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Assessing The Impact of Digital Learning on Entrepreneurship Education in Selangor's Vocational Colleges: Challenges and Improvement Strategies

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ABSTRACT - Entrepreneurship education plays a crucial role in equipping students with the knowledge, skills, and mindset to innovate in a competitive economy. Hence, this research addresses the need to digitize its delivery in response to the Fourth Industrial Revolution (IR4.0) and the digital shift accelerated by the COVID-19 pandemic. By embedding digital tools into the entrepreneurship curriculum, the study examines how these innovations influence student engagement, practical skill development, and entrepreneurial readiness. Thus, the aim of this research is to study the perception of the students and lecturers of the challenges on the implementation of digital learning in entrepreneurship education within vocational colleges in Selangor, alongside the improvement measures that can be taken to refine the usage of digital learning in the entrepreneurship education syllabus. This study was conducted through a qualitative study, wherein six participants that were selected based on purposive sampling, from vocational colleges in Selangor were interviewed in a semi-structured manner, with the sample size deemed sufficient as data collection continued until data saturation was achieved. The data acquired was analyzed using thematic analysis, alongside open and axial coding, to identify the specific themes pertaining the research objectives. Based on the analysis, the challenges that vocational colleges in Selangor faced in implementing digital learning in entrepreneurship courses are the lack of infrastructure, the students' attitude and involvement, lecturer and student communication alongside lecturers' proficiency in technology. The findings proposed improvements such as educators' competency enhancements, upgrading infrastructure and external support may lead to the betterment in conducting digital learning for them. The study offers practical contributions by identifying key challenges and proposing solutions that align with the Ministry of Education's action plan and the need for industry partnerships, while also providing theoretical contributions through an integrated framework that explains how digital environments, learner autonomy, and technology acceptance collectively influence the development of entrepreneurial competencies in vocational education.

INTRODUCTION

The Fourth Industrial Revolution (IR4.0), driven by breakthroughs in technologies such as artificial intelligence and robotics, has significantly increased the demand for highly skilled and adaptable workers (Khairul Saidah Abas Azmi & Azzarina Zakaria, 2023). In response, Malaysia has enhanced its Technical and Vocational Education and Training (TVET) programs to develop industry-relevant competencies while incorporating entrepreneurship education. At the same time, digital learning has

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emerged as a crucial component of modern education, especially after the Covid-19 pandemic, which accelerated the global shift towards online and technology-based learning platforms (Tóth-Pajor et al., 2023; Crawford et al., 2020). Digital learning enhances the accessibility, interactivity, and effectiveness of teaching and learning while equipping students with vital IR4.0-era competencies, such as data literacy, technological fluency, and human literacy (Erdisna et al., 2020).

Entrepreneurship education focuses on building knowledge, creativity, and problem-solving skills to help individuals recognize and act on business opportunities (Ratten & Jones, 2021; Staicu, 2021). It is considered a driving force in boosting socio-economic development (Durán-Sánchez et al., 2018). Within the TVET system, entrepreneurship education plays a crucial role in preparing students to enter the workforce or start their own businesses (Omar et al., 2011 as cited in Muhd Khaizer Omar et al., 2021). However, despite policy support, studies show that TVET students often lack entrepreneurial readiness (Sarimah Che Hassan et al., 2020).

In Malaysia, digital education has evolved since the late 1990s, with programs such as the Smart Schools initiative and recent policies like the Malaysian Education Blueprint 2015–2025 and the Digital Education Policy (DEP) reinforcing the integration of technology in teaching and learning (Adams et al., 2020; Muhammad Sabri Sahrir et al., 2021). However, despite the global rise of digital learning due to the Covid-19 pandemic (Ratten, 2020), its integration into entrepreneurship education, particularly within vocational colleges in Selangor, remains underexplored. Selangor was chosen as the study's location due to the region's known strong access to digital learning resources (Siti Nazurah Salim and Rafiduraida Abdul Rahman, 2022). Norlidah Alias et al. (2021) noted uncertainties about the entrepreneurship components required in the curriculum and a shortage of studies on entrepreneurship in Malaysian vocational colleges, highlighting an existing knowledge and implementation gap locally. While digital learning has become a necessary tool in education, experts such as Tiberius and Weyland (2024) observed a reluctance among educators to adopt it in entrepreneurship teaching. Consequently, there is a need to assess how extensively digital learning is used in these settings and its potential benefits in preparing graduates for a digital economy.

