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IMPLEMENTATION AND AWARENESS OF E-LEARNING IN MALAYSIA: A BIBLIOMETRICS RESEARCH

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Abstract:

The implementation and awareness with regard to e-learning in Malaysia have gained significant attention, particularly in response to the growing digital transformation in education. While e-learning presents opportunities for improved accessibility and flexible learning environments, challenges such as digital readiness, technological infrastructure, and engagement persist. The goal of this study is to assess the research landscape towards e-learning implementation and awareness in Malaysia through a bibliometric approach. We analyzed 723 relevant publications from the Scopus database using Scopus Analyzer and VOSviewer software. These tools facilitated the extraction of prevalent keywords, co-occurrence patterns, and collaborative research trends, which are summarized in the form of occurrence rates and total link strength among keywords. The findings indicate that research interest in e-learning has significantly increased, particularly post-2020, caused by the influence of the COVID-19 pandemic. Note that the most frequently occurring keywords include “e-learning,” “online learning,” “implementation” and “awareness”

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highlighting the dominant themes in this field. Additionally, co-authorship analysis reveals Malaysia's strong research collaboration with countries like the United Kingdom, Indonesia, and Saudi Arabia, further solidifying its role as a leader in digital education research. Despite the progress, challenges such as limited access in rural areas, digital literacy gaps, and technological resistance remain key obstacles to successful e-learning adoption. This study provides valuable insights into research trends, enabling policymakers, educators as well as researchers to establish more efficient strategies in order to integrate e-learning into Malaysia's education system. Future studies should explore the integration of emerging technologies, digital equity, and post-pandemic e-learning sustainability in ensuring long-term success in digital education.

Keywords:

Implementation; Awareness; E-learning

Introduction

The learning environment established through electronic devices with optional Internet access stands as a defined practice in tertiary education to improve student educational experiences (Azhari & Ming, 2015). Various past research have proven that e-learning does not resemble a new concept in Malaysia, with several universities already adopting this method. For instance, e-learning practices review at the tertiary level highlights the mixed responses from students and lecturers, indicating both acceptance and challenges in its implementation. Additionally, research shows that e-learning increases student satisfaction along with perceived usefulness, which determines the willingness of students to use these platforms (Al-rahmi et al., 2018). Despite the growing acceptance, the implementation of e-learning in Malaysia faces several challenges. A study on using online learning resources among academicians at a Malaysian university revealed that while e-learning modules are widely used, other resources like Open Courseware (OCW) as well as Massive Open Online Courses (MOOC) are less frequently implemented due to issues such as system instability and lack of student participation (Salim et al., 2018). Moreover, the COVID-19 pandemic has emphasized the significance of e-learning, with many educational institutions shifting to online platforms to continue the learning process. Research conducted in a pondok school in Kelantan showed that students' characteristics, such as motivation and computer competency, significantly affect their acceptance as well as continuous engagement with e-learning (A. Rahman et al., 2022).

Overall, while e-learning has the potential to transform education in Malaysia, continuous efforts are needed to address the barriers and enhance the efficacy of these digital learning environments.

Literature Review

Malaysian universities represent one of the main targets for educational transformation through e-learning adoption driven by governmental initiatives and technological advancements. Puteh, (2008) analyzed the Malaysian government's push for knowledge worker production since the introduction of the Multimedia Super Corridor in 1996, highlighting the emphasis on e-learning and multimedia integration in higher education institutions (HEIs). However, resistance among faculty members has posed a significant challenge, aligning with Roger's Technology Adoption Model, which underscores the reluctance of the majority to embrace new technologies. Similarly, Al-Rahmi et al., (2018) explored the technology acceptance model

(TAM) in assessing students' perceptions towards e-learning, finding that perceived usefulness and satisfaction significantly influence adoption. Ghavifekr, (2017) further investigated how demographic factors affect e-learning usage, indicating that engagement in co-participatory activities plays a crucial role in motivation. These studies collectively underline the importance of institutional strategies in overcoming resistance and enhancing e-learning adoption. The COVID-19 pandemic forced educational institutions to transition to online learning, which exposed both the advantages and disadvantages of virtual learning technologies. Rahman et al., (2022) assessed student acceptance towards e-learning during the pandemic, highlighting that motivation, computer competency, and economic factors influence technology adoption. Similarly, Fei & Hui, (2022) analyzed student behavioral intentions towards e-learning during Malaysia's Movement Control Order (MCO), identifying perceived usefulness, ease of use, and social influence as primary determinants. However, self-efficacy did not directly impact adoption, contradicting earlier research by Al-Rahmi et al., (2018). Tham et al., (2020) explored e-learning implementation in rural Malaysian regions, revealing gaps in accessibility and familiarity with online platforms. These studies highlight the necessity for continued research into digital inclusivity and technological readiness in different student demographics.

