E-learning in Vocational Institutions: Trends, Challenges, and Gamification Opportunities

Zhang Shaohua[1] and Norasnita Ahmad[2*]

[1, 2*]Information Systems Department, Faculty of Management (FM), Universiti Teknologi Malaysia (UTM), UTM Skudai, 81310 Johor Bahru, Johor, Malaysia
[2*]Corresponding Authors Email: norasnita@utm.my

Abstract
Despite the growing use of e-learning in vocational schools under learner-centered approaches, its implementation is hindered by the practical, skill-oriented demands of training and disparities in digital preparedness among teachers and students. This study aims to identify current trends in e-learning implementation in vocational schools, analyse its challenges and limitations, and explore emerging opportunities. This study adopts the PRISMA framework to conduct a systematic literature review, following structured steps for identification, screening, eligibility assessment, and synthesis of selected studies. The results show that while blended learning models, digital tools, and learner autonomy are increasingly prioritized in vocational education, inadequate infrastructure, insufficient teacher training, and low digital competence hinder their effectiveness, leading to poor student motivation and engagement, yet gamification as a potential solution to enhance interest and interactivity remains underexplored in e-learning. Therefore, this study calls for a more in-depth investigation to better integrate teaching methods and contexts into gamified e-learning.
Keywords: Systematic Literature Review, E-learning Implementation, Gamification, Vocational Institutions, Digital Learning Challenges, Skill-based Learning

Introduction
The increasing integration of e-learning into vocational education aligns with global trends toward flexible, technology-enhanced learning, yet vocational training's emphasis on practical, job-ready skills poses unique challenges in adapting hands-on instruction to digital or blended formats without compromising learning outcomes (Han et al., 2020; Ma & Li, 2024). Despite policy-driven investments in digital platforms (e.g., China's "Smart Education Strategy"), implementations often lack interactivity, contextual relevance, and learner engagement, compounded by instructors' limited digital pedagogy training and students' struggles with motivation and digital competence (Vásquez, 2024; Rott et al., 2022; Affendy et al., 2022). Gamification—leveraging elements like points and badges—has shown promise in enhancing engagement and skill-based learning (Kovalenko & Skvortsova, 2022), yet its

application in vocational e-learning remains fragmented and underexplored (Samah & Ismail, 2021; Zhang et al., 2024).

E-learning in Vocational Institutions

Vocational education is designed to provide specialized, employment-oriented training, particularly for students from technical or non-academic backgrounds. In recent years, e-learning has increasingly been integrated into vocational institutions to modernize teaching methods, meet the demands of the labor market, and enhance educational accessibility (Han et al., 2020; Xibin et al., 2023). Many institutions have adopted Learning management systems (LMS), online resources and video-based teaching as important components of digital transformation (Yang et al., 2024; Zhang et al., 2024). Take China as an example. The national policy vigorously promotes digital education initiatives and encourages institutions to widely apply e-learning platforms (Han et al., 2020; Ma & Li, 2024).

Instructor and Learner Digital Competence

Research shows that digital capabilities are crucial for both teachers and learners in a professional e-learning environment. Vocational teachers usually hold multiple positions, being content creators, facilitators, and platform managers (Xibin et al., 2023; Yang et al., 2024). However, their use of digital tools often remains at the basic level, mainly focusing on material distribution and attendance management, with less utilization of interactive or adaptive functions (Rott et al., 2022). In terms of learners, digital readiness varies significantly due to factors such as geographical location and resource availability (Ab Hamid et al., 2023). The ability of students to conduct self-regulated learning and effective communication in the digital environment is particularly crucial (Zuo et al., 2025). Hofmeister & Pilz (2020) pointed out that digital capabilities are not limited to technical skills but also encompass cultural and motivational dimensions, especially when connecting theoretical concepts with practical professional tasks.