Another concern is the effectiveness of entrepreneurship education in today’s digitally driven landscape. Although changes have occurred post-pandemic, the degree to which entrepreneurship education is successfully implemented in vocational colleges in Selangor has not been thoroughly evaluated (Krishnamurthy, 2020). Understanding its current state can help refine curricula to better meet student and industry needs. Moreover, the relationship between digital learning and entrepreneurship education is rarely studied, especially in the vocational context (Liu et al., 2021). Examining this link can reveal how digital tools influence teaching outcomes. Similarly, while previous studies have focused on entrepreneurship outcomes (Nasra & Ali, 2021), few have assessed the direct impact of digital learning on these programs.

Challenges students face with digital platforms also remain overlooked (Llorent-Vaquez et al., 2024). Identifying these barriers is essential for ensuring effective, inclusive education. These challenges may include limited digital access, lack of technical support, or insufficient digital literacy skills. Although general suggestions exist (Yeap et al., 2021), there is a lack of tailored recommendations for improving digital learning implementation in entrepreneurship education within Selangor’s vocational colleges. Without specific, context-based strategies, efforts to enhance teaching and learning may fall short. Addressing these concerns will guide better practices for educators, institutions, and policymakers, fostering a more adaptive and student-centred educational environment. Therefore, the purpose of this research is to examine the effects of digital learning on entrepreneurship education in the context of vocational colleges in Selangor, specifically, this study has two research objectives, which are:

1. To explore the challenges faced by the students due to the implementation of digital learning in entrepreneurship education in vocational colleges in Selangor.
2. To recommend suggestions on the improvement of the usage of digital learning in entrepreneurship education in vocational colleges in Selangor.

The intention of this study is to serve as an eye opener on the difficulties that students are facing in entrepreneurship courses while using digital learning, alongside recommendation on how to effectively use technology in teaching entrepreneurship courses, especially for vocational colleges in Malaysia. All in all, this article includes several sections which starts with the research background, followed by the literature review, the methodology used, findings, alongside the pertinent discussion, and conclusion.

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LITERATURE REVIEW

Digital learning broadly refers to the use of electronic technology to enhance education, offering flexible formats such as gamification, simulations, mobile apps, and virtual classrooms (Horton, 2012). Using platforms like MOOCs, AR/VR, and gamified tools like Kahoot and Quizizz, Siti Dianah et al. (2020) highlighted its role in enhancing accessibility, engagement, and personalised learning. Jahnke (2022) emphasised digital learning's supporting role in effectiveness and appeal, while Ngo et al. (2021) advocated combining synchronous and asynchronous lessons to improve learning experience. Ögeyik (2022) noted its ability to enhance lower order thinking skills, especially post-pandemic.

In Malaysia, digital learning evolved during and after the COVID-19 pandemic. Pre-pandemic, blended learning driven by the Malaysian Education Blueprint 2015–2025 used LMS platforms like Moodle and Blackboard (Adams et al., 2020). During the pandemic, Google Classroom, WhatsApp, and Google Meet sustained remote learning despite challenges (Muhamad Suhaimi Taat et al., 2022; Abdullah et al., 2020). Post-pandemic, the 2023 Digital Education Policy (DEP) promotes technology integration, digital infrastructure enhancement, and strategic collaborations aligned with IR4.0 and sustainability goals.

In Vocational Colleges, digital learning transitioned from basic use to essential delivery with tools like AR/VR and gamification supporting interactive learning (Siti Dianah et al., 2020). During lockdowns, platforms like ReSQUE enabled real-time feedback and collaboration (Noor Suriani et al., 2022). However, Ainull Najhwar Abdul Razak et al. (2022) highlighted the lack of a formal digital framework tailored for TVET. Muhammad Shahrir et al. (2024) confirmed digital content integration significantly improves students' cognitive and psychomotor skills in technical subjects.