The integration of e-learning into higher education is further influenced by organizational and leadership factors. Ismail et al., (2023) investigated how different leadership styles impact job satisfaction among teachers involved in online education, finding significant correlations between transformational, transactional, and laissez-faire leadership styles and teacher satisfaction. Teoh & Tan, (2020) expanded this discussion to the workplace, analyzing behavioral intentions of manufacturing engineers toward e-learning adoption. Their findings support the mediating role of perceived usefulness as well as ease of use between behavioral intention and self-efficacy. Lo et al., (2015) tested the validity of TAM in predicting actual e-learning usage, demonstrating a strong correlation between intention and actual adoption in Malaysian universities. These studies collectively emphasize the need for robust leadership strategies and institutional support to ensure sustainable e-learning adoption. Despite the progress in e-learning implementation, challenges such as technological resistance, accessibility, and engagement persist. Puteh, (2008) identified faculty reluctance as a barrier to successful e-learning strategies, while Tham et al., (2020) pointed out disparities in access among rural students. Additionally, Fei & Hui, (2022) highlighted the need to enhance hedonic motivation in e-learning, suggesting that ensuring enjoyable and engaging learning experiences can improve student adoption rates. The lack of social influence in some studies, as noted by Rahman et al., (2022), suggests that peer and institutional encouragement remains underutilized. Addressing these gaps is essential to developing a more inclusive and effective e-learning environment.

Future research needs to establish better ways to enhance student engagement and overcome barriers to e-learning access. Studies such as Al-Rahmi et al., (2018) and Ghavifekr, (2017) stated the importance of interactive and collaborative learning environments, which could be further explored through adaptive learning technologies. Additionally, research into faculty development programs, as suggested by Puteh, (2008), could provide insights into overcoming institutional resistance to technology. As Malaysia continues to advance its digital education landscape, addressing these challenges through empirical research will be vital in ensuring the success of e-learning initiatives.

Research Question

1. What are the research trends in e-learning studies according to the year of publication?
2. Who and how much has been published in the area with regard to the authors?
3. Who are the top 10 authors based on citation by research?
4. What are the popular keywords related to the study?
5. What are co-authorship countries' collaboration?

Methodology

Using bibliometrics means collecting bibliographic information from scientific documents followed by data management and statistical analysis methods (Alves et al., 2021; Assyakur & Rosa, 2022; Verbeek et al., 2002). Beyond basic statistics, such as identifying publishing journals, publication years, and leading authors (Wu & Wu, 2017), bibliometrics includes more sophisticated techniques like document co-citation analysis. A successful literature review demands following a systematic and repeating procedure to select suitable keywords, search the literature, and perform an in-depth analysis. This approach helps to compile a comprehensive bibliography and achieve reliable results (Fahimnia et al., 2015). With this in mind, the study focused on high-impact publications, as they provide meaningful insights into the theoretical frameworks that shape the research field. To ensure data accuracy, SCOPUS served as the primary source for data collection (Al-Khoury et al., 2022; di Stefano et al., 2010; Khiste & Paithankar, 2017). Additionally, to maintain quality, the study only considered articles published in peer-reviewed academic journals, deliberately excluding books and lecture notes (Gu et al., 2019). Elsevier's Scopus database was utilized due to its broad coverage to collect publications spanning from 2020 until December 2023.

Data Search Strategy

Advanced searching on the Scopus database is a method that enables researchers to create highly specific and tailored search queries using a combination of keywords, Boolean operators, and filters. Unlike basic keyword searches, advanced searching provides options to structure and refine searches, allowing users to pinpoint relevant studies while filtering out irrelevant results. This approach is particularly useful for conducting systematic reviews, meta-analyses, and bibliometric studies, where precision and data relevance are crucial. Table 1 and Table 2 show the keyword searching and criterion of inclusion and exclusion.

Table 1: The Search String.

