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Superstar Learning Platform in Vocational Entrepreneurship Education: A Quasi-Experimental Study

ChunLei Ren[1] and Thanawan Phongsatha[2]
[1]Zhejiang DongFang Vocational and Technical College, China
[2]Graduate School of Business and Advanced Technology Management, Assumption University, Thailand
[1]E-mail: 28281751@qq.com, ORCID ID: https://orcid.org/0009-0005-5904-9241
[2]E-mail: thanawanphn@au.edu, ORCID ID: https://orcid.org/0000-0003-3918-1796

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Abstract

Background and Aim: The rapid integration of information technology in Chinese vocational education necessitates empirical studies on its effectiveness. This study investigates the impact of the Superstar Learning Platform (SLP) within a blended learning framework on entrepreneurial competencies in vocational education. Grounded in constructivist and experiential learning theories, which emphasize active and hands-on learning, this research examines how digital learning tools enhance practical skill development among sophomore Business Administration students at the Digital Business Academy, Zhejiang DongFang Vocational and Technical College.

Methodology: A quasi-experimental design was employed to compare traditional and blended learning approaches in the "Start Your Business" course, a key component of vocational entrepreneurship training. The study measured entrepreneurial knowledge, skills, intentions, and self-efficacy using validated pre-tests and post-tests. A perception survey assessed student engagement, interaction, and satisfaction. Quantitative data were analyzed using statistical software Jamovi, and qualitative insights were derived from student feedback. The study's design aligns with competency-based education (CBE) principles, which emphasize measurable skill development and practical applications in vocational training. This research encompassed a total of 400 students, with 122 participating in the study through purposive sampling. The cohort was divided into a control group, adhering to traditional teaching methods, and two treatment groups.

Results: Findings indicate that SLP significantly enhanced entrepreneurial knowledge ($p=0.002$, $d=0.76$) and self-efficacy ($p=0.017$, $d=0.59$) in the treatment group compared to the control group. Entrepreneurial skills showed marginal significance ($p=0.055$, $d=0.48$), suggesting that vocational skill acquisition may require additional hands-on training. No significant difference was found in entrepreneurial intentions ($p=0.643$, $d=0.12$). Traditional teaching methods also proved effective, as pre-test and post-test improvements were significant in both the control ($p<0.001$, $d=1.02$) and treatment groups ($p<0.001$, $d=1.25$). Survey results demonstrated that students in the blended learning environment reported higher engagement, interaction, and satisfaction, reinforcing the importance of digital tools in vocational education.

Conclusion: This study highlights the benefits of integrating blended learning in vocational education, particularly in entrepreneurship training. By improving key competencies and student engagement, SLP contributes to a more effective learning environment. These findings provide valuable insights for vocational educators, institutions, and policymakers, supporting the broader adoption of technology-enhanced instructional strategies. Furthermore, this study fills a gap in vocational education literature by examining the role of digital platforms in entrepreneurship courses, emphasizing their potential to enhance job readiness and practical business competencies.

Keywords: Blended Learning; Vocational Education; Superstar Learning Platform; Entrepreneurial Knowledge; Entrepreneurial Skills; Entrepreneurial Intention; Entrepreneurial Self-Efficacy; Quasi-Experimental Study

Introduction

The rapid advancements in educational technology, driven by the Fourth Industrial Revolution, are transforming the learning landscape in China. Digital tools offer enhanced convenience, interactivity, and personalized learning experiences (Stockwell, 2016). Among these innovations, hybrid learning models that integrate structured online platforms with the flexibility of mobile access are gaining traction (Li & Heng, 2021). This shift is particularly relevant for vocational education, where blended learning is being increasingly adopted to bridge the gap between theoretical knowledge and practical application (Basori et al., 2023).

Entrepreneurship education (EE) has evolved as a critical component of higher education curricula worldwide. Originally developed in response to economic stagnation in the 1970s (Wadhwani

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& Viebig, 2021), EE programs aim to foster entrepreneurial knowledge, skills, and attitudes (Fayolle & Gailly, 2008). The "Start Your Business" (SYB) course, established by the International Labour Organization (ILO) in the 1990s, is a prominent initiative designed to empower young entrepreneurs, particularly in developing economies (Remeikienė et al., 2020). However, while traditional EE has proven effective, there remains an ongoing challenge in adapting these programs to digital learning environments.

The Superstar Learning Platform (SLP), developed by Chaoxing Education Group, is a leading digital learning system in China. It integrates interactive tools, video streaming, and robust course management capabilities, facilitating a blended learning experience that combines theoretical instruction with practical application (Wan, 2023; Yu, 2023). Although blended learning has shown promise in enhancing engagement and self-efficacy in vocational education (Li et al., 2022; Minarti & El Hakim, 2022), its specific impact on entrepreneurship education, particularly in skill development and entrepreneurial intention, remains underexplored.

Despite the increasing integration of digital platforms in EE, significant research gaps remain. Existing studies predominantly focus on entrepreneurial knowledge acquisition through online learning but lack empirical evidence on how blended learning affects entrepreneurial skills, self-efficacy, and intentions. Furthermore, while studies have highlighted the advantages of SLP in general higher education settings(Li & Heng, 2021; Yu, 2023), its effectiveness in vocational EE, especially in fostering practical entrepreneurial competencies, has not been thoroughly investigated.