Entrepreneurship education has gained momentum in the IR4.0 era due to the rising demand for innovation skills. Denner dos Santos et al. (2022) and Galvão et al. (2018) link it to regional development by nurturing entrepreneurial abilities. Adamu (2019) emphasizes financial literacy, responsibility, and competitiveness, while Onweh et al. (2013) stress leadership and management skills. Sitaridis & Kitsios (2023) note its role in recognizing entrepreneurial opportunities (Kakouris & Liargovas, 2020; Gielnik et al., 2012). Fayolle (2009), cited by Shamsuri Abdullah (2020), views it as cultivating entrepreneurial attitudes and innovation.

In Malaysia, entrepreneurship education is a critical agenda across education levels. The Ministry of Entrepreneur and Cooperatives Development promotes digital entrepreneurship to enhance youth competitiveness (Nurfarahin et al., 2021). The "e-Usahawan" initiative targets polytechnic students (Mohd Zaini et al., 2020). Norfariza Mohd Radzi and Muhammad Faizal A. Ghani (2021a) highlight the blend of theory and experiential learning to build innovation and survival skills. However, Leong (2017) notes limited implementation despite curriculum inclusion, supported by MOHE's Entrepreneurship Action Plan 2021–2025 aiming for structured skills-based curricula (Shuhaimi et al., 2023).

In Vocational Colleges, entrepreneurship education is integrated into TVET to produce industry-ready graduates. Muhd Khaizer et al. (2021) note it is taught through dedicated courses or embedded activities. Dahalan et al. (2018) underscored instructors' roles in effective delivery. As IR4.0 reshapes workforce demands, entrepreneurship education equips students with survival and innovation skills (Khairul Saidah Abas Azmi & Azzarina Zakaria, 2023). However, limited focus impacts graduate readiness. Digital entrepreneurship has been integrated since 2016, including online marketing and social media skills (Mohd Zaini et al., 2019). The School Enterprise Program simulates real-life business experiences for vocational students (Norfariza Mohd Radzi & Muhammad Faizal A. Ghani, 2021a).

Research Framework

The establishment of this study is based on four main theoretical foundations: Constructivist Learning Theory as the overarching theory, the Unified Theory of Acceptance and Use of Technology (UTAUT) for the independent variable, Meier's Rapid Instructional Design (RID) for the dependent variable, and Connectivism Learning Theory to illustrate the relationship between the two variables.

Constructivist Learning Theory is selected as the main theory because it emphasizes active engagement, learner autonomy, and knowledge construction through experience—principles that align well with digital learning. This theory supports digital learning environments by promoting interactive, student-centered instruction, which is critical in measuring how effectively digital learning is applied in entrepreneurship education in vocational colleges in Selangor.

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For the independent variable, the UTAUT model measures the level of digital learning. Dwivedi et al. (2019) found moderators such as gender and age are often omitted, so this study uses a modified version with six core constructs: performance expectancy, effort expectancy, social influence, facilitating conditions, behavioral intention, and use behavior. Performance expectancy refers to students' belief in digital tools improving academic performance; effort expectancy assesses ease of use; social influence considers others' views; facilitating conditions gauge technological support; behavioral intention captures motivation to use digital learning, and usage behavior reflects actual engagement. These elements are essential in understanding students' acceptance and use of digital learning in entrepreneurship courses.

The dependent variable, entrepreneurship education, is measured using Meier's RID, which includes preparation (student readiness), delivery (skills delivery), training (practical training), and implementation (application of knowledge and skills). Meier's model supports efficient and practical learning aligned with entrepreneurship's dynamic nature. Student readiness involves understanding entrepreneurial concepts and maintaining interest, delivery refers to exposure to real business operations, training emphasizes creating business plans and practical activities, and implementation assesses managing sales, marketing, finance, and HR. This framework is vital for evaluating entrepreneurship education in Selangor's vocational colleges.

To establish the relationship between digital learning and entrepreneurship education, Connectivism Learning Theory is applied. It emphasizes networks, digital connectivity, and access to diverse information sources, supporting the idea that digital environments enhance entrepreneurship education by promoting adaptability, collaboration, and continuous learning. Connectivism aligns with the interactive nature of digital learning and entrepreneurial skill development.

