as cognitive and social factors also contribute to the overall e-user experience within e-learning systems (Lanzilotti et al., 2009). Leveraging interactive features in digital learning can significantly enhance learning outcomes and motivation (El-Seoud et al., 2016). Alesi et al. (2024) and Lama (2024) have demonstrated the moderating role of motivation in the relationship between self-efficacy and student learning experiences in virtual environments. Alesi et al. (2024) specifically highlighted academic motivation as a determinant of students' learning strategies' quality, while (Lama, 2024) emphasized the pivotal role of motivation and attitude in determining students' satisfaction levels with online learning. Pham et al. (2024) corroborated these findings, elucidating the mediating effect of learning style in the relationship between experiences of self-directed learning and learning satisfaction, while also revealing the moderating effect of academic self-efficacy on the association between academic motivation and satisfaction.

H5: *Self-Efficacy in E-Learning Mediates the Relationship Between Motivation in E-Learning and Student's Experiences in E-Learning.*

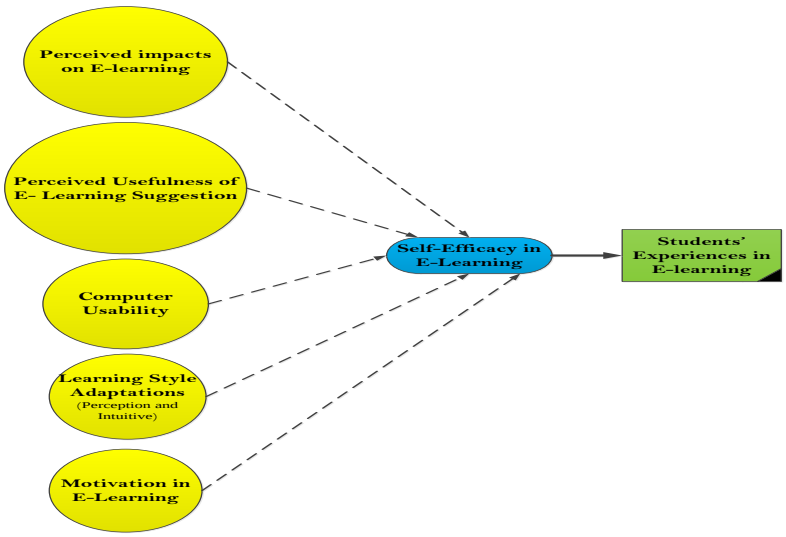

Figure 1: *Conceptual Framework*

Methodology

Data were gathered from a sample comprising 248 students participating in diverse E-learning programs across multiple universities in Saudi Arabia. The sampling methodology employed simple random sampling due to the absence of a definitive roster or enumeration of students enrolled in various E-learning programs. This study aims to delve into the perception component of the Felder-Silverman model, elucidating students' interactions with and perceptions of e-learning materials. By doing so, it seeks to offer insights into the development of more inclusive and adaptable e-learning environments.

Reliability and Validity

This table provides a synthesis of various factor loading values, reliability coefficients as assessed by Cronbach's alpha (α), composite reliability (CR), and average variance extracted (AVE) for diverse research constructs pertinent to e-learning.

Table 1

Reliability, Convergent Validity

	CR	***AVE***	***a***
Perceived impacts on E-learning- PIEL	0.761	0.627	0.794
Perceived usefulness of E-learning suggestion- PUEIS	0.738	0.630	0.769
Computer Usability- CU	0.733	0.649	0.784
Learning style adaptations- LSA	0.841	0.587	0.855
Motivation in E-learning- MEL	0.860	0.601	0.894
Self-efficacy in E-learning- SEELI	0.699	0.662	0.724
Student's experiences in E-learning- SEELII	0.759	0.594	0.790

Discriminant Validity

Table 2

Discriminant Validity

	1	***2***	***3***	***4***	***5***	***6***	***7***
PIEL							
PUEIS	0.387						
CU	0.269*	0.227*					
LSA	0.358	0.162**	0.294				
MEL	0.197**	0.387	0.349*	0.193			
SEELI	0.225*	0.468	0.118**	0.260*	0.228**		
SEELII	0.169*	0.238	0.318	0.137**	0.201*	0.348*	

*Note: values of AVE on diagonal higher than squared correlations values. † $p < 0.100$; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$*