This study aims to fill these gaps by examining the impact of the Superstar Learning Platform on the "Start Your Business" (SYB) course. Specifically, it assesses whether SLP enhances students' entrepreneurial competencies—knowledge, skills, self-efficacy, and intention—beyond what traditional teaching methods achieve. Additionally, it explores students' engagement, interaction, and satisfaction with the blended learning approach. By addressing these aspects, the study contributes to the field of educational technology by providing empirical insights into the role of digital platforms in vocational entrepreneurship education.

The research questions were as follows:

1. How does the Superstar Learning Platform affect the learning performance of the experimental group?
2. What is the difference in students' performance between using the Superstar Learning Platform and traditional teaching methods for the Start Your Business course?
3. What are Business Administration major students' perceptions (engagement, interaction, and satisfaction) toward the Superstar Learning Platform in Start Your Business teaching?

Objectives

1. To examine the effectiveness of using the Superstar Learning Platform for Business Administration majors' learning performance.
2. To identify the differences in students' learning performance between using the Superstar Learning Platform and the traditional teaching method for the Start Your Business Course.
3. To determine Business Administration major students' perception (Student engagement, Learner Interaction, and satisfaction) toward the Superstar Learning Platform in the Start Your Business Course teaching.

Literature review

Theories relating to the research

This study explores how digital platforms like the Superstar Learning Platform (SLP) impact entrepreneurial skills development within the framework of Constructivism, Cognitivism, and Blended Learning (BL). While these theories provide valuable insights into learning processes, a critical

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examination of their integration is essential to understand their practical implications in vocational education, particularly in entrepreneurship training.

Constructivist Learning Theory

Constructivism posits that knowledge is actively constructed rather than passively absorbed, emphasizing learner engagement, context, and social interaction (Schunk, 2012). In vocational education, constructivist approaches align well with the emphasis on practical skills and real-world application, as they foster problem-solving abilities, creativity, and adaptability—essential traits for job readiness. Active learning through hands-on projects and real-world simulations enhances vocational students' ability to apply theoretical knowledge in workplace settings.

While constructivism supports scaffolded instruction and differentiated learning, its implementation in vocational education presents challenges. Vocational students often have diverse learning backgrounds and motivations, necessitating tailored instructional strategies. Studies indicate that while project-based learning enhances entrepreneurial competencies, digital tools require careful design to sustain engagement, particularly among students with lower digital literacy (Siregar et al., 2024).

Additionally, the effectiveness of constructivist strategies within blended learning varies based on students' motivation levels and the extent of instructor support (Wibowo et al., 2025). Therefore, while SLP offers interactive and self-directed learning opportunities, its success depends on integrating structured guidance and real-world application to maintain vocational students' engagement.

Cognitivism Theory

Cognitivism focuses on mental processes such as memory, problem-solving, and comprehension, providing a structured approach to knowledge acquisition (Habsy et al., 2024). In vocational education, understanding cognitive processes is particularly beneficial as it supports skill acquisition, problem-solving abilities, and decision-making, all crucial for workforce readiness. Cognitivist strategies, such as scaffolding and chunking information, enhance students' ability to retain and apply knowledge in practical settings.

Digital learning platforms like SLP align with cognitivist principles by offering structured learning experiences, real-time feedback, and interactive tasks. However, a critical limitation of purely cognitivist approaches in vocational education is their emphasis on structured learning over experiential adaptability. While SLP provides cognitive scaffolding through multimedia content and assessments, vocational students often require hands-on practice to develop real-world competencies. Moreover, the assumption that all learners process information similarly raises concerns about the adaptability of digital platforms to diverse cognitive styles and vocational disciplines (Helm, 2025). Addressing these challenges requires integrating cognitive strategies with experiential learning elements, such as virtual simulations and industry-based case studies, to enhance vocational students' learning experiences.

Blended Learning: Integration and Outcomes

Blended Learning (BL) merges traditional and digital learning strategies, offering flexibility and scalability. Research highlights BL's effectiveness in improving student engagement and knowledge retention compared to purely traditional methods (Anthony et al., 2019; Williams et al., 2008). The interactive features of SLP align with BL principles, enabling personalized learning paths and real-time feedback.

In vocational education, blended learning is particularly effective as it combines theoretical instruction with hands-on training, bridging the gap between classroom learning and real-world applications. Vocational students benefit from the flexibility of BL, allowing them to balance coursework with practical training. However, despite its advantages, BL presents challenges in ensuring that digital learning components effectively support skill acquisition. Studies indicate that while BL enhances theoretical understanding, vocational students still require face-to-face mentoring and workplace exposure for skill mastery (Sala et al., 2024).