Thus, Constructivism provides the overarching foundation for understanding digital learning environments, UTAUT explains factors affecting student engagement with digital tools, Meier's RID evaluates entrepreneurship education delivery, and Connectivism bridges the two by showing how digital learning supports entrepreneurial competencies. This theoretical framework supports the study's aim to assess and strengthen digital learning's role in entrepreneurship education across vocational colleges in Selangor.

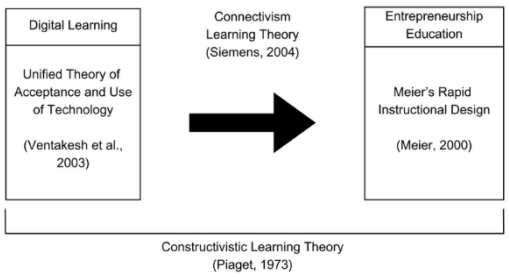

Figure 1. Theoretical Framework of the Study

METHODOLOGY

This study utilises qualitative research method, wherein this method is used for investigating and understanding the importance that people or groups place on a social issue or human situation, which includes developing questions and procedures, data collected in the participant's context, inductive data analysis that moves from specifics to broad themes, and the researcher's interpretations of the meaning of the data (Creswell, 2009). This method is chosen as data from interviews can address specific issues, offer valuable perspectives and contextualize and expound data that are more cryptic, like survey data.

Semi-structured interview sessions have been carried out with the main purpose of acquiring information regarding the challenges students faced in the integration of digital learning in entrepreneurship education in vocational colleges, alongside suggestions on how to improve the execution. As Guest et al. (2006) as cited by Bekele and Ago (2022) suggested that 6 to 12 participants are sufficient for qualitative-based research, this study has selected 3 students and 3 lecturers from 3 vocational colleges in Selangor, which are Gombak Vocational College, Sepang Vocational College

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and Sungai Buloh Vocational College. The participants were chosen using purposive sampling based on the specific following characteristics: for lecturers, they are teaching in a vocational college in Selangor, with 5 years' experience in teaching entrepreneurship education and has used digital learning for entrepreneurship education since/before the Covid-19 pandemic. Meanwhile, for students, they need to be studying in a vocational college in Selangor and has completed or currently enrolled in entrepreneurship education in vocational college using digital learning. The diverse perspectives from both educators and learners provided a more holistic understanding of the issues and potential solutions related to digital learning implementation. The sample size of six participants is considered sufficient for this qualitative study, as data collection continued until theoretical saturation is achieved, meaning no new themes, challenges, or suggestions emerge from the interviews (Muhammad Naeem et al., 2024).

To perform the research, this study obtained permission from Universiti Malaya through their Ethics Committee, alongside permission from the Ministry of Education through the eRas 2.0 website. This research also obtained permission from the Department of Technical Vocational Education and Training of the Ministry of Education (BPLTV) as it involves vocational colleges. Ethical considerations were rigorously upheld throughout the study. Prior to participation, each respondent was provided with a consent form outlining the purpose of the research, procedures, confidentiality measures, and their rights, including voluntary participation and withdrawal at any time. Pseudonyms were used to protect participant identities, and all data was stored securely to maintain confidentiality.

Thematic analysis was employed to analyse the data. Transcripts were first coded using open coding to identify meaningful data segments. These initial codes were then grouped and refined through axial coding to form broader categories and themes. This method helped reveal recurring patterns and relationships relevant to the research objectives. To enhance the trustworthiness of the analysis, member checking was conducted by sharing the preliminary findings with participants to ensure the themes accurately reflected their experiences. Furthermore, the findings were triangulated across both student and lecturer data, thereby strengthening the credibility of the results. This methodological approach ensured a thorough and credible examination of the challenges faced and potential improvements for digital learning in entrepreneurship education. The findings provide valuable, context-specific insights that can inform future policy and practice in vocational education.

FINDINGS

Based on the analysis made from the information acquired from the interviews held, there are four main challenges faced by the students due to the implementation of digital learning in entrepreneurship education in vocational colleges in Selangor and three suggestions on the improvement of the usage of digital learning in entrepreneurship education in these institutions.