Measurement Model FIT

- Comparative Fit Index (CFI): The CFI evaluates the congruence between the model and the data by aligning all highly correlated variables while maintaining a baseline of no connection. A CFI value exceeding 0.90 is generally considered indicative of acceptable model fit with the data. In this instance, the CFI value of 0.90 satisfies the criterion.
- Adjusted Goodness of Fit Index (AGFI): The AGFI distinguishes itself from the simple Goodness of Fit Index (GFI) by accounting for the adjustment of model degrees of freedom. A status indicator of 0.80 or greater is considered satisfactory. The attained AGFI value of 0.81 meets this criterion.
- Root Mean Square Error of Approximation (RMSEA): The RMSEA serves as an estimate of the error variance, adjusted for the model's complexity. A value below 0.10 is indicative of a well-performing model, demonstrating a close fit to the data. In this particular case, the RMSEA value was calculated as 0.020, meeting the stipulated criteria.
- Chi-Square Divided by Degrees of Freedom (CMIN/df): The CMIN/df ratio represents the residual-to-fit ratio within the model. A value as small as 3 may be considered of "minor importance". Therefore, the resulting CMIN/df value of 2.3 is below this threshold and thus meets the criterion.
- Tucker-Lewis Index (TLI): The TLI evaluates the baseline model with a rating equivalent to a "B" and a score of 40 out of 100, whereas the proposed model achieved a comparable score of 40 and a rating of "A." A value of 0.89 or greater is generally indicative of a good fit to the data. The obtained TLI value of 0.90 aligns with this criterion.
- Incremental Fit Index (IFI): The IFI is derived from the CFI and accommodates additional model intricacies. A value of 0.90 or higher is considered the expected threshold. The achieved Weber-Feker value of 0.91 meets this criterion, indicating satisfactory model fit.

Structural Model Fit:

- CFI: The CFI evaluates the fit of the structural model compared to a baseline model. A value of 0.90 or higher typically indicates a well-fitting model, signifying that the observed data aligns well with the model's predictions. This is deemed desirable, and in this case, the obtained CFI value of 0.92 corresponds with the specified cut-off point, demonstrating satisfactory model fit.
- AGFI: The AGFI considers the number of estimated factors, as this parameter has a tendency to inflate the model's scale. A score of 0.80 or higher indicates that the test effectively measured its intended constructs. The obtained AGFI value of 0.85 exceeds the specified criterion, indicating satisfactory performance in measuring the intended constructs.
- RMSEA: The RMSEA evaluates the disparity between the predicted covariance matrix of the model and the observed matrix, factoring in the model's complexity. A value below 0.10 is commonly deemed acceptable, indicating a good fit between the data and the derived model. In this instance, both criteria are met, with an RMSEA value of 0.011.

- CMIN/df: The CMIN/df ratio assesses the adequacy of fit for the model. A ratio below 3 is typically regarded as satisfactory. This rationale aligns with the observed CMIN/df value of 2.05, which meets the stipulated minimum requirement.
- TLI: The TLI compares the proposed structural model to the baseline model to assess the validity of identifying structural parameters. Values approaching 0.89 are typically indicative of acceptable quality. Ultimately, we achieved a TLI value of 0.92, meeting the specified criterion.
- IFI: The IFI, akin to the CFI, is tailored to accommodate complex models. A threshold of approximately 0.90 or lower is considered indicative of a satisfactory fit. Three indices have been discerned from the achieved IFI value, which was observed to be 0.93, thereby meeting the stipulated criterion.

Summary of Effects

Table 3 presents a summary of the direct, indirect, and total effects of factors on the measures of SEELI (Self-efficacy in E-learning) and SEELI'2 (Student's experience in E-learning).

Table 3

Summary of Effects

Variables	Direct Effects	Indirect Effects	Total Effects
PIEL→ SEELI	0.239	-----	0.239
PUEIS→ SEELI	0.314	-----	0.314
CU→ SEELI	0.322	-----	0.322
LSA→ SEELI	0.349	-----	0.349
MEL→ SEELI	0.128	-----	0.128
SEELI→ SEELI	0.469	-----	0.469
PIEL→ SEELII	-----	0.399	0.399
PUEIS→ SEELII	-----	0.467	0.467
CU→ SEELII	-----	0.569	0.569
LSA→ SEELII	-----	0.558	0.558
MEL→ SEELII	-----	0.399	0.399

Outcome of Analyses and Hypotheses

H1: The hypothesis posits that self-efficacy in e-learning serves as a mediating variable between students' attitude towards e-learning and their experiences in e-learning. This hypothesis is supported by the statistical significance, with a p-value of 0.015, indicating a value less than 0.05, and a t-value of 2.39, surpassing the threshold of 1.96.