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Moreover, student perceptions of BL vary based on prior technological exposure and self-regulation abilities, impacting the effectiveness of digital entrepreneurship training Previtali and Scarozza, 2019). Comparative studies suggest that while BL enhances theoretical knowledge, practical skill development benefits from a blended approach incorporating internships and hands-on workshops (Shih, 2010)

Implications for Entrepreneurial Skills Development through SLP

The integration of Constructivism, Cognitivism, and BL within SLP presents both opportunities and limitations for entrepreneurial education in vocational contexts. While SLP facilitates cognitive structuring and engagement, its effectiveness in developing entrepreneurial skills depends on how well it integrates real-world applications and practical learning experiences. Features such as interactive videos, practice tasks, and real-world case studies help bridge the gap between theoretical knowledge and entrepreneurial practice.

Entrepreneurial skill development is a multidimensional construct encompassing competencies such as opportunity recognition, risk management, financial literacy, and leadership (Man et al., 2002). Research indicates that these skills contribute to improved business performance and innovation capabilities(Drucker & Maciariello, 2014; Mitchelmore & Rowley, 2010). Studies highlight that digital learning tools, when effectively designed, can enhance entrepreneurial skill acquisition by providing scenario-based learning, problem-solving activities, and collaborative networking opportunities (Fayolle & Gailly, 2008). Despite numerous studies confirming BL's effectiveness, the link between SLP and vocational entrepreneurship education remains an underexplored area in existing research. While prior studies have examined BL's role in education broadly, few have specifically assessed its impact on vocational students' entrepreneurial skills development. Moreover, entrepreneurial skills are often measured through self-assessments, behavioral evaluations, and performance-based metrics (Ahmad, 2007), yet studies examining how SLP aligns with these measurement approaches remain scarce.

The present study aims to fill this gap by investigating how SLP supports the acquisition of entrepreneurial knowledge, skills, and self-efficacy in vocational settings. By incorporating validated entrepreneurial competency scales and experiential learning tools, SLP has the potential to enhance opportunity recognition, strategic planning, and innovation in vocational education (Davidsson & Honig, 2003). This research contributes to vocational education management by providing empirical insights into the effectiveness of digital platforms in skill-based training, offering recommendations for optimizing digital learning strategies in entrepreneurship education.

Conceptual Framework

The conceptual framework, illustrated in Figure 1, is grounded in the literature on vocational education, blended learning, and entrepreneurial competency development. The study involves one control group utilizing traditional teaching methods and two experimental groups engaged in blended learning through the Superstar Learning Platform (SLP) over eight weeks. The framework incorporates pre-tests and post-tests to assess students' entrepreneurial knowledge, skills, intentions, and self-efficacy. Additionally, a perception survey measuring student engagement, learner interaction, and satisfaction is administered to the experimental groups to evaluate their experiences with SLP. The final evaluation phase examines the overall effectiveness of the program and the impact on students' entrepreneurial competencies.

This framework aligns with Competency-Based Education (CBE) principles, which emphasize measurable skill development and practical abilities in vocational education. The inclusion of entrepreneurial knowledge, skills, intentions, and self-efficacy as key outcomes is rooted in vocational education literature, where these competencies are critical for job readiness, employability, and practical success in business administration. The use of pre-tests and post-tests directly supports the

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assessment of competency development, reinforcing vocational education's focus on outcome-based learning.

The perception survey evaluates student engagement, interaction, and satisfaction—three essential factors influencing learning effectiveness in vocational training. Research highlights that higher engagement, active interaction, and learner satisfaction contribute to improved skill acquisition, motivation, and successful vocational learning outcomes.

Furthermore, comparing traditional teaching with blended learning through SLP provides valuable insights into the effectiveness of technology-enhanced learning in vocational education. Given the increasing reliance on digital tools in modern workplaces, it is essential to assess whether blended learning better equips students with entrepreneurial competencies. The framework, therefore, serves as a structured approach to understanding how digital learning impacts vocational training and entrepreneurial success.

The conceptual framework is as follows:

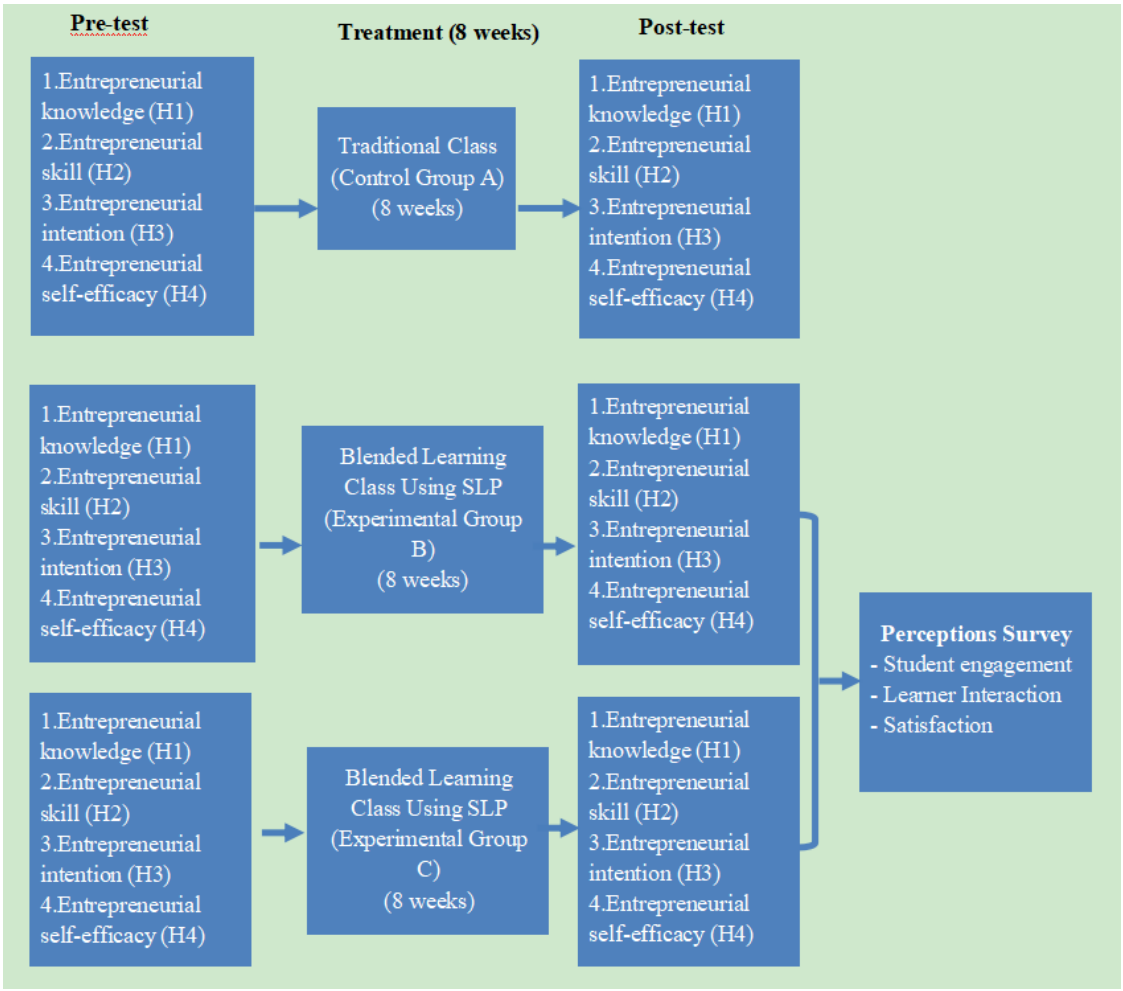

Figure 1 Conceptual Framework

Based on this framework, the study formulates the following hypotheses:

$H_0$1: There is no difference between the treatment group, which learns through blended learning, and the control group, which learns through traditional modes, in Entrepreneurial knowledge.

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$H_0$2: There is no difference between the treatment group, which learns through blended learning, and the control group, which learns through traditional modes, in Entrepreneurial skills.

$H_0$3: There is no difference between the treatment group, which learns through blended learning, and the control group, which learns through traditional modes, in entrepreneurial intention.

$H_0$4: There is no difference between the treatment group, which learns through blended learning, and the control group, which learns through traditional modes, in entrepreneurial self-efficacy.

$H_0$5: There is no difference between pre-test and post-test for the control group when learning through the traditional mode.

$H_0$6: There is no difference between pre-test and post-test for the treatment group when learning through the blended learning mode.

Methodology

Population and sample

The target population for this research consists of 400 sophomore students enrolled in the Business Administration program at Digital Business Academy, Zhejiang DongFang Vocational and Technical College, located in Wenzhou, Zhejiang Province, China. This institution, a state-owned private higher vocational and technical college, offers a curriculum that integrates theoretical management knowledge with practical applications. The students, who have been studying these theories for approximately two semesters, are aged between 18 and 22 years old. This demographic and academic context is ideal for examining the effectiveness of digital learning platforms in vocational education.

The study employs purposive sampling, a non-random technique where participants are deliberately selected based on specific characteristics relevant to the research objectives. Purposive sampling is appropriate in vocational education contexts as it allows the researcher to focus on students actively engaged in digital and blended learning modalities, thereby ensuring the relevance of the findings. Vocational education literature supports purposive sampling due to its effectiveness in selecting students who best represent practical training and applied skill acquisition.

A sample of 122 students from three different classes within the same academic program was chosen. These classes were purposefully selected to represent different instructional delivery modalities for comparative analysis. The sample is divided into three groups:

Group A (44 students): Traditional teaching method (control group)

Group B (36 students): Blended learning approach using the Superstar Learning Platform (SLP)

Group C (42 students): Blended learning approach using the SLP, differing in class size

This study design enables a comparative evaluation of the impact of SLP on academic performance and students' perceptions of digital learning. A power analysis was conducted to determine the adequacy of the sample size, ensuring that statistical tests can detect meaningful differences among the groups. However, one limitation of purposive sampling is its potential for selection bias, which may limit the generalizability of findings beyond the specific population studied.

Treatment

The intervention spans eight weeks, structured as follows:

Week 1: Pre-test assessment for all groups

Weeks 2-7: Instructional treatment phase:

Control Group (Group A): Traditional lecture-based teaching

Experimental Groups (Groups B and C): Blended learning with the Superstar Learning Platform (SLP)

Week 8: Post-test assessment for all groups and a perception survey for experimental groups

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The eight-week duration was chosen based on vocational education literature, which highlights the necessity of sufficient time for students to develop entrepreneurial knowledge, vocational skills, and self-efficacy. Research suggests that six weeks of blended learning is adequate for meaningful skill acquisition and knowledge retention in vocational training environments.