Gamification in E-learning for Vocational Institutions

Gamification integrates game elements such as points, badges, leaderboards and progress indicators into the learning environment. While retaining the core teaching content, it significantly enhances the functions of traditional e-learning platforms by using incentive mechanisms (Li et al., 2024). In practice and ability-oriented vocational education, gamification effectively meets teaching needs, such as providing real-time feedback, structured skill advancement and reinforcement training (Dahalan et al., 2024). By transforming passive learning into interactive experiences, gamification cultivates learners' persistence, progress tracking ability and sense of achievement (Garcia-Lopez et al., 2023). Based on the self-determination theory, gamification meets the psychological needs of learners in terms of autonomy, ability and relevance through customizable tasks and collaboration functions, thereby maintaining learning motivation and social participation (Luarn et al., 2023; Zourmpakis et al., 2023).

Problem Statement

Although more and more vocational education has adopted e-learning, yet implementation remains fragmented due to the imbalance of infrastructure, inadequate teacher training in digital pedagogy (Affendy et al., 2022; Yang et al., 2024), and learners' struggles with self-regulation and digital readiness (Zuo et al., 2025; Ab Hamid et al., 2023). The practical nature

of vocational training—requiring hands-on simulation and competency-based assessment—further complicates digitization, often resulting in passive, theory-heavy e-learning that lacks real-time feedback and skill reinforcement (Grundgeiger et al., 2023; Vásquez, 2024). While gamification has demonstrated potential to enhance engagement and motivation through game elements like progress tracking and adaptive feedback (Almutairi, 2024; Dahalan et al., 2024), its integration into vocational e-learning remains underexplored, particularly in aligning with domain-specific tasks and addressing dropout risks (Ristianto et al., 2025). These challenges highlight a critical gap: the need for pedagogically grounded, gamified strategies that bridge digital divides, empower instructors, and foster vocationally relevant, interactive learning experiences.

To address the above problems, this study is guided by three research questions:
RQ1: What are the prevailing trends in e-learning adoption and implementation within vocational education institutions?
RQ2: What are the key challenges and limitations hindering the effective integration of e-learning in vocational training, particularly concerning pedagogical, technical, and institutional factors?
RQ3: How can gamification address existing gaps and enhance the effectiveness of e-learning in vocational education?

Research Methodology
This study adopts a systematic literature review (SLR) approach to investigate the current state of e-learning in vocational institutions. This systematic review strictly adheres to the PRISMA 2020 guidelines (Page et al., 2021) to ensure the transparency, repeatability and scientific rigor of the screening process, method design and comprehensive analysis.

Search Strategy
A comprehensive search was conducted across four major academic databases: IEEE Xplore, ScienceDirect, Scopus, and Web of Science. The search targeted peer-reviewed journal articles published between 2020 and 2024, using the following Boolean string: ("e-learning" OR "online learning" OR "digital learning" OR "web-based learning" OR "blended learning") AND ("vocational education" OR "vocational institutions" OR "higher vocational institutions" OR "TVET" OR "polytechnic education"). To provide a broad and unbiased overview of e-learning implementation in vocational education, keywords related to gamification were deliberately excluded from the initial search to avoid prematurely narrowing the scope. The search yielded 781 records (IEEE = 250, ScienceDirect = 188, Scopus = 252, Web of Science = 91), all of which were managed using Zotero and screened by title, author, year, and abstract. While gamification-related terms were excluded from the initial query, studies relevant to Research Question 3 were identified during the screening and full-text review stages. Particular attention was given to studies discussing motivational design elements—such as badges, points, feedback loops, or game-based mechanics—even if not explicitly labeled as "gamification." This two-stage strategy, aligned with the systematic review framework of Booth, Sutton, and Papaioannou (2016), enabled both broad trend analysis and targeted gamification investigation. Initial screening identified 21 eligible studies meeting all inclusion criteria, and in-depth analysis revealed that 7 of these studies (33.3%) specifically addressed gamification mechanisms. This ensured that gamification-focused studies were deliberately integrated into the review, despite their initial exclusion from the keyword strategy.