Scopus	TITLE-ABS-KEY ((implementat* OR aware* OR use*) AND (e-learning OR "electronic learning" OR "online learning") AND Malaysia) AND (LIMIT-TO (AFFILCOUNTRY , "Malaysia")) AND (LIMIT-TO (LANGUAGE , "English"))
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Table 2: The Selection Criterion Is Searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Country	Malaysia	Besides Malaysia

Data Analysis

VOSviewer is a user-friendly bibliometric software developed by Nees Jan van Eck and Ludo Waltman at Leiden University, Netherlands (van Eck & Waltman, 2010, 2017). The tool serves as a scientific visualization and analytics system which generates clear network diagrams along with relational pattern clustering and displays density distribution effectively. This tool supports analysis of co-authorship connections, co-citation relationships, and keyword co-occurrence patterns, which grants researchers complete knowledge of research domains. Interactive design, along with real-time updates in the system, enables users to efficiently examine large datasets through its dynamic interface. The analytical capabilities of VOSviewer, together with user-adjustable visualizations and multitasking functionality with bibliographic data, make this tool an important tool for academic researchers studying complex fields.

One of the standout features of VOSviewer is its capacity to transform intricate bibliometric datasets into visually interpretable maps and charts. With a focus on network visualization, the software excels in clustering related items, analyzing keyword co-occurrence patterns, and generating density maps. Researchers benefit from its user-friendly interface, enabling both novice and experienced users to explore research landscapes efficiently. Ongoing VOSviewer development helps the platform lead bibliometric analysis with its computing functionality while providing flexible visualizations. Its capability to handle various bibliometric data types, including co-authorship and citation networks makes VOSviewer the essential instrument which researchers rely on for advancing their domain understanding through meaningful insights.

The PlainText datasets obtained from the Scopus database included publication year, title, author name, journal, citation and keyword information for the period between 2004 and December 2024. The datasets underwent analysis through VOSviewer software version 1.6.19. These techniques served to refine and create maps based on the VOS clustering approach, which was integrated into the software platform. The VOSViewer software provides a different solution to MDS methods by creating low-dimensional placements for items to display accurate relationships and similarities between them. (van Eck & Waltman, 2010). In this respect, VOSViewer shares a similarity with the MDS approach (Appio et al., 2014). VOS diverges from MDS through its use of the association strength (AS_{ij}) that serves as a better normalization technique for co-occurrence frequency calculations (Van Eck & Waltman, 2007):

$$AS_{ij} = \frac{C_{ij}}{w_i w_j}$$

which is proportional to the ratio between the observed number of co-occurrences of i and j as well as the expected number of co-occurrences of i and j under the assumption that co-occurrences of i and j are statistically independent (Van Eck & Waltman, 2007).

Result and Discussion

What Are The Research Trends In E-Learning Studies According To The Year Of Publication?

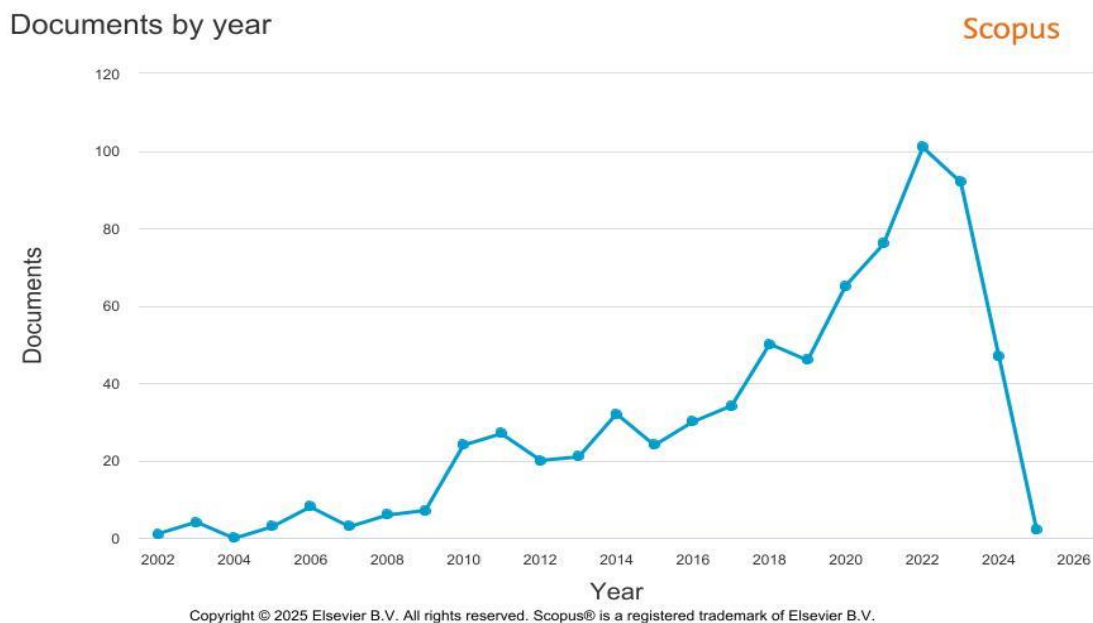


Figure 1: Plotting Document Publication By Years.