Challenges faced by the students due to the implementation of digital learning in entrepreneurship education in vocational colleges in Selangor. The findings of this research shows that there are four main themes in the challenges that vocational college students in Selangor faced in learning entrepreneurship education through digital learning, which are, the lack of infrastructure, the students' attitude and involvement, lecturer and student communication, alongside the lecturers' lack of proficiency in using digital technology.

i) Lack of infrastructure

A recurring theme among both lecturers and students was the lack of robust digital infrastructure. All the participants cited unreliable internet connectivity, insufficient access to digital devices, and outdated e-learning platforms as major impediments to effective digital learning. These infrastructural deficits not only hinder the teaching and learning session but also limit students' ability to engage with interactive and practical components of entrepreneurship education, such as simulations and gamified learning modules. While most grievances occur due to the unstable internet connection, Student 2 had stated:

> "... among it is unstable internet connection problem... Sometimes we have to postpone classes because our projector is not working properly for that day."

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ii) Students' attitude and involvement

Concerns regarding the students' attitude and involvement also emerged among one of the most constant themes. The lecturers observed that some students displayed passive learning behaviors, lack of discipline, low participation in online activities, and a tendency to disengage when faced with technical difficulties. Students often struggled to stay focused during online lessons, were easily distracted, and lacked the basic digital skills needed to navigate platforms and tools. Some of them reported feeling disconnected from their peers and instructors, which diminished their sense of accountability and reduced opportunities for collaborative, experiential learning. Student 1 had shared:

> "... for me, especially is harder to grasp the concept of the subject. I tend to lose focus..."

iii) Lecturer and student communication

Both groups of participants emphasized the challenges in maintaining effective communication in a digital context. Lecturers noted difficulties in gauging student understanding and struggled to ensure their instructions were clearly understood. Students, on the other hand, expressed hesitation in seeking clarification or assistance online, alongside noting the lack of interaction among the students themselves. This communication gap not only affects knowledge transfer but also impedes the development of essential soft skills, such as teamwork and problem-solving, which are integral to entrepreneurship education. Lecturer 2 had confided:

> "... Our communication is lacking. So, students misunderstand what we've said."

While Student 2 shared that:

> "... it's hard to ask the questions straight to the lecturer."

iv) Lecturers' lack of proficiency in using digital technology

A notable challenge highlighted was the varying levels of digital literacy among educators. Some lecturers admitted to struggling with the adoption of new e-learning tools and pedagogical strategies, especially among older educators. Many lecturers faced difficulties in using digital tools effectively due to lack of training and experience. Some had to learn how to use new platforms on their own, which affected their ability to design and deliver engaging digital lessons. This lack of digital confidence made it challenging to adapt to online teaching methods. It also impacted the students, who often relied on their lecturers to guide them through the digital platforms used in class. Lecturer 3 had shared that:

> "... Teachers who are 40 and above would always bemoan about it (digital technology) ... that's also an obstacle because we don't have a workshop. There's no briefing about Google Classroom. So, we must learn on our own."

Suggestions on the improvement of the usage of digital learning in entrepreneurship education in vocational colleges in Selangor

While digital learning has been on the rise since the Covid-19 pandemic, the execution is still sorely lacking. Based on the results acquired from this research, there are three main themes on the suggestions given by the participants in terms of improving the usage of digital learning in entrepreneurship education, specifically in vocational colleges in Selangor, which are the educators' competency enhancements, upgrading infrastructure and external support.

i) Educators' competency enhancements

Among the most common theme for the recommendations given by the participants for the improvement is to systematically enhance lecturers' digital skills and pedagogical strategies for e-learning. Targeted training, such as workshops on e-learning platforms, blended curricula design, online collaboration tools, and digital assessments, will equip lecturers with essential competencies, alongside allowing lecturers to be more familiarized with e-learning platforms, digital tools like gamification, and blended teaching methods. Ongoing support via peer mentoring or communities of practice can sustain

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educators' development, ensuring they are able to create engaging, interactive, and student-centered online learning environments. Lecturer 1 had stated that, regarding increasing the effectiveness of digital pedagogy:

> "... One of them is a more interactive learning design. This means that using a blended learning approach, which combines digital learning and traditional learning."