Inclusion and Exclusion Criteria
The following criteria were applied to ensure relevance and quality of the selected literature: Inclusion criteria: Focus on e-learning implementation, challenges, strategies, or tools in vocational institutions; Study population includes vocational schools, polytechnics, or other TVET institutions; Articles published in peer-reviewed journals; English-language full texts with clearly described methods. Exclusion criteria: Studies focusing exclusively on K–12 or general higher education; Articles unrelated to e-learning (e.g., ICT use without pedagogical focus); Non-English publications; Informal publications such as conference abstracts, blog posts, or short communications.
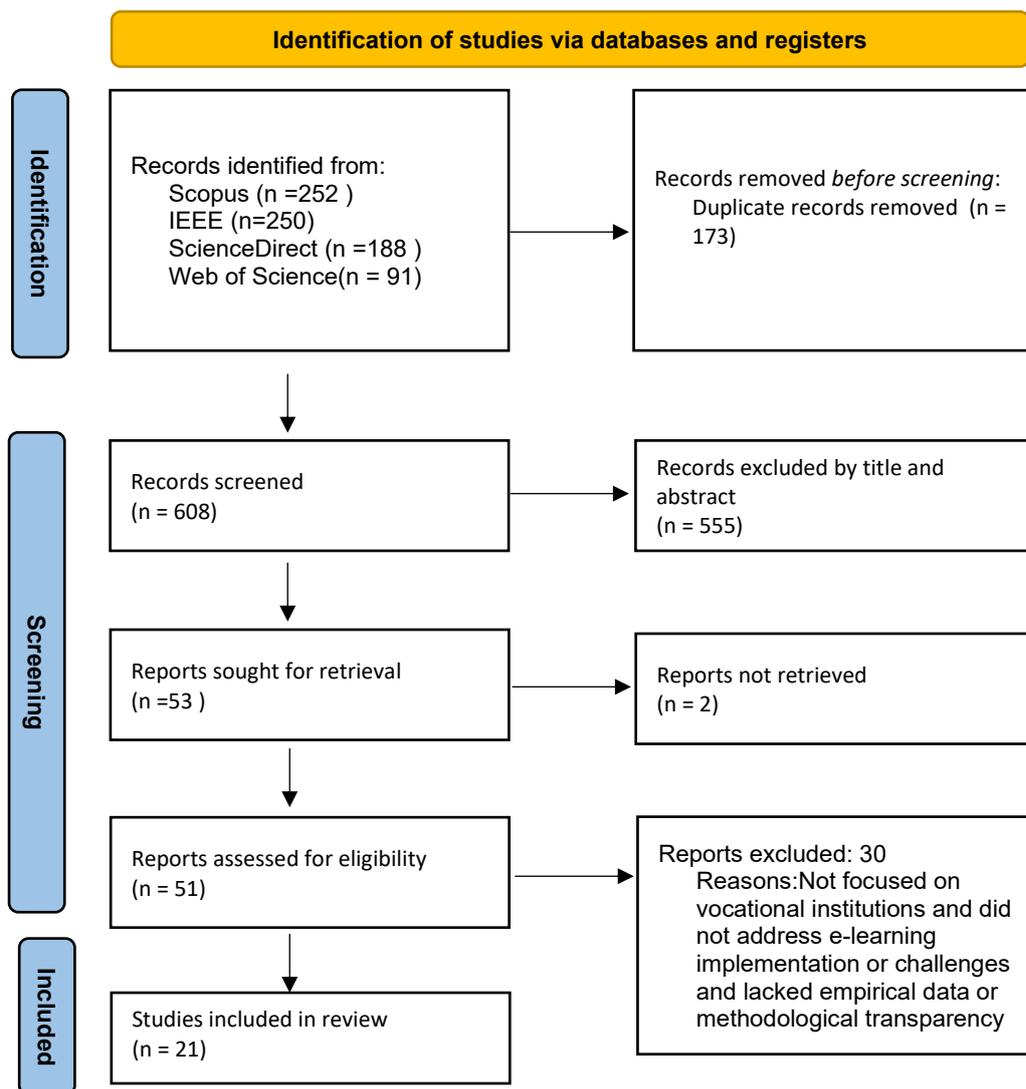
Screening and Eligibility

Figure 1. Study selection process based on PRISMA 2020 guidelines (Page et al., 2021)

After removing duplicates, 608 unique records remained for screening. Title and abstract review led to the exclusion of 555 records based on relevance, language, or publication type, leaving 51 articles for full-text assessment. Of these, 30 were excluded for the following reasons: not focused on vocational institutions (n = 10), unrelated to e-learning implementation or challenges (n = 9), lacking empirical data or methodological clarity (n = 7),

overlapping with included studies (n = 3), or not being peer-reviewed (n = 1). Ultimately, 21 articles met all inclusion criteria and were included in this systematic review. The full selection process is illustrated in the PRISMA 2020 flow diagram (Figure 1).