The publication trend on e-learning implementation and awareness in Malaysia from 2002 to 2025 reveals distinct phases of growth and decline, reflecting broader socio-technological and contextual shifts. Between 2002 and 2010, publications remained low (≤ 32 documents annually), indicating nascent interest, likely due to limited technological infrastructure, policy prioritization, and academic focus. A gradual rise began post-2011, peaking at 101 documents in 2022, with notable accelerations from 2016 onward. This surge aligns with Malaysia's intensified digital education policies, such as the National e-Learning Policy (2011) and the COVID-19 pandemic (2020–2022), which necessitated rapid e-learning adoption. However, post-2022, publications sharply declined (92 in 2023, 47 in 2024, and 2 in 2025), suggesting potential saturation, shifting research priorities, or incomplete data for recent years, as 2024–2025 entries may reflect partial records or ongoing projects not yet published. The 2022 peak underscores the pandemic's catalytic role in accelerating e-learning research, while the subsequent drop hints at stabilization or reduced urgency as institutions adapted to post-pandemic norms.

The fluctuating trends also highlight disparities in research sustainability and focus areas. Pre-2010 stagnation contrasts with post-2010 growth, likely driven by improved internet accessibility, government initiatives like the Malaysia Education Blueprint (2013–2025), and HEIs' integration of digital tools. The dip in 2021 (76 documents vs. 101 in 2022) may reflect pandemic-related disruptions, while the 2023–2025 decline raises questions about long-term engagement. Notably, the abrupt drop to 2 publications in 2025 is anomalous, possibly indicating a lag in database indexing or a transition toward applied studies (e.g., AI in e-learning) not yet captured in bibliometric analyses. This pattern underscores the need for

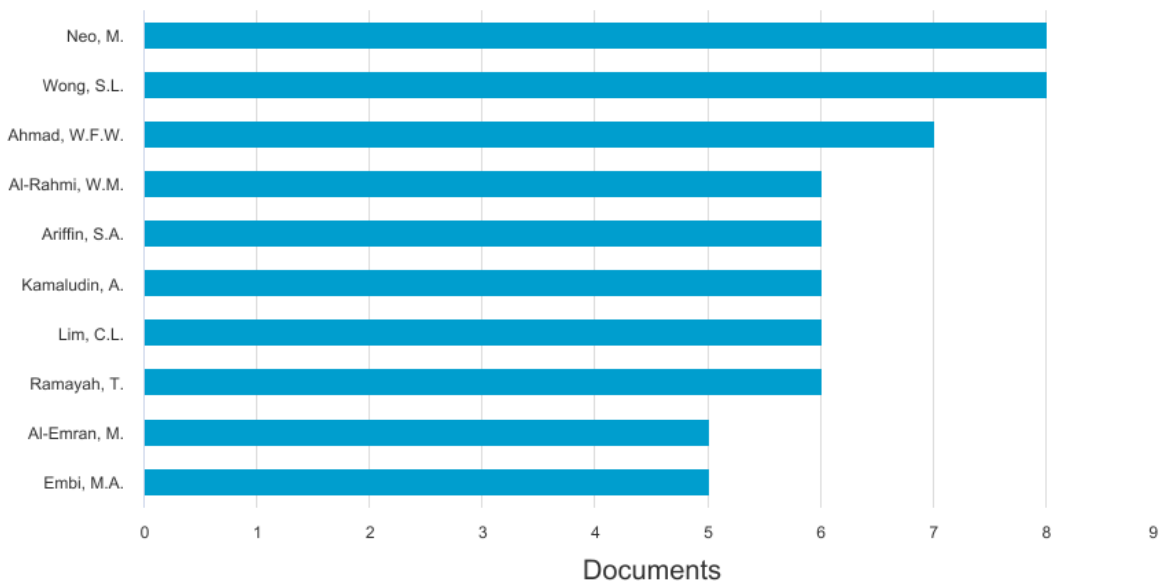
sustained funding and policy support to maintain research momentum beyond crisis-driven phases. Overall, the data reflects Malaysia's evolving e-learning landscape, shaped by policy, technology, and global events, but also signals challenges in ensuring consistent academic output and addressing gaps in post-pandemic research trajectories.