While Student 3 had suggested:

> "... The lecturer must be good at getting the students' attention."

ii) Upgrading infrastructure

Reliable infrastructure is foundational for effective digital learning. This includes ensuring stable high-speed internet connectivity, providing students and lecturers with up-to-date devices, and deploying user-friendly and functionally appropriate learning management systems (LMS). Investment in digital infrastructure should also address the specific needs of entrepreneurial training—for instance, integrating simulation software, gamification modules, or virtual collaboration spaces that allow for project-based learning. By minimizing technological barriers, both students and educators will have more equitable access to digital resources and be able to derive greater benefit from the learning experience. Student 2 had given a suggestion, regarding enhancements that can be made to digital learning platforms:

> "... For me, digital platforms need to have discussion spaces, notifications (...)class recordings, interactive quizzes and question and answer forums to help students better understand and get involved."

iii) External support

To effectively integrate digital learning into entrepreneurship subjects, external support for both the lecturers and students are imperative. For the lecturers, offering technical support for their everyday usage of technology and mentorship for guidance in navigating the digital realm, alongside having a more concrete guideline in the usage of digital technology in entrepreneurship courses and the materials will greatly aid in ensuring their effective use of digital technology in the classroom. Additionally, increasing subject-related personnel, especially lecturers who specializes in entrepreneurship may help improve the quality of technology usage in the course. Meanwhile, collaboration with industry players and entrepreneurial network is important as such collaborations can introduce students to up-to-date entrepreneurship practices, provide mentorship opportunities, and enable participation in real-world projects or digital internships. Student 1 proposed:

> "The colleges can offer digital field training session- maybe like asking for a mentor help or alumni that is great in this subject itself."

DISCUSSION

This study identified four major challenges impacting the effectiveness of digital learning in entrepreneurship education at vocational colleges in Selangor: lack of infrastructure, student attitudes and involvement, communication barriers, and lecturers limited digital proficiency. Each of these factors plays a critical role in shaping the digital learning environment and student outcomes. The lack of infrastructure emerged as a fundamental obstacle. Unstable internet connectivity, insufficient access to modern devices, and outdated e-learning platforms hindered both teaching and learning processes and restricted students' engagement with interactive entrepreneurship activities. This limitation is significant, especially given the critical role of practical simulations in entrepreneurship education (Yeap et al., 2021).

Additionally, student attitudes and involvement presented serious challenges. Lecturers reported passive learning behaviors and difficulties keeping students motivated and digitally literate, while students expressed feelings of disconnection and a lack of focus in online settings. This aligns with the

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results from Yeap et al. (2021), wherein students' lack of motivation, alongside their readiness pose as a hindrance to TVET education. The communication gap between lecturers and students further complicated instruction. Students were reluctant to ask questions, which hindered the development of crucial entrepreneurial soft skills like problem-solving and cooperation. Lecturers also found it difficult to evaluate understanding and provide clear instructions. However, this finding negates with Hsieh & Martiz's (2023) finding, which reported that the application of digital technology in integrated entrepreneurship education facilitates benign interaction between teachers and students, allowing teachers to check students' learning effectiveness based on satisfaction, ensure teaching quality, and timely modify teaching styles to better match student learning needs. Finally, the limited proficiency of some lecturers in digital tools affected the delivery of engaging lessons. Without formal training, many educators resorted to traditional methods, limiting the potential benefits of digital and blended learning approaches (Yeap et al., 2021).

To address these challenges, the study highlights three key improvements. First, enhancing educators' competencies through targeted training programs and ongoing support is essential. Equipping lecturers with skills to design interactive, blended entrepreneurship curricula will increase student engagement and effective knowledge transfer. Peer mentoring and communities of practice can sustain such development over time. Establishing and enhancing practice and training system is crucial to assist their development (Huang et al., 2021). Second, upgrading digital infrastructure, namely good internet connection and sufficient devices, alongside user-friendly platforms is critical. Haitham Eyadat (2023) had recommended developing school infrastructure as a measure to encourage vocational education teachers to teach using technology. Lastly, fostering external support and partnerships offers valuable opportunities. Collaboration with industry players and entrepreneurial networks can introduce real-world projects, mentorship, and technological resources, bridging theoretical learning with practical application and enhancing students' readiness for the digital economy (Yeap et al., 2021; Norfariza Mohd Radzi and Muhammad Faizal A. Ghani, 2021b).