Data Extraction and Analysis
Key data from the 21 selected studies were extracted and organized into a summary matrix, including publication year, country, research method, focus area, and relevance to the three research questions. Thematic analysis was conducted by clustering findings into three categories aligned with the research questions: (1) trends in e-learning implementation, (2) challenges and limitations, and (3) opportunities for gamification in vocational institutions.

Results and Discussion
This section provides a systematic literature review of 21 peer-reviewed studies published between 2020 and 2024 based on the three research questions (RQS) proposed in this study. This report explores the main trends in the implementation of e-learning in vocational colleges (RQ1), identifies the common challenges and limitations encountered when adopting e-learning (RQ2), and highlights the emerging opportunities and research gaps that support the integration of gamification into potential solutions (RQ3).

Trends in E-learning Implementation in Vocational Institutions (RQ1)
A comprehensive analysis of publications from 2020 to 2024 shows that research on e-learning in vocational education has increased, particularly in 2023–2024, as shown in Figure2 (with gap). It reflects the growing global interest in digital and hybrid learning models. The literature demonstrates a clear pedagogical evolution: early implementations relied on passive LMS-based content delivery (Han et al., 2020; Syauqi et al., 2020), while recent studies emphasize blended learning, gamification, and digital simulations to enhance engagement and skill acquisition (Ferdiansyah et al., 2023; Ma & Li, 2024; Samah & Ismail, 2021). Blended learning has emerged as the dominant approach, strategically combining flexible e-learning with hands-on training (Krismadinata et al., 2020; Shakeel et al., 2023), though gaps persist where implementations remain content-centric rather than interactive (Rott et al., 2022).
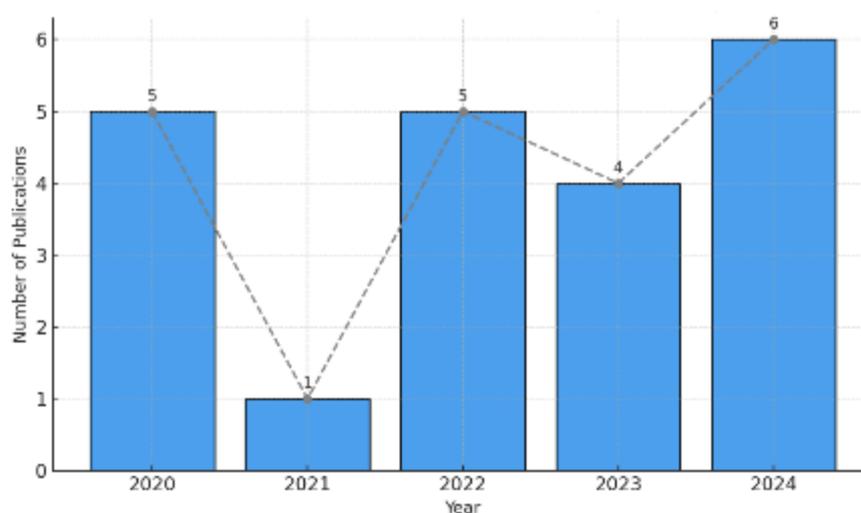

Figure 2. Publication trend of reviewed studies from 2020 to 2024 (data synthesized from the 21 reviewed studies)