The blended learning approach integrates the BOPPPS (Bridge-in, Objective, Pre-assessment, Participatory, Post-assessment, and Summary) teaching model, ensuring structured and interactive learning:

Pre-Class Activities: Students complete preparatory tasks, such as reading materials, watching instructional videos, or taking short quizzes, to activate prior knowledge.

In-Class Activities: Sessions emphasize participatory learning, including discussions, problem-solving tasks, and practical applications. The instructor acts as a facilitator to encourage active engagement.

Bridge-in: Real-life scenarios or thought-provoking questions introduce each lesson to capture students' interest and contextualize learning.

Post-Class Reflection: Students engage in reflective tasks, quizzes, and collaborative projects to reinforce learning, promote self-directed study, and enhance peer interactions.

This structured framework aligns with competency-based education and experiential learning principles, which are central to vocational education. By linking participatory learning with real-world applications, the BOPPPS model enhances students' problem-solving abilities and practical competencies.

Research Instruments and Tools

The research instruments utilized in this study include performance tests and questionnaires to collect both quantitative and qualitative data.

Performance Tests To quantitatively assess changes in Entrepreneurial Knowledge, Skills, Intention, and Self-Efficacy, this study employed pre-test and post-test performance assessments. These tests consisted of standardized questions adapted from Zhejiang DongFang Vocational and Technical College's official evaluations to ensure content reliability. The questions were designed to measure students' cognitive and applied competencies in entrepreneurship, providing an objective metric for evaluating the impact of the Superstar Learning Platform (SLP) on learning outcomes.

A structured questionnaire was designed to gather students' perceptions of SLP in a blended learning environment. Administered after the post-test, the questionnaire measured three key dimensions: Student Engagement, Learner Interaction, and Student Satisfaction. Responses were recorded on a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), to quantify students' subjective experiences and attitudes.

To ensure the validity of the questionnaire, an Item-Objective Congruence (IOC) test was conducted with expert reviewers, yielding results above 0.67, confirming the survey's relevance and appropriateness. Furthermore, a pilot study involving 56 junior students with prior experience using SLP was conducted to establish reliability. The internal consistency was assessed using Cronbach's Alpha, with results indicating excellent reliability:

Table 1 Results of Cronbach's Alpha of the questionnaire

Variables	Number of Items	Cronbach's Alpha	Interpretation
Student Engagement	6	0.993	Excellence
Learner Interaction	6	0.986	Excellence
Student Satisfaction	4	0.995	Excellence

To enhance linguistic reliability and conceptual clarity, the questionnaire was translated into Chinese using a forward and backward translation process. Two associate professors specializing in English and translation oversaw this process to ensure accuracy. One performed the initial English-to-

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Chinese translation, and the other conducted the back-translation to verify fidelity to the original content. This rigorous approach helped maintain the validity and clarity of survey items across language contexts.

Research analysis

Descriptive statistics were used to demonstrate the central tendency and variability of the scores derived from performance assessments and surveys. This included calculating the mean scores, standard deviation, and range for both pre-tests and post-tests. These statistics provided a foundational overview of students' performance trends before and after the intervention.

For inferential analysis, paired sample t-tests were conducted to assess the mean differences between pre-test and post-test scores. This analysis was applied to evaluate changes in Entrepreneurial Knowledge, Skills, Intention, and Self-Efficacy, offering insights into the impact of the Superstar Learning Platform (SLP) on learning outcomes.

Additionally, one-way ANOVA tests were used to compare post-test results across the three study groups, identifying statistically significant differences in educational outcomes based on instructional modality. The statistical tests were chosen due to their effectiveness in measuring learning gains and instructional differences in vocational education settings.

All analyses were conducted using Jamovi, a statistical software known for its user-friendly interface and robust capabilities in handling t-tests and ANOVA. The results are presented in tables and figures, including ANOVA tables and means plots, to clearly illustrate significant findings and trends.

Ethical Considerations

This study adhered to ethical guidelines to ensure the protection of participants' rights and privacy. Institutional Review Board (IRB) approval was obtained before data collection, ensuring compliance with research ethics protocols. Participants were provided with informed consent forms outlining the study's purpose, procedures, potential risks, and their right to withdraw at any time without penalty. To maintain confidentiality, all collected data were anonymized using coded identifiers instead of personal information. Data storage and access were secured, with only authorized researchers permitted to handle sensitive information. These measures ensured the ethical integrity of the research and the safeguarding of participant confidentiality.

Results

Demographic Information

The study involved 122 students from three classes, consisting of one control group (Group A, 44 students) and two experimental groups (Group B, 36 students; Group C, 42 students). The demographic breakdown of gender and age is relevant in vocational education research, as these factors can influence learning outcomes, motivation, and skill acquisition. For example, age can impact the developmental stage of self-efficacy, while gender distribution might suggest differences in engagement with entrepreneurial education. Below is the detailed demographic information.