CONCLUSION

Overall, this study investigated the challenges and potential improvements in implementing digital learning within entrepreneurship education at vocational colleges in Selangor. The research highlights the growing significance of digital integration in education, especially as IR4.0 and the COVID-19 pandemic have accelerated digital transformation within Malaysia's Technical and Vocational Education and Training (TVET) sector. Four central challenges were identified: lack of infrastructure, student attitudes and involvement, communication barriers between lecturers and students, and lecturers' limited proficiency with digital technology. To address these, the study recommends enhancing educator competency, upgrading infrastructure, and expanding external support, all critical for preparing digitally literate graduates who can thrive in the digital economy.

Practically, the research pinpoints barriers such as inadequate infrastructure, low digital literacy among educators, limited student engagement, and communication challenges that hinder effective digital entrepreneurship education. Addressing these requires investment in reliable connectivity and modern devices, adoption of user-friendly learning management systems, and ongoing professional development for educators. These initiatives align with Malaysia's Ministry of Education's Entrepreneurship Action Plan 2021–2025, which emphasizes upskilling educators and technology integration. Forming partnerships with industry and entrepreneurial networks is also essential for bridging theory and practice, further developing students' readiness and digital skills. Theoretically, the study utilizes an integrated framework combining Constructivist Learning Theory, the Unified Theory of Acceptance and Use of Technology (UTAUT), Meier's Rapid Instructional Design, and Connectivism Learning Theory. Findings indicate that learner autonomy, technology acceptance, instructional design, and digital connectivity jointly shape outcomes in vocational education. This multidimensional framework clarifies how digital environments support the development of entrepreneurship competencies, while also emphasizing the value of networking and continuous learning for modern educators and students.

However, there are limitations to this study that stem from its methodological choices and restricted scope. As it was a qualitative study involving a small sample of only six participants (three students and three lecturers), the findings may have limited generalizability. Additionally, the study was geographically confined to vocational colleges in Selangor, which means the identified challenges may not be representative of the diverse resource levels and situations found in other Malaysian regions. Future research is recommended to address these limitations by conducting a broader assessment of

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digital learning integration and its direct impact on entrepreneurial outcomes, moving beyond just identifying challenges and suggestions. Specifically, studies should quantify the effectiveness of digital learning in preparing graduates for the digital economy and thoroughly evaluate the successful implementation of entrepreneurship education post-pandemic. There is also a need to develop and test tailored, context-based strategies for improvement, focusing on specific barriers like limited digital access, technical support, and digital literacy skills among students and educators.

In conclusion, this study provides clear guidance to policymakers and educators for advancing digital learning in entrepreneurship curricula. Prioritizing infrastructure, educator capacity, and ecosystem collaboration will help vocational colleges in Selangor better prepare students for the demands of the Fourth Industrial Revolution, strengthening policy and practice in Malaysia's evolving TVET landscape.

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CONFLICT OF INTEREST

Authors declare that there is no conflict of interests regarding the publication of the paper.

AUTHORS CONTRIBUTION

Nur Farhah Nadhirah Mohd Suhaimi.: Data Curation, Investigation, Project Administration, Visualization, Writing- Original Draft. **Norfariza Mohd Radzi**: Conceptualization, Funding Acquisition, Resources, Supervision, Writing- Reviewing and Editing. **Siti Hajar Halili**: Formal Analysis, Methodology, Software, Validation.

AVAILABILITY OF DATA AND MATERIALS

Data available on request from the authors.

DECLARATION OF GENERATIVE AI

During the preparation of this work, the authors used QuillBot and Google Gemini to enhance the clarity of the writing. After using the QuillBot and Google Gemini, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

ETHIC STATEMENTS

The research is compliant with the Universiti Malaya Research Ethics Committee (UMREC) [Reference number: UM.TNC2/UMREC_4364] and has been approved by the committee and the Department of Technical Vocational Education and Training of the Ministry of Education (BPLTV) as the research involve vocational colleges.

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