Geographically, research output is concentrated in Asia (e.g., China, Malaysia, Indonesia) and Europe (e.g., Germany, Finland), as shown in Figure 3. This might be driven by national policy initiatives like China's "Smart Education Strategy" (Xibin et al., 2023). This regional clustering underscores disparities in global research representation, with limited studies from Africa, Latin America, and the Middle East—highlighting a critical need for broader cross-regional investigations to contextualize e-learning adaptations. Methodologically, quantitative studies dominate (e.g., learning outcome evaluations), though design-based and qualitative approaches are growing, particularly in examining instructional design and learner engagement (Ferdiansyah et al., 2023; Affendy et al., 2022).
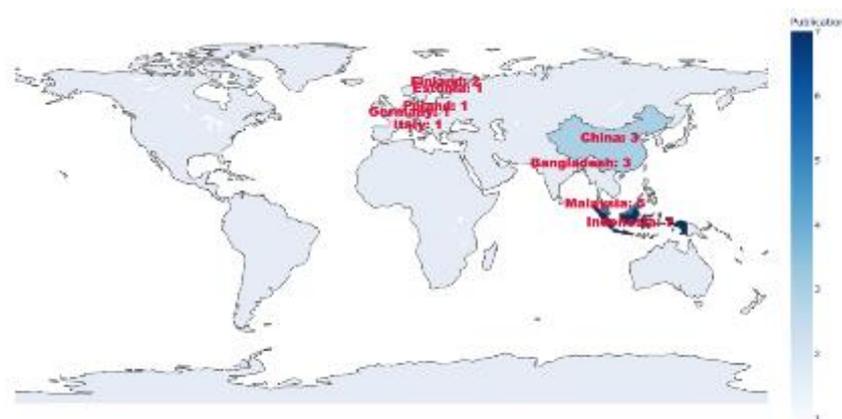

Figure 3. Geographic distribution of the reviewed studies by country or region (data synthesized from the 21 reviewed studies)

The reviewed literature clearly demonstrates that prevailing trends in vocational e-learning adoption have evolved from basic content delivery systems (e.g., early LMS implementations) toward more sophisticated, pedagogically-driven blended models that integrate interactive elements like gamification and digital simulations (Ferdiansyah et al., 2023; Ma & Li, 2024). This shift reflects an institutional prioritization of flexible yet skill-aligned approaches, with blended learning emerging as the dominant framework to balance digital accessibility with hands-on training requirements (Krismadinata et al., 2020; Shakeel et al., 2023). These trends reflect the growing concern for learner engagement strategies and digital preparation, especially in Asia and Europe. Policy-driven measures, such as China's Smart Education strategy, have significantly promoted the development of related research (Xibin et al., 2023). However, the research still mainly relies on quantitative results and has insufficient regional representativeness, indicating that these trends may not yet fully reflect global occupational demands. This indicates that various institutions are undergoing profound changes in their concepts and practical approaches towards the development of e-learning skills.

Implementation Challenges and Limitations (RQ2)
A systematic literature review shows that despite the continuous improvement of digital infrastructure, the implementation of digitalization and blended learning in vocational education still faces ongoing challenges. A recurring theme is the ineffectiveness of the online environment in supporting the development of practical skills, which are the core demands

of vocational training (Hu et al., 2024; Kiikeri et al., 2024; Syauqi et al., 2020). Although digital tools have enhanced the accessibility of theoretical guidance, practical links such as real-time feedback, simulation-based evaluation, and application of collaborative skills are still insufficient (Daryanto et al., 2022; Hofmeister & Pilz, 2020. The technological gap further exacerbates these problems. Students and teachers in resource-poor areas face challenges such as poor connectivity, shortage of equipment and unequal digital literacy (Krismadinata et al., 2020; Sadam & Al-Mamun, 2024; Shakeel et al., 2023).

Pedagogical barriers also hinder effective implementation. Many instructors lack training in interactive and adaptive digital teaching methods, resulting in overreliance on static content delivery rather than engaging, learner-centered approaches (Ferdiansyah et al., 2023; Chen & He, 2020). This is compounded by usability issues in existing platforms, where rigid content structures, poor interface design, and insufficient personalization reduce both instructor efficiency and learner engagement (Ma & Li, 2024; Noor et al., 2022). Consequently, student motivation and autonomy often decline in asynchronous or poorly designed digital environments, leading to lower participation and higher dropout rates (Samah & Ismail, 2021; Baharin et al., 2024).