Who And How Much Has Been Published (Top 10) In The Area With Regard To The Authors?

Documents by author

Scopus

Compare the document counts for up to 15 authors.



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Figure 2: Top 10 Authors Based On The Number Of Publications

Table 3: Publication Contributions Of Leading Authors In E-Learning Research

Author Name	Number of Document	Percentages (% / 723)
Neo, M.	8	1.11
Wong, S.L.	8	1.11
Ahmad, W.F.W.	7	0.97
Al-Rahmi, W.M.	6	0.83
Ariffin, S.A.	6	0.83
Kamaludin, A.	6	0.83
Lim, C.L.	6	0.83
Ramayah, T.	6	0.83
Al-Emran, M.	5	0.69
Embi, M.A.	5	0.69

The analysis of authorship in e-learning research highlights the contributions of leading scholars in the field. Neo, M. and Wong, S.L. have the highest number of publications, each contributing eight documents, representing 1.11% of the total 723 articles. Their research likely reflects a sustained commitment to exploring e-learning implementation and awareness. Ahmad, W.F.W. follows closely with seven publications (0.97%), while Al-Rahmi, W.M., Ariffin, S.A., Kamaludin, A., Lim, C.L., and Ramayah, T. each have six documents, constituting 0.83% of the overall publications. The occurrence of multiple researchers with similar contributions suggests a competitive and collaborative academic environment where various perspectives enrich the discourse on e-learning. Further analysis shows that Al-Emran, M. and Embi, M.A. have each contributed five publications, making up 0.69% of the total. While their output is slightly lower than others on the list, their work remains significant within the domain. The distribution of publications among these top researchers suggests that no single scholar dominates the field, indicating a diverse research landscape where multiple contributors shape the understanding and advancement of e-learning. This diversity enhances the field by incorporating varied methodologies, theoretical perspectives, and regional contexts, ultimately fostering a more comprehensive approach to e-learning implementation and awareness.

Who Are The Top 10 Authors Based On Citation By Research?

The top-cited articles on e-learning in Malaysia, as indexed by Scopus, highlight the profound impact of the COVID-19 pandemic and foundational theories in shaping research priorities. The most cited study (432 citations) by Sundarasan et al. (2020) examines the psychological impact of COVID-19 and lockdowns on Malaysian university students, underscoring the pandemic's role as a catalyst for urgent e-learning research. Similarly, Shahzad et al. (2021) and Al-Kumaim et al. (2021) focus on gender disparities and motivational models in pandemic-driven e-learning, reflecting the global academic community's scramble to address crisis-induced educational challenges. These studies, published in high-impact journals like the International Journal of Environmental Research and Public Health as well as Sustainability, emphasize policy recommendations and sustainable online learning frameworks, aligning with

the immediacy of pandemic-related inquiries. Alongside COVID-19 themes, enduring theoretical frameworks, for instance, the Technology Acceptance Model (TAM) as well as the Unified Theory of Acceptance and Use of Technology (UTAUT2) dominate the list, as seen in Al-Rahmi et al. (2019) and Ain et al. (2016). These works, published in IEEE Access and Information Development, reveal a sustained interest in understanding user behavior and system usability, suggesting that pandemic-driven research coexists with long-standing investigations into e-learning adoption drivers.

The list also underscores interdisciplinary collaboration and the prominence of specific authors and institutions in Malaysian e-learning research. Al-Rahmi et al. appear twice, highlighting their contributions to technology acceptance studies. Meanwhile, journals like *Physica Medica* and *Australasian Journal of Educational Technology* illustrate the field's diversity, bridging education, technology, and healthcare. Notably, the 2020–2021 articles dominate citations, likely due to the pandemic's urgency, whereas pre-2020 works like Ain et al. (2016) demonstrate lasting relevance, accruing citations over time. However, the sharp decline in citations for non-pandemic studies (e.g., Moorthy et al., 2019) raises questions about whether post-pandemic research will sustain this momentum or refocus on non-crisis themes like AI integration and lifelong learning. The data also reflects Malaysia's strategic alignment with global education trends, as seen in collaborations with international authors, enhancing research visibility. Moving forward, balancing crisis-responsive studies with foundational explorations of accessibility, equity, and pedagogical innovation will be critical to maintaining Malaysia's role as a regional leader in e-learning research.