Table 2 Demographic Information of Samples

Variable	Category	Frequency	Percentage
Class	Control Group A	44	33.07%
	Experimental Group B	36	29.51%
	Experimental Group C	42	34.42%
	Total	122	100%
Gender	Male	69	56.91%
	Female	53	42.09%

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Variable	Category	Frequency	Percentage
	Total	122	100%
Age	19	50	40.98%
	20	59	48.36%
	21	13	10.66%
	Total	122	100%

Hypotheses Testing

The results of the hypothesis testing are presented below, reflecting the impact of different teaching methods on entrepreneurial knowledge, skills, intention, and self-efficacy. These results are linked to the broader context of vocational education, which emphasizes practical knowledge, self-efficacy, and career readiness.

H0 1: There is no difference between the treatment group and the control group in Entrepreneurial knowledge.

Table 3 One-way ANOVA Analysis of Variance Summary for Entrepreneurial Knowledge Improvement Score

	Mean differences (Post – Pre)	**SD**	**N**	**F**	**P**	**η²**
Control Group A	12.2	4.17	44			
Experimental Group B	14.3	4.92	36	6.60	0 .002	0.100
Experimental Group C	15.7	4.53	42			
Total	**14.02**	**4.52**	**122**			

Based on the ANOVA results in Table 3 ($F(2, 119) = 6.60$, $p = 0.002$), a significant difference in entrepreneurial knowledge was found across the groups, leading to the rejection of the null hypothesis. The experimental groups showed higher mean improvement scores compared to the control group, indicating better performance. The effect size of 0.1 suggests a moderate impact, accounting for 10% of the total variance in knowledge improvement. This significant difference ($F(2, 119) = 6.60$, $p = 0.002$) indicates that the experimental groups outperformed the control group, emphasizing the value of interactive learning environments in vocational education, where knowledge is closely linked to practical application.

Table 4 Homogeneity of Variances Test (Levene's)

	F	**df1**	**df2**	**P**
Entrepreneurial knowledge improvement score	0.338	2	119	0.714

Since Levene's test was not significant, indicating equal variances, pairwise comparisons were conducted using the Tukey post-hoc test, assuming homogeneity of variances.

Table 5 Tukey Post-Hoc Test for Group Pairwise Comparison Summary for Entrepreneurial Knowledge Improvement Score

	Mean Differences	**t-value**	**P**
Control Group A and Experimental Group B	-2.12	-2.09	0.097
Control Group A and Experimental Group C	-3.52	-3.61	0.001
Experimental Group B and Experimental Group C	-1.40	-1.36	0.365

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Table 5 shows that there is a marginally significant difference between Control Group A and Experimental Group B, while a statistically significant difference is observed between Control Group A and Experimental Group C ($p = 0.001$). The significant difference between Control Group A and Experimental Group C suggests that incorporating a blended learning environment, such as the Superstar Learning Platform, can significantly enhance entrepreneurial knowledge. This highlights the potential effectiveness of blended learning approaches in improving knowledge acquisition in vocational education settings.

H02: There is no difference between the treatment group and the control group in Entrepreneurial Skill.

Table 6 One-way ANOVA Analysis of Variance Summary for Entrepreneurial Skill Improvement Score

	Mean differences (Post - Pre)	**SD**	**N**	**F**	**P**	**η^2**
Control Group A	12.6	4.01	44			
Experimental Group B	14.0	5.11	36	2.97	0 .055	0.048
Experimental Group C	15.2	5.67	42			
Total	**13.91**	**4.96**	**122**			

According to the ANOVA results presented in Table 6, the analysis yielded an F value of 2.97 with a p-value of 0.055, indicating a marginally significant difference in Entrepreneurial Skill improvement among the groups. Given that the p-value is close to the 0.05 threshold, we fail to reject the null hypothesis, suggesting that there is no clear, statistically significant difference in entrepreneurial skill improvement between the groups at the conventional 0.05 significance level.

However, the descriptive statistics show that the experimental groups (B and C) had higher mean improvement scores in Entrepreneurial Skill compared to the control group (A). Specifically, Experimental Group B had a mean improvement score of 14.0, Experimental Group C had 15.2, and Control Group A had 12.6. This trend suggests that the interventions in the experimental groups had a positive impact on entrepreneurial skill development, although the difference was not statistically robust.

The effect size ($\eta^2 = 0.048$) indicates a small but noteworthy influence of group assignment on entrepreneurial skill improvement, explaining 4.8% of the variance. This suggests that while the group interventions may have had a modest impact, the effect is not large enough to reach conventional levels of statistical significance.

The marginally significant result ($F = 2.97$, $p = 0.055$) highlights that while the experimental groups showed higher improvements in entrepreneurial skills, the observed differences were not definitive enough to warrant a strong conclusion. This aligns with findings in vocational education literature, which emphasizes that skill development often requires more extensive and hands-on practice, particularly in a vocational context. The lack of a statistically significant difference may reflect the need for more comprehensive, real-world application opportunities to effectively enhance entrepreneurial skills in vocational education settings.

Table 7 Homogeneity of Variances Test (Levene's)

	F	**df1**	**df2**	**P**
Entrepreneurial Skill improves score	2.19	2	119	0.117

Since Levene's test was not significant, indicating equal variances, pairwise comparisons were conducted using the Tukey post-hoc test, assuming homogeneity of variances.