At the institutional level, the strategic gap remains significant. Many vocational schools are not fully prepared to deal with digital emergencies and lack contingency plans or tools to ensure the continuation of practical training during disruptions (Sirk, 2024; Sutiman et al., 2022). Although gamification and algorithm-driven models have been proposed to enhance learning engagement, their complexity and insufficient adaptation to professional scenarios often limit practical applications (Noor et al., 2022; Ma & Li, 2024). These findings collectively reveal a significant disconnect between the potential of digital learning and its application in vocational education practice.

These challenges clearly indicate that systematic solutions are urgently needed to bridge the gap between technology and teaching. Firstly, digital platforms should prioritize the development of functions that can make up for the insufficiency of practical learning, such as immersive simulation, capability-based feedback mechanisms, and real-time collaboration tools. Secondly, teacher training programs need to shift from basic digital literacy to advanced teaching strategies, such as building self-directed learning platforms or integrating skill-oriented micro-certificate courses. Finally, institutional policies should ensure fair access to technological resources and establish flexible frameworks to enhance digital resilience. Without these comprehensive measures, vocational e-learning will not only be difficult to democratize skill development, but may also exacerbate the existing gap. Future research should focus on exploring scalable and contextualized models of digital career integration, especially in underserved regions.

Gamification Opportunities and Research Gaps (RQ3)
Gamification shows great potential in enhancing participation, learning motivation and sustainability in vocational education. Empirical evidence indicates that it can effectively enrich theoretical and practical training (Chen & He, 2020; Daryanto et al., 2022). Research shows that gamification mechanisms such as tasks, feedback loops, and virtual simulations can enhance interactivity and continuously stimulate learners' interest in digital or hybrid learning environments (Krismadinata et al., 2020; Ma & Li, 2024). However, the results of the

systematic review have revealed the key gaps existing in the current implementation. Most gamified systems employ generic features (e.g., badges, leaderboards) without domain-specific adaptation to vocational education's competency-based and procedural demands (Hu et al., 2024). This misalignment limits their effectiveness in supporting hands-on skill acquisition. Furthermore, adaptive gamification—where difficulty, feedback, or content dynamically adjusts to learner profiles—remains underdeveloped in vocational contexts (Ma & Li, 2024), despite its theoretical promise for personalized skill development.

The review also highlights methodological limitations, including a reliance on short-term interventions and self-reported data, which constrain conclusions about long-term impacts on job readiness or skill retention (Daryanto et al., 2022). Few studies incorporate longitudinal assessments or objective performance metrics, particularly for practical competencies. Cultural applicability emerges as another concern, as most gamification frameworks derive from Western educational contexts and lack validation in Asian or Global South vocational settings (Daryanto et al., 2022). While Self-Determination Theory (SDT) is frequently cited to justify gamification's motivational effects (Luarn et al., 2023; Zourmpakis et al., 2023), few studies explicitly operationalize its constructs (autonomy, competence, relatedness) into design elements. For instance, task branching could theoretically support autonomy, yet empirical linkages between specific game mechanics and SDT-based outcomes are rare (Hu et al., 2024; Chen & He, 2020).

These findings underscore that gamification can address key gaps in vocational e-learning by tailoring game mechanics to domain-specific skill acquisition, thereby bridging the disconnect between generic gamified systems and the hands-on, competency-based nature of vocational training. By incorporating adaptive features (e.g., dynamic difficulty adjustments, personalized feedback), gamification could better support procedural learning and individual progress—addressing the current lack of personalization in vocational digital platforms. Furthermore, culturally contextualized designs and stronger theoretical alignment with SDT (e.g., explicit mapping of autonomy-supportive tasks or collaborative features to psychological needs) could enhance motivation and engagement, particularly in underrepresented regions like Asia and the Global South. Finally, longitudinal, performance-driven studies are needed to move beyond short-term engagement metrics and demonstrate gamification's impact on measurable skill mastery and job readiness—directly tackling the empirical and methodological limitations identified in the literature. Thus, gamification's potential lies not just in superficial engagement boosts but in systematically redesigning vocational e-learning to be more interactive, adaptive, and outcome-oriented.