H2: The hypothesis posits that self-efficacy in e-learning serves as the intermediary linking the perceived usefulness of e-learning suggestions to students' experiences in e-learning. This hypothesis is rejected due to the p-value (0.167) exceeding the threshold of 0.05.

H3: The hypothesis is grounded on the concept that self-efficacy in e-learning serves as a moderating factor in the influence of computer usability on students' experiences in e-learning. The acceptance of the hypothesis is substantiated by the p-value (0.010),

indicating significance below the 5% threshold, and the t-value (3.64), exceeding the critical value of 1.96.

H4: The hypothesis posits that self-efficacy in the e-learning domain serves as a mediating mechanism between adjustments in learning style adaptations and students' experiences. The acceptance of this hypothesis is contingent upon two observations: the p-value (0.00) is less than 0.05, and the t-value (3.49) exceeds 1.96.

H5: The hypothesis posits that self-efficacy in e-learning acts as a mediator between motivation in e-learning and students' experiences in e-learning. This hypothesis is deemed accepted, as indicated by the p-value (0.015) being less than 0.05, and the t-value (4.58) exceeding 1.96.

Table 4

Result of Analyses and Hypotheses

	Hypotheses	P-value	T-value	Accept or Reject
H1	Self-efficacy in E-learning mediates relationship between Perceived impacts on E-learning and Student's experiences in E-learning	0.015	2.39	Accept
H2	Self-efficacy in E-learning mediates relationship between Perceived usefulness of E-learning suggestion and Student's experiences in E-learning	0.167	1.08	Rejected
H3	Self-efficacy in E-learning mediates relationship Computer Usability and Student's experiences in E-learning	0.010	3.64	Accept
H4	Self-efficacy in E-learning mediates relationship between Learning style adaptations and Student's experiences in E-learning	0.00	3.49	Accept
H5	Self-efficacy in E-learning mediates relationship between Motivation in E-learning and Student's experiences in E-learning	0.015	4.58	Accept

p-value <0.05(Hair et al., 2007), t-value > 1.96 (Bhatti & Sundram Kaiani, 2015)

Discussion

Understanding the dynamics inherent in the e-learning process is essential for elucidating factors that influence learner performance and outcomes. One crucial aspect is the perceived usefulness of e-learning, which significantly impacts learners' engagement and persistence. When learners perceive e-learning as beneficial for their learning objectives, they are more likely to engage actively and persist in their efforts. This perception of usefulness is influenced by various factors, including the alignment of learning goals, materials, and interface design with learners' needs and interests. A user-friendly interface is particularly important, as it enhances learners' comfort and confidence in using technology, thereby fostering a positive learning experience. Conversely, technical

issues or complex interfaces can impede user engagement, leading to frustration and potentially compromising learners' engagement and satisfaction levels.

Based on the study findings, hypothesis H1 posited the significance of students' self-efficacy beliefs in e-learning contexts, acting as the intermediary between their perceptions of e-learning program effects and their overall online learning experiences. The hypothesis was validated, suggesting that students who perceive e-learning initiatives positively or negatively develop corresponding levels of confidence in their ability to succeed, subsequently influencing their engagement and performance in the online environment. The analysis concluded that e-learning self-efficacy serves as a mediator between e-learning attitudes and student experiences in online learning. This validation stemmed from statistical significance tests indicating the pivotal role of self-efficacy in shaping students' e-learning experiences.

Based on the findings of this study, H2 pertains to the perceived usefulness of e-learning suggestions and their impact on students' experiences. The rejection of this hypothesis suggests that students' belief in their self-efficacy in e-learning, subsequent to perceiving such suggestions as helpful, constitutes a crucial set of factors for overall e-learning success. This enhanced self-assurance further influences their online experiences, positively impacting the quality of their engagement and learning. The mediation model positing self-efficacy as a mediator between the perceived usefulness of e-learning and students' experiences does not receive support from the obtained results. Consequently, it appears that self-efficacy does not play a mediating role in this particular cause-and-effect relationship.

The study revealed that hypothesis H3, concerning the relationship between computer usability and students' e-learning experiences, was mediated by self-efficacy beliefs. The validation of these hypotheses provided evidence that students' perception of e-learning technologies as either "easy" or "intuitive" led to the development of their confidence in accessing and utilizing online resources. This proficiency subsequently influences the entirety of the e-learning process, indicating that self-efficacy in e-learning mediates between computer usability and students' e-learning experiences, thereby supporting the hypothesis. The significant findings indicate that self-efficacy indeed functions as a mediator, either amplifying or attenuating the effects of computer usability on students' experiences.