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Table 8 Tukey Post-Hoc Test for Group Pairwise Comparison Summary for Entrepreneurial Skill Improvement Score

	Mean Differences	t-value	P
Control Group A and Experimental Group B	-1.4	-1.26	0.421
Control Group A and Experimental Group C	-2.6	-2.43	0.043
Experimental Group B and Experimental Group C	-1.20	-1.06	0.538

As shown in Table 8, Control Group A and Experimental Group C are statistically significantly different from each other. The results indicate that the improvement in entrepreneurial skills for students in Experimental Group C was significantly higher than that of the Control Group A ($p = 0.043$). This suggests that the intervention implemented for Group C had a more pronounced effect on enhancing entrepreneurial skills compared to the traditional approach used in the control group.

However, the differences between Control Group A and Experimental Group B ($p = 0.421$), as well as between Experimental Group B and Experimental Group C ($p = 0.538$), were not statistically significant. This indicates that while Group C showed a significant improvement over Group A, there were no meaningful differences between the two experimental groups or between the control group and Experimental Group B.

These results suggest that the blended learning approach used in Experimental Group C may be more effective in improving entrepreneurial skills than the other methods tested. The significant difference between Control Group A and Experimental Group C aligns with the growing body of vocational education research that supports the integration of blended learning strategies, which combine theoretical knowledge with practical application, as a potentially more impactful approach for developing entrepreneurial skills.

$H_0$3: There is no difference between the treatment group and the control group in Entrepreneurial Intention.

Table 9 One-way ANOVA Analysis of Variance Summary for Entrepreneurial Intention Improvement Score

	Mean differences (Post – Pre)	SD	N	F	P	η^2
Control Group A	2.32	2.02	44			
Experimental Group B	2.75	2.37	36	0.444	0 .643	0.01
Experimental Group C	2.36	1.34	42			
Total	**2.46**	**1.94**	**122**			

The ANOVA results presented in Table 9 show that the F value is 0.444 with a p-value of 0.643, which is not statistically significant. Therefore, we fail to reject the null hypothesis, indicating that there is no significant difference in the entrepreneurial intention improvement scores between the control group and the experimental group.

Additionally, the effect size ($\eta^2 = 0.01$) suggests a very small impact from the interventions, explaining only 1% of the variance in entrepreneurial intention improvement scores. This indicates that the interventions had a minimal effect on the entrepreneurial intention of the participants.

The descriptive statistics reveal that the control group (A) had a mean improvement score of 2.32, Experimental Group B had 2.75 (the highest among the three groups), and Experimental Group C had 2.36. The improvement scores across the groups are relatively close, with Group B showing the most variability in improvement. This variability indicates that there were diverse responses to the intervention in Group B, suggesting that some participants may have benefited more from the intervention than others.

Given that no significant improvement was observed in entrepreneurial intention ($F = 0.444$, $p = 0.643$), these results align with existing vocational education literature. It suggests that enhancing entrepreneurial intention may require longer-term or more intensive interventions to foster a more lasting

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and significant impact. Additionally, vocational education programs may need to incorporate a variety of approaches or strategies that specifically target entrepreneurial intention development, beyond the scope of the interventions tested in this study.

Table 10 Homogeneity of Variances Test (Levene's)

	F	df1	df2	P
Entrepreneurial Intention improves score	7.98	2	119	< .001

The Levene's test for equality of variances was significant ($p < 0.001$), indicating unequal variances among the groups. Because the assumption of equal variances was violated, follow-up pairwise comparisons were conducted using the Games-Howell post-hoc test, which is appropriate when variances are unequal.

Table 11 Games-Howell Post-Hoc Test for Group Pairwise Comparison Summary for Entrepreneurial Intention Improvement Score

	Mean Differences	t-value	P
Control Group A and Experimental Group B	-0.432	-0.865	0.664
Control Group A and Experimental Group C	-0.039	-0.106	0.994
Experimental Group B and Experimental Group C	0.3929	0.881	0.655

The results from Table 11 indicate that there are no statistically significant differences in entrepreneurial intention improvement scores between any of the group comparisons. Specifically, the difference between Control Group A and Experimental Group B was not significant ($p = 0.664$). Similarly, the difference between Control Group A and Experimental Group C was not significant ($p = 0.994$). Additionally, the difference between Experimental Group B and Experimental Group C was also not significant ($p = 0.655$).

These findings suggest that the interventions used in the experimental groups (B and C) did not lead to a greater improvement in entrepreneurial intention compared to the control group (A). Therefore, the data show no meaningful differences in entrepreneurial intention improvements among the three groups. These results underscore the need for further research to identify and refine effective methods for enhancing entrepreneurial intention. Particularly in vocational education settings, where practical, hands-on learning may have a stronger influence on students' entrepreneurial attitudes than traditional motivational strategies. This suggests that future studies should explore alternative approaches or combinations of interventions that may more effectively foster entrepreneurial intention in vocational education contexts.

$H_0$4: There is no difference between the treatment group and the control group in Entrepreneurial Self-efficacy.