Conclusion

In conclusion, this systematic literature review makes three key contributions that align with and address the study's original research objectives. First, it identifies and documents the significant evolution of e-learning in vocational education, tracing the shift from basic content delivery systems to sophisticated blended models incorporating interactive elements like gamification and digital simulations - a trend particularly evident in policy-driven regions like Asia and Europe. Second, the analysis reveals persistent implementation challenges, including technological disparities, pedagogical barriers in digital teaching methods, and institutional unpreparedness that collectively hinder effective hands-on skill development in virtual environments. Most importantly, the review highlights gamification as a promising yet

underdeveloped solution, demonstrating its potential to enhance engagement and motivation while pinpointing critical research gaps - particularly the need for domain-specific adaptations, culturally contextualized designs, and longitudinal performance studies to validate long-term impacts on vocational skill acquisition. These findings collectively provide a comprehensive foundation for future research and practice aimed at optimizing e-learning implementations in vocational education worldwide.

References

Ab Hamid, E. A. H., Maskur, H., & Mutalib, R. A. (2023). The Use of ChatGPT Applications in Learning: Impact on Understanding and Student Engagement in TVET Institutions. *Malaysian Journal of Information and Communication Technology (MyJICT)*, 78–87.

Affendy, N. A. R., Ayi, T. P., & Basir, M. S. S. M. (2022). A Study on Students' Online Learning Performance and Satisfaction During the Pandemic: The Case for TVET Education Institution in Borneo Malaysia. *2022 XII International Conference on Virtual Campus (JICV)*, 1–4.

Almutairi, A. M. (2024). A Systematic Review of Catching and Comparing the Most Valuable Gamification Elements Used in Online Learning. *Edelweiss Applied Science and Technology*, 8(4), 2181-2201.

Baharin, S. S. K., Aziz, M. A., Othman, Z., & Bohari, N. M. A. Md. (2024). Enhancing TVET Blended Learning Student Engagement Through Geo-Attendance. *2024 International Conference on TVET Excellence & Development (ICTeD)*, 107–111. Booth, A., Sutton, A., & Papaioannou, D. (2016). *Systematic approaches to a successful literature review (2nd ed.)*. SAGE Publications.

Chen, H., & He, Z. (2020). Blended Learning Design and Praxis for the Coordinated Development of Theory and Practice --Take Vocational Education as an Example. *2020 International Conference on Modern Education and Information Management (ICMEIM)*, 671–675.

Dahalan, F., Alias, N., & Shaharom, M. (2024). Gamification and Game Based Learning for Vocational Education and Training: A Systematic Literature Review. *Education And Information Technologies*, 29(2), 1279–1317. https://doi.org/10.1007/s10639-022-11548-w

Daryanto, E., Siregar, B., & Januariyansah, S. (2022). A Meta-Analysis of the E-Learning Influence on Vocational Education and Training (VET): Preliminary Study of Virtual to Actualization. *International Journal of Education in Mathematics*, Science and Technology, 10(3), 710–721.

Ferdiansyah, Maksum, H., Rizal, F., & Ulya, R. H. (2023). Problem-Based Blended Learning Models in Vocational Education: A Developmental Research. *International Journal of Information and Education Technology*, 13(12), 1968–1976.

Firat, M. (2023). Predicting Student Disengagement: Harnessing Visual Cues for Intelligent Tutoring Systems. *London Journal of Social Sciences*, 6, 75-83.

Gamarra, M., Dominguez, A., Velazquez, J., & Páez, H. (2022). A Gamification Strategy in Engineering Education—A Case Study on Motivation and Engagement. *Computer Applications in Engineering Education*, 30(2), 472–482. Scopus.

Luarn, P., Chen, C.-C., & Chiu, Y.-P. (2023). Enhancing Intrinsic Learning Motivation Through Gamification: A Self-Determination Theory Perspective. *The International Journal of Information and Learning Technology*, 40(5), 413–424.