Based on the study findings, H4 examined the impact of learning style adaptations on students' e-learning experiences, mediated by self-efficacy beliefs. The hypothesis and results suggest that self-efficacy serves as a mediator between learning style adaptations and students' e-learning experiences, as supported by statistical evidence. This indicates that self-efficacy acts as a regulatory mechanism, shaping students' e-learning experiences through adjustments in their learning styles. Acceptance of this hypothesis suggests that students feel more supported and confident in their ability to succeed when e-learning materials align with their individual learning styles. This enhanced confidence leads to a more positive overall experience with online learning.

The findings indicated support for hypothesis H5, which posited that e-learning motivation mediated by self-efficacy influences students' experiences in e-learning. The study results demonstrated that self-efficacy plays a pivotal role in regulating the impact of motivation on students' engagement in online learning. This underscores the significance of self-confidence in the context of distance learning, as it serves as a

fundamental element shaping individuals' perceptions and interactions with online courses, leading to a more gratifying and efficacious learning experience.

Customizing e-learning materials to accommodate different learning styles enhances learners' understanding and engagement. For instance, visual learners may benefit from multimedia presentations, while auditory learners may prefer podcasts. This tailored approach not only improves teaching effectiveness but also increases learner engagement. Motivation is another crucial factor in e-learning. Internally motivated students, who find learning enjoyable and interesting, tend to be more engaged and achieve better results. Components such as competence, autonomy, and connection with others play key roles in sustaining motivation. Moreover, the usability of e-learning tools positively influences learners' perception of usefulness and motivation. Adapting teaching styles to suit learners' preferences further enhances motivation and perceived usefulness, fostering a more conducive learning environment.

The findings of this study underscore the intricate web of factors shaping students' experiences within e-learning environments. Through a comprehensive analysis of these interconnected variables, the study elucidates the dynamics of online learning environments. Specifically, it reveals that self-efficacy in e-learning serves as a mediator between perceived influences on e-learning, computer usability, learning style adaptations, and motivation in e-learning. However, self-efficacy does not mediate the relationship between perceived usefulness of e-learning suggestions and learners' experiences in e-learning. The analysis highlights significant correlations among these key variables, underscoring the pivotal role of self-efficacy in shaping students' experiences in e-learning. These findings underscore the importance of individual beliefs and perceptions in shaping the learning process, aligning with previous research in various educational contexts. By providing empirical evidence of the mediating role of self-efficacy in e-learning experiences, this study contributes to the existing knowledge base on e-learning. Furthermore, it extends established theoretical frameworks such as Social Cognitive Theory, enriching our understanding of cognitive and motivational factors in the e-learning domain.

Implications

The findings highlight the pivotal role of self-efficacy as a mediator in e-learning experiences, shedding light on how personal perspectives influence learning outcomes. This aligns with established theoretical frameworks like Social Cognitive Theory, which emphasize the impact of self-efficacy on behaviour and outcomes, including in online learning. By considering both external factors (e.g., perceived effects, usability) and internal factors (e.g., self-efficacy), the study provides insights into students' e-learning experiences.

Educators and instructional designers can leverage these findings to enhance e-learning platforms and materials. Strategies such as setting clear goals, providing feedback based on specific criteria, and monitoring individual progress can enhance student effectiveness and improve learning outcomes. Organizations can implement programs to foster an aspirational mindset among students, thereby creating a highly positive and effective e-learning environment. Recognizing self-efficacy as a mediator between students, challenges in online learning, and related interventions can inform the development of targeted interventions to address specific issues in online learning.

Limitations

The study's generalizability may be limited to a specific demographic or educational context, potentially reducing its applicability as a reference. Therefore, researchers should consider conducting additional studies to enhance the validity of the findings. Respondents may exhibit social desirability bias, leading to potentially unrealistic data. Moreover, the cross-sectional design precludes establishing causal relationships between variables. Longitudinal or experimental studies would provide more robust evidence regarding the hypothesized mediation effect. Additionally, this study did not account for variations attributable to unidentified confounding variables and alternative explanations, which may influence the observed relationships.