Table 4: Details Primary Data For The Top 10 Highest Citation

No	Authors	Title	Year	Journal	Cited by
1	(Sundarasan et al., 2020)	Psychological impact of COVID-19 and lockdown among university students in Malaysia: Implications and policy recommendations	2020	International Journal of Environmental Research and Public Health	432
2	(Shahzad et al., 2021)	Effects of COVID-19 in E-learning on higher education institution students: the group comparison between male and female	2021	Quality and Quantity	352
3	(Al-Rahmi et al., 2019)	Integrating Technology Acceptance Model with Innovation Diffusion Theory: An Empirical Investigation on Students' Intention to Use E-Learning Systems	2019	IEEE Access	297
4	(Ain et al., 2016)	The influence of learning value on learning management system use: An extension of UTAUT2	2016	Information Development	244
5	(Wang et al., 2019)	Usability factors predicting continuance of intention to use cloud e-learning application	2019	Heliyon	159

6	(Azlan et al., 2020)	Teaching and learning of postgraduate medical physics using Internet-based e-learning during the COVID-19 pandemic – A case study from Malaysia	2020	Physica Medica	143
7	(Al-Rahmi et al., 2018)	Use of E-Learning by University Students in Malaysian Higher Educational Institutions: A Case in Universiti Teknologi Malaysia	2018	IEEE Access	141
8	(Al-Kumaim et al., 2021)	Exploring the impact of the COVID-19 pandemic on university students' learning life: An integrated conceptual motivational model for sustainable and healthy online learning	2021	Sustainability (Switzerland)	133
9	(Al-Emran et al., 2020)	Towards a conceptual model for examining the impact of knowledge management factors on mobile learning acceptance	2020	Technology in Society	121
10	(Moorthy et al., 2019)	Habit and hedonic motivation are the strongest influences in mobile learning behaviours among higher education students in Malaysia	2019	Australasian Journal of Educational Technology	106

What Are The Popular Keywords Related To The Study?