Ma, Z., & Li, W. (2024). Design of Online Teaching Interaction Mode for Vocational Education Based on Gamified-Learning. *Entertainment Computing*, *50*, 100647.

Noor, S. F. M., Mohamed, H., Zaini, N. A., & Daiman, D. (2022). Use of Interactive Multimedia e-Learning in TVET Education. *International Journal of Advanced Computer Science and Applications*, *13*(9).

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews. *BMJ*, 372.

Ristianto, S. D., Putri, A., & Rosmansyah, Y. (2025). Personalized Gamification a Technological Approach for Student Education: A Systematic Literature Review. *IEEE Access*, *13*, 55712–55726.

Rizal, F., Hidayat, H., Jaya, P., & Verawardina, U. (2022). Lack E-Learning Effectiveness: An Analysis Evaluating E-Learning in Engineering Education. *International Journal of Instruction*, *15*(4).

Rott, K. J., Lao, L., Petridou, E., & Schmidt-Hertha, B. (2022). Needs and Requirements for an Additional AI Qualification during Dual Vocational Training: Results from Studies of Apprentices and Teachers. *Computers and Education: Artificial Intelligence*, *3*, 100102.

Sadam, N. Y. S., & Al Mamun, M. A. (2024). Polytechnic Students' Perceived Satisfaction of using Technology in the Learning Process: The Context of Bangladesh TVET. *Heliyon*, *10*(16), e35977. https://doi.org/10.1016/j.heliyon.2024.e35977

Samah, L. A., & Ismail, A. (2021). Enhance Motivation and Engagement in Blended e-Learning for TVET Using Gamification. *2021 International Conference on Electrical Engineering and Informatics (ICEEI)*, 1–6. https://doi.org/10.1109/ICEEI52609.2021.9611100

Shakeel, S. I., Haolader, M. F. A., & Sultana, M. S. (2023). Exploring Dimensions of Blended Learning Readiness: Validation of Scale and Assessing Blended Learning Readiness in the Context of TVET Bangladesh. *Heliyon*, *9*(1), e12766.

Sirk, M. (2024). Vocational Teaching Practices for Online Learning during a State of Emergency and its Relation to Collaboration with Colleagues. Learning, *Culture and Social Interaction*, *44*, 100781.

Sutiman, S., Sofyan, H., Soenarto, S., Mutohhari, F., & Nurtanto, M. (2022). Students' Career Decision-Making During Online Learning: The Mediating Roles of Self-Efficacy in Vocational Education. *European Journal of Educational Research*, *11*(3), 1669–1682.

Syauqi, K., Munadi, S., & Triyono, M. B. (2020). Students' Perceptions toward Vocational Education on Online Learning during the COVID-19 pandemic. *International Journal of Evaluation and Research in Education (IJERE)*, *9*(4), 881.

Vásquez, M. C. (2024). Digital Control Education, Engaging and Skill-Oriented. *IFAC-PapersOnLine*, *58*(26), 88–93.

Xibin, H. A. N., Chengming, Y. A. N. G., & Qian, Z. H. O. U. (2023). Digital Transformation in Vocational Education: Present Situation, Problems, and Countermeasures. *Frontiers of Education in China*, *18*(1).

Yang, H. (2024). E-learning Platforms in Ideological and Political Education at Universities: Students' Motivation and Learning Performance. *BMC Medical Education*, *24*(1), 628.

Zhang, Y., Pappa, C. I., & Pittich, D. (2024). Exploring User-Generated Content Motivations: A Systematic Review of Theoretical Perspectives and Empirical Gaps in Online Learning. *Computers and Education Open*, *7*, 100235.

Zuo, H., Zhang, M., & Huang, W. (2025). Lifelong Learning in Vocational Education: A Game-Theoretical Exploration of Innovation, Entrepreneurial Spirit, and Strategic Challenges. *Journal of Innovation & Knowledge*, *10*(3), 100694.

Zourmpakis, A.-I., Kalogiannakis, M., & Papadakis, S. (2023). Adaptive Gamification in Science Education: An Analysis of the Impact of Implementation and Adapted Game Elements on Students' Motivation. *Computers*, *12*(7), 143.