Future Research Directions

Prospective endeavours might involve examining additional variables that could impact students' achievements in e-learning, such as social presence, instructor support, and technology readiness. Future research methodologies could track the evolution of self-efficacy beliefs over time and evaluate their impact on students' sustained learning outcomes. Researchers may enhance the generalizability of their findings by conducting comparative studies across diverse educational settings or cultural contexts. Integrating qualitative methodologies alongside quantitative approaches can offer a comprehensive exploration of students' experiences and viewpoints within online learning environments.

Contribution

This study offers both theoretical and practical insights into the realm of e-learning. By highlighting the mediating role of self-efficacy in e-learning, it expands theoretical understanding of how individual beliefs influence learning outcomes. The practical implications of the findings offer timely guidance for educators, instructional designers, and policymakers seeking to enhance the effectiveness of e-learning initiatives. Despite its limitations, this study lays the groundwork for future research endeavours aimed at delving deeper into the interplay among individual, instructional, and contextual factors in online learning environments.

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References

Abdulaal1, 2, M. A. A.-D., Shaalan, I. E.-N. A., Yousif, A. S. A., Alenazi, M. H., & Abuslema, N. F. M. A. (2024). The Effect of Real-World Evaluation on Self-Controlled Learning, Independence, and Self-effectiveness Among EFL Learners with Some Psychological Implications. *World*, *14*(2). https://doi.org/10.5430/wjel.v14n2p146

Al Mulhem, A. (2020). Investigating the effects of quality factors and organizational factors on university students' satisfaction of e-learning system quality. *Cogent Education*, *7*(1), 1787004. https://doi.org/10.1080/2331186X.2020.1787004

Alesi, M., Giordano, G., Gentile, A., Roccella, M., Costanza, C., & Caci, B. (2024). The mediating role of academic motivation in the relationship between self-efficacy and learning strategies during the COVID-19 pandemic. Frontiers in Education, https://doi.org/10.3389/feduc.2023.1339211

Asfahani, A. M. (2023). The Relationship between academic self-efficacy and undergraduate students' perceptions of electronic assessment: A mediation analysis. *International Journal of Learning, Teaching and Educational Research*, *22*(6), 226-244. https://doi.org/10.1080/02602938.2019.1640184

Barth, M., & Burandt, S. (2013). Adding the "e-" to learning for sustainable development: Challenges and innovation. *Sustainability*, *5*(6), 2609-2622. https://doi.org/10.3390/su5062609

Bismala, L. (2022). The impact of e-learning quality and students' self-efficacy toward the satisfaction in the using of e-learning. *Malaysian Online Journal of Educational Technology*, *10*(2), 141-150. https://doi.org/10.52380/mojet.2022.10.2.362

Chahal, J. (2022). Effect of Computer and Internet Self-Efficacy on Students' Acceptance of E-Learning: Analysis of TAM Model Using PLS SEM Approach. 2022 International Conference on Computing, Communication, and Intelligent Systems (ICCCIS), https://doi.org/10.1109/ICCCIS56430.2022.10037611

El-Seoud, S. A., El-Khouly, M. M., & Taj-Eddin, I. (2016). Motivation in e-learning: How do we keep learners motivated in an e-learning environment. *International Journal of Learning and Teaching*, *2*(1), 63-66. https://doi.org/10.18178/ijlt.2.1.63-66

Frias-Martinez, E., Chen, S. Y., & Liu, X. (2009). Evaluation of a personalized digital library based on cognitive styles: Adaptivity vs. adaptability. *International Journal of Information Management*, *29*(1), 48-56. https://doi.org/10.1016/j.ijinfomgt.2008.01.012

Fryer, L. K., & Bovee, H. N. (2016). Supporting students' motivation for e-learning: Teachers matter on and offline. *The Internet and Higher Education*, *30*, 21-29. https://doi.org/10.1016/j.iheduc.2016.03.003

Green, A., Jeffs, D. A., Boateng, B. A., Lowe, G. R., & Walden, M. (2017). Evaluating evidence-based practice knowledge and beliefs through the e-learning EBP academy. *The Journal of Continuing Education in Nursing*, *48*(7), 304-311. https://doi.org/10.3928/00220124-20170616-07

Guzmán, A. D. M. (2020). An Exploratory Study of the Student's Learning Experience by Applying Different Tools for e-Learning and e-Teaching. *International Journal of Educational and Pedagogical Sciences*, *14*(10), 982-986. https://www.researchgate.net/profile/Angel-Guzman/publication/348394948