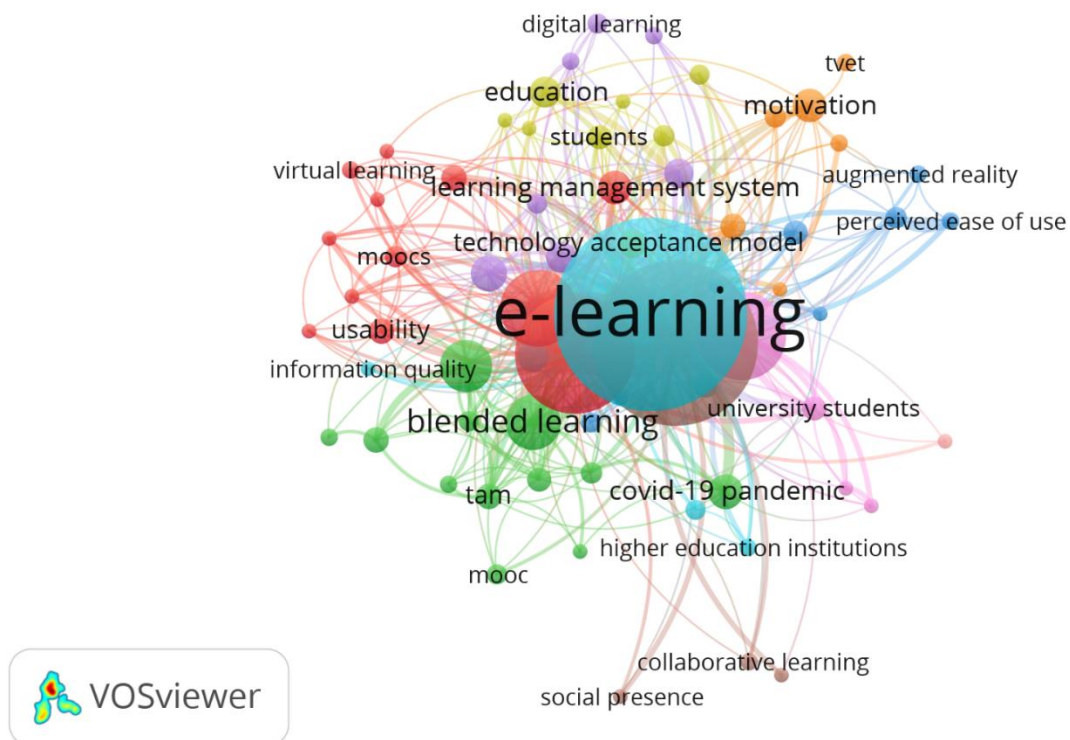


Figure 3: Network Visualization Map Of Keywords' Co-Occurrence

The keyword co-occurrence analysis highlights key themes in e-learning research, with “e-learning” (148 occurrences, 165 link strength) and “online learning” (120 occurrences, 154 link strength) emerging as dominant topics, indicating their central role in the field. “Higher education” (43 occurrences, 85 link strength) as well as “Malaysia” (77 occurrences, 125 link strength) also indicate strong associations, suggesting that much of the research focuses on university-level e-learning adoption, particularly in Malaysia. Moreover, the COVID-19 pandemic impact is evident, with “covid-19” (52 occurrences, 100 link strength) and related terms like “pandemic” (13 occurrences, 30 link strength) and “covid-19 pandemic” (15 occurrences, 22 link strength) highlighting the shift to digital education and its associated challenges. Additionally, “blended learning” (27 occurrences, 35 link strength) as well as “mobile learning” (26 occurrences, 30 link strength) underscore the importance of hybrid and mobile-based learning approaches in modern education.

Beyond technological implementation, the analysis also reveals a focus on user experience and psychological factors affecting e-learning adoption. Keywords like “motivation” (14 occurrences, 18 link strength), “satisfaction” (10 occurrences, 20 link strength) as well as “self-efficacy” (5 occurrences, 8 link strength) indicate a strong research emphasis on student engagement and learning effectiveness. The presence of “technology acceptance model” (11 occurrences, 19 link strength), “perceived usefulness” (8 occurrences, 20 link strength), and “tam” (10 occurrences, 27 link strength) highlights the role of technology acceptance theories in understanding e-learning adoption. Additionally, keywords like “stress” (5 occurrences, 10 link strength) and “depression” (5 occurrences, 9 link strength) suggest that researchers are also investigating the emotional and mental health impact of digital education. These findings

collectively illustrate a multifaceted approach to e-learning research, balancing technological advancements with human-centered consideration

What Are Co-Authorship Countries' Collaboration?

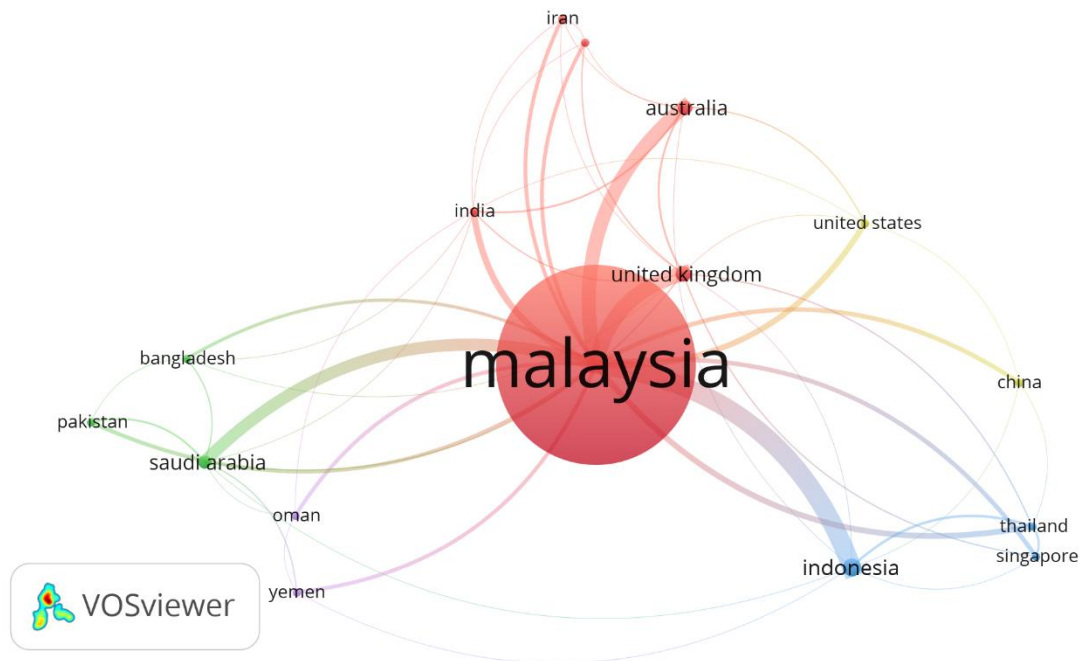


Figure 4: The Countries Whose Authors Collaborate On E-Learning.