Hair, J. F., Money, A. H., Samouel, P., & Page, M. (2007). Research methods for business. *Education+ Training*, *49*(4), 336-337. https://doi.org/10.1108/et.2007.49.4.336.2

Hanif, A., Siddiqi, A. F., & Jalil, Z. (2019). Are computer experience and anxiety irrelevant? towards a simple model for adoption of E-Learning systems. *Int. J. Eng. Pedagog.*, *9*(5), 112-125. https://doi.org/10.3991/ijep.v9i5.11488

Hariadi, I. G., & Simanjuntak, D. C. (2020). Exploring the experience of EFL students engaged in asynchronous e-learning. *Academic Journal Perspective: Education, Language, and Literature*, *8*(2), 72-86. https://dx.doi.org/10.33603/perspective.v8i2.4194

Hua, M., Wang, L., & Li, J. (2024). The impact of self-directed learning experience and course experience on learning satisfaction of university students in blended

learning environments: the mediating role of deep and surface learning approach. *Frontiers in Psychology*, *14*, 1278827. https://doi.org/10.3389/fpsyg.2023.1278827

Huang, H.-M., & Liaw, S.-S. (2007). Exploring learners' self-efficacy, autonomy, and motivation toward e-learning. *Perceptual and motor skills*, *105*(2), 581-586. https://doi.org/10.2466/pms.105.2.581-586

Husna, N. (2018). *Students' Perceived Usefulness of the E-learning (A Survey Study at Ar-Raniry State Islamic University)* UIN Ar-Raniry Banda Aceh]. https://repository.ar-raniry.ac.id/id/eprint/4677

Huynh, Q. L., & Thi, T. (2014). The mediating role of the perceived usefulness in the acceptance of e-learning. *International Journal of Humanities and Social Science Invention*, *3*(2), 37-42. http://www.ijhssi.org/papers/v3(2)/Version-3/F0323037042.pdf

Ingkavara, T., Panjaburee, P., Srisawasdi, N., & Sajjapanroj, S. (2022). The use of a personalized learning approach to implementing self-regulated online learning. *Computers and Education: Artificial Intelligence*, *3*, 100086. https://doi.org/10.1016/j.caeai.2022.100086

Jashapara, A., & Tai, W.-C. (2006). Understanding the complexity of human characteristics on e-learning systems: an integrated study of dynamic individual differences on user perceptions of ease of use. *Knowledge Management Research & Practice*, *4*, 227-239. https://doi.org/10.1057/palgrave.kmrp.8500099

Khan, M. A., Nabi, M. K., Khojah, M., & Tahir, M. (2020). Students' perception towards e-learning during COVID-19 pandemic in India: An empirical study. *Sustainability*, *13*(1), 57. https://doi.org/10.3390/su13010057

Kropman, M., Schoch, H. P., & Teoh, H. Y. (2004). An experience in e-learning: Using an electronic textbook. Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference.https://www.ascilite.org/conferences/perth04/procs/pdf/kropman.pdf

Lama, S. (2024). Analysis of student perceptions relating to satisfaction from online learning during COVID-19 in Sikkim, India: The mediating role of motivation and attitude, and the moderating role of constraints. *E-Learning and Digital Media*, 20427530241229119. https://doi.org/10.1177/20427530241229119

Lanzilotti, R., Montinaro, F., & Ardito, C. (2009). Influence of students' motivation on their experience with e-learning systems: an experimental study. Universal Access in Human-Computer Interaction. Applications and Services: 5th International Conference, UAHCI 2009, Held as Part of HCI International 2009, San Diego, CA, USA, July 19-24, 2009. Proceedings, Part III 5, https://doi.org/10.1007/978-3-642-02713-0_7

Latip, M. S. A., Noh, I., Tamrin, M., & Latip, S. (2020). Students' acceptance for e-learning and the effects of self-efficacy in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, *10*(5), 658-674. https://doi.org/10.6007/ijarbss%2Fv10-i5%2F7239

Lestari, D., Usman, U., & Munzir, S. (2024). Mathematical Representation Abilities and Self-Confidence through Application of Discovery Learning Model with Geogebra-assisted. 2nd Annual International Conference on Mathematics, Science and Technology Education (AICMSTE 2023), https://doi.org/10.2991/978-2-38476-216-3

Masalimova, A. R., Zheltukhina, M. R., Sergeeva, O. V., Sizova, Z. M., Novikov, P. N., & Sadykova, A. R. (2024). Exploring higher education students' attitudes toward e-

learning after COVID-19. *Contemporary Educational Technology*, *16*(1), Article ep488. https://doi.org/10.30935/cedtech/14045

Mathur, G., Nathani, N., Chauhan, A. S., Kushwah, S. V., & Quttainah, M. A. (2024). Students' Satisfaction and Learning: Assessment of Teaching-Learning Process in Knowledge Organization. *Indian Journal of Information Sources and Services*. https://doi.org/10.51983/ijiss-2024.14.1.3798

Moelans, C., Geerling, J., Radersma, R., Moons, M., van Diest, P., & van Der Schaaf, M. (2024). Biomedical students' satisfaction with and engagement in laboratory e-learning support are related to their self-regulation. *Biochemistry and Molecular Biology Education*. https://doi.org/10.1002/bmb.21810

Moussaoui, S. (2024). Enhancing Writing Quality and Self-Efficacy Beliefs through Process-oriented Task-based Instruction and Multiple Feedback Forms. *Journal of Educational and Psychological Studies [JEPS]*, *18*(1), 96-116. https://doi.org/10.53543/jeps.vol18iss1pp96-116

Nikolova, I., Nikolov, R., & Kovatcheva, E. (2005). e-Learning for e-Learning: Reflection on Teacher and Student Experiences in an e-Learning Course. 2-nd Balkan Conference on Informatics, https://hal.science/hal-00592514

Paechter, M., Maier, B., & Macher, D. (2010). Students' expectations of, and experiences in e-learning: Their relation to learning achievements and course satisfaction. *Computers & education*, *54*(1), 222-229. https://doi.org/10.1016/j.compedu.2009.08.005

Peca, L. (2023). E-Learning Experiences in the Computer Networks Course in Higher Education. *Intellectus*, 62. https://doi.org/10.56329/1810-7087.23.2.07

Pham, T. T. H., Ho, T. T. Q., Nguyen, B. T. N., Nguyen, H. T., & Nguyen, T. H. (2024). Academic motivation and academic satisfaction: a moderated mediation model of academic engagement and academic self-efficacy. *Journal of Applied Research in Higher Education*. https://doi.org/10.1108/JARHE-10-2023-0474

Pishchik, V., Azarko, E., & Sinko, T. (2024). Study of use and perception of Internet information by young people with a field-dependent/field-independent cognitive style for decision making for sustainable development. BIO Web of Conferences, https://doi.org/10.1051/bioconf/20248404030

Rajaratnam, A. (2023). Impact of the extended version of Technology Acceptance Model on predicting learners' adoption to synchronous online learning in Sri Lanka. *Vidyodaya Journal of Management*, *9*(I). https://doi.org/10.31357/vjm.v9iI.6374

Rohendi, D. (2012). Developing E-Learning Based on Animation Content for Improving Mathematical Connection Abilities in High School Students. *International Journal of Computer Science Issues*. https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=40e4d54cfd2ffe1e5a15a7d14e808aa0b05d7aed

Saba, T. (2012). Implications of E-learning systems and self-efficiency on students outcomes: a model approach. *Human-Centric Computing and Information Sciences*, *2*, 1-11. https://doi.org/10.1186/2192-1962-2-6

Soflano, M., Connolly, T. M., & Hainey, T. (2015). An application of adaptive games-based learning based on learning style to teach SQL. *Computers & education*, *86*, 192-211. https://doi.org/10.1016/j.compedu.2015.03.015

Srikanth, M. (2024). *Exploring the Perceptions and Experiences of E-Learning in Consultancy Organizations: A qualitative study with a focus on the Indian context* University of

Essex]. https://repository.essex.ac.uk/38170/1/Srikanth%20Mandela%202111817%20Thesis.pdf

Syara, N. D., & Andayani, E. S. (2022). Pengaruh Kualitas E-Learning, Self-Efficacy, dan Interaksi Terhadap Student Satisfaction Pada Pembelajaran Online di Sekolah Menengah Kejuruan. *Refleksi Edukatika: Jurnal Ilmiah Kependidikan*, *12*(2), 155-164. https://doi.org/10.24176/re.v12i2.6186

Udin, T., Maufur, S., & Riyanto, O. R. (2022). Student's Self-Efficacy and Perceptions of Online Learning on the Use Learning Management System. *Journal of Education Technology*, *6*(1), 165-172. https://doi.org/10.23887/jet.v6i1.41884

van der Walt, F., Nkoyi, A., & Thithi, M. (2024). The influence of selected factors on perceived enjoyment of the online learning experience: lessons for post-COVID-19 classrooms. Frontiers in Education, https://doi.org/10.3389/feduc.2024.1274126