The co-authorship network in the field of e-learning reveals a striking dominance by Malaysia, which leads the table with 723 documents, 7,636 citations, and a total link strength of 172. This impressive output highlights Malaysia as a pivotal hub in e-learning research collaboration, suggesting a well-established infrastructure for both research production and international partnerships. Other countries, such as Indonesia (30 documents, 101 citations, 40 link strength), Saudi Arabia (19 documents, 1,440 citations, 31 link strength), and the United Kingdom (24 documents, 196 citations, 41 link strength), also play significant roles in the collaborative landscape. However, their outputs and collaboration intensities are more modest compared to Malaysia. Notably, despite lower document counts, nations like Bangladesh (5 documents, 508 citations) and Pakistan (6 documents, 461 citations) exhibit high citation impacts, indicating that their contributions, though fewer in number, are highly influential.

The total link strength across countries serves as a robust indicator of international collaboration, with higher values reflecting a greater number of co-authored works and cross-border research engagements. The United Kingdom and Malaysia, with link strengths of 41 and 172, respectively, indicate that research visibility and impact in e-learning demand strong collaborative networks for their successful operation. Conversely, countries such as China, Iran, and Oman show more modest collaboration metrics, suggesting either a focus on domestic research efforts or emerging participation in international networks. This heterogeneous collaboration pattern, with a mix of high-output and high-impact countries, underscores the dynamic and multifaceted nature of global research in the implementation and awareness of e-learning.

Conclusion

The bibliometric study findings give significant intuition into the research landscape of e-learning implementation and awareness in Malaysia. The analysis of 603 publications from Scopus highlights the increasing academic focus on digital education, specifically paying special attention to modern technological innovations and worldwide issues such as the COVID-19 pandemic. The research trends indicate a significant rise in e-learning studies post-2011, with a peak in 2022, reflecting Malaysia's policy-driven push towards digital learning. However, the decline in publications after 2022 suggests either a saturation of research or a shift in focus towards newer educational paradigms, such as artificial intelligence and adaptive learning systems. Keyword co-occurrence analysis reveals critical themes in e-learning research, including digital readiness, pedagogical adaptation, and student engagement. Terms like "technology acceptance model," "perceived usefulness," and "satisfaction" indicate that researchers have been focusing on factors influencing e-learning adoption. Additionally, the presence of psychological aspects like "motivation," "stress," as well as "self-efficacy" highlights the significance of user experience in e-learning platforms. Institutional challenges, including accessibility issues, technological infrastructure, and faculty resistance, remain prominent barriers to effective e-learning implementation. Addressing these challenges requires continuous investment in digital resources, professional development for educators, and policies promoting digital inclusivity. The co-authorship analysis highlights Malaysia as a leading contributor to e-learning research, with substantial international collaborations. The United Kingdom, Indonesia, and Saudi Arabia have emerged as key research partners, indicating a growing global interest in Malaysia's digital education initiatives. Despite strong collaborations, countries like China and Iran exhibit limited international engagement, suggesting a need for enhanced cross-border partnerships to enrich the global discourse on e-learning. The citation impact of countries such as Bangladesh and Pakistan, despite their lower publication counts, signifies the influence of select high-impact studies in shaping the field.

This bibliometric analysis underscores the evolving nature of e-learning research in Malaysia, shaped by technological advancements, policy interventions, and global disruptions. The study highlights key research themes, including digital readiness, pedagogical strategies, and student engagement, as well as persistent challenges in accessibility and technological adaptation. While Malaysia has emerged as a leader in e-learning research, international collaboration and knowledge exchange remain crucial for sustaining academic contributions and addressing emerging educational needs. Future research should focus on enhancing engagement strategies, addressing digital divide issues, and integrating emerging technologies like artificial intelligence (AI) as well as virtual reality (VR) into e-learning frameworks. Additionally, studies should explore long-term post-pandemic e-learning trends to assess whether digital education remains a priority or if institutions are reverting to traditional learning models. Ensuring sustained research momentum and policy support will play a crucial role in fully leveraging the potential of e-learning to transform education in Malaysia and beyond.

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