Waghmare, M. P. (2021). An Empirical Research on Teaching, Learning and Evaluation with Online Education. *IBMRD's Journal of Management & Research*, 18-23. https://doi.org/10.17697/ibmrd/2021/v10i1/159759

Wati, I. W. K., Sari, A. S., & Setyaningsih, R. (2020). Media Need Analysis of Learning Practicum in the Covid-19 Pandemic. *VANOS Journal of Mechanical Engineering Education*, *5*(2). http://dx.doi.org/10.30870/vanos.v5i2.9441

Xiong, Y., Ling, Q., & Li, X. (2021). Ubiquitous e-Teaching and e-Learning: China's massive adoption of online education and launching MOOCs internationally during the COVID-19 outbreak. *Wireless Communications and Mobile Computing*, *2021*, 1-14. https://doi.org/10.1155/2021/6358976

Yasin, N. M., Ong, M. H., & Utmspace, U. T. M. (2020). A blended learning model of technology access and technical self-efficacy: Multiple mediator effects on student readiness. *Journal of Advanced Research in Dynamical and Control Systems*, *12*(3), 531-539. http://dx.doi.org/10.5373/JARDCS/V12I3/20201220

Zhou, L., Wu, S., Zhou, M., & Li, F. (2020). 'School's out, but class' on', the largest online education in the world today: Taking China's practical exploration during The COVID-19 epidemic prevention and control as an example. *Best evid chin edu*, *4*(2), 501-519. https://dx.doi.org/10.2139/ssrn.3555520

APPENDIX 1: Measurement Scales

Perceived impacts on E-learning	
1. Using this learning system for my course has positively impacted my learning of the subject. 2. Using this learning system for my course is an important and valuable aid. 3. I gained a clearer understanding of some knowledge from this learning system. 4. Using this learning system has provided me with a good opportunity to learn content knowledge well.	(Ingkavara et al., 2022)
Perceived Usefulness of E- Learning Suggestion	
1. This learning system would be helpful for me to identify my knowledge strengths/weaknesses and relevant learning needs. 2. The learning system would be helpful for me to build knowledge in my learning strategies. 3. Using this learning system would enhance effectiveness in my task-related learning strategies.	
Computer Usability	
1. I am satisfied with how easy it is to use the system 2. I can effectively complete my work using this system 3. I feel comfortable using this system 4. It was easy to learn to use this system 5. The interface of this system is pleasant 6. I like using the interface of this system 7. This system has all the functions I expect it to have 8. Overall, I am satisfied with this system	(Frias-Martinez et al., 2009)
Learning Style Adaptations (Perception and Intuitive)	
1. I understand something better after I (a) try it out. (b) think it through. 2. I would rather be considered (a) realistic. (b) innovative. 3. When I think about what I did yesterday, I am most likely to get (a) a picture. (b) words. 4. I tend to (a) understand details of a subject but may be fuzzy about its overall structure. (b) understand the overall structure but may be fuzzy about details. 5. When I am learning something new, it helps me to (a) talk about it. (b) think about it.	(Soflano et al., 2015)
Motivation in E-Learning	
1. I try hard to construct knowledge in e-learning environments. 2. I want to improve my achievement in e-learning environments. 3. I want to learn more in e-learning environments. 4. I am satisfied with being a knowledge learner in e-learning environments. 5. I am satisfied with getting praise in e-learning environments. 6. I am satisfied with being a good student in e-learning environments.	(Huang & Liaw, 2007)

Self-Efficacy in E-Learning	
1. I am good at using e-learning.	
2. 1 am good at Internet access.	
3. I am good at Word Processing.	
4. I am good at using Web browsers.	
Students' Experiences in E-learning	
1. I can decide on my own about the pace of learning and the use of learning strategies (flexibility)	(Paechter et al., 2010)
2. My instructor has a high level of expertise in the implementation of e-learning courses (tutor expertise)	
3. My instructor supports and counsels me with regard to my learning processes (tutor support)	
4. I can exchange knowledge easily and quickly with other course participants via e-mail, chat, newsgroups etc. (communication: knowledge)	
5. The online communication tools facilitate establishing new relationships with other students (communication: relation)	
6. The course itself and the learning material are clear and well structured (structure)	
7. I find it difficult to motivate myself and to maintain learning motivation in the course (motivation)	