Table 12 One-way ANOVA Analysis of Variance Summary for Entrepreneurial Self-efficacy Improvement Score

	Mean differences (Post – Pre)	SD	N	F	P	η^2
Control Group A	4.91	2.98	44			
Experimental Group B	6.19	3.53	36	4.23	0 .017	0.066
Experimental Group C	6.83	2.90	42			
Total	**5.95**	**3.13**	**122**			

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The ANOVA results presented in Table 12 show that the F-value is 4.23, with a p-value of 0.017, which is statistically significant at the 0.05 level. This significant result leads to the rejection of the null hypothesis, indicating that there is a significant difference in entrepreneurial self-efficacy improvement scores among the groups. The effect size ($\eta^2 = 0.066$) suggests a moderate impact, explaining 6% of the total variance in self-efficacy improvement.

Descriptive statistics reveal that both experimental groups (B and C) had higher improvement scores in entrepreneurial self-efficacy compared to the control group (A). These findings suggest that the interventions applied in the experimental groups led to a greater positive effect on self-efficacy, indicating that the learning methods used in these groups were more effective in enhancing students' entrepreneurial confidence.

The significant result ($F = 4.23$, $p = 0.017$) further supports the idea that the blended learning approach, implemented in both experimental groups, was particularly beneficial in fostering an increase in entrepreneurial self-efficacy. This reinforces the importance of incorporating such innovative teaching methods in vocational education, as they not only improve skills but also contribute to a stronger sense of confidence, a crucial component for entrepreneurial success.

Table 13 Homogeneity of Variances Test (Levene's)

	F	df1	df2	P
Entrepreneurial Self-efficacy score	0.448	2	119	0.640

The Levene's test for equality of variances was not significant ($p = 0.640$), indicating that the assumption of equal variances among the groups is valid. As a result, pairwise comparisons were conducted using the Tukey post-hoc test, which assumes homogeneity of variances.

Table 14 Tukey Post-Hoc Test for Group Pairwise Comparison Summary for Entrepreneurial Self-efficacy Improvement Score

	Mean Differences	t-value	P
Control Group A and Experimental Group B	-1.29	0.164	-1.83
Control Group A and Experimental Group C	-1.924	-2.856	0.014
Experimental Group B and Experimental Group C	-0.639	-0.639	0.641

As it is shown in Table 14, the difference between Control Group A and Experimental Group B was not statistically significant ($p = 0.164$). The difference between Control Group A and Experimental Group C was statistically significant ($p = 0.014$), indicating that the control group and Experimental Group C have significantly different improvement scores. The difference between Experimental Group B and Experimental Group C was not significant ($p = 0.641$).

Thus, the Tukey post-hoc analysis reveals that only the difference between Control Group A and Experimental Group C is statistically significant, with Experimental Group C showing greater improvement in entrepreneurial self-efficacy.

$H_0 5$: There is no difference between pre-test and post-test for the control group.

Table 15 Paired Samples T-Test for the control group

	Mean difference	p
Pre-Entrepreneurial knowledge VS Post-Entrepreneurial knowledge	-12.2	<0.001
Pre-Entrepreneurial Skill VS Post-Entrepreneurial Skill	-12.6	<0.001

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	Mean difference	p
Pre-Entrepreneurial Intention VS Post-Entrepreneurial Intention	-2.32	<0.001
Pre-Entrepreneurial Self-efficacy VS Post-Entrepreneurial Knowledge	-4.91	<0.001

Note. H_a μ Measure 1 - Measure 2 ≠ 0

According to Table 15, the paired sample T-test for the control group showed a statistically significant difference in means between pre-test and post-test ($p < 0.001$), indicating effective traditional teaching in enhancing entrepreneurial competencies. Specifically, post-test scores for Entrepreneurial Knowledge and Skill were higher by 12.2 and 12.6 points, respectively. Lesser improvements were seen in Entrepreneurial Intention and Self-Efficacy, with increases of 2.32 and 4.91 points, suggesting potential areas for course content or teaching method optimization to boost students' confidence and motivation. The null hypothesis was rejected, affirming that traditional teaching significantly enhanced the measured indicators.

$H_0$6: There is no difference between pre-test and post-test for the treatment group.

Table 16 Paired Samples T-Test for treatment group

	Mean difference	p
Pre-Entrepreneurial knowledge VS Post-Entrepreneurial knowledge	-15.0	<0.001
Pre-Entrepreneurial Skill VS Post-Entrepreneurial Skill	-14.7	<0.001
Pre-Entrepreneurial Intention VS Post-Entrepreneurial Intention	-2.24	<0.001
Pre-Entrepreneurial Self-efficacy VS Post-Entrepreneurial Knowledge	-6.44	<0.001

Note. H_a μ Measure 1 - Measure 2 ≠ 0

The paired sample T-test for the treatment group revealed a statistically significant improvement in post-test scores compared to pre-test scores ($p < 0.001$) after using the Superstar Learning Platform. Specifically, post-test gains for Entrepreneurial Knowledge and Skill were 15.0 and 14.7 points, respectively, indicating substantial improvements. Entrepreneurial Intention and Self-Efficacy also improved by 2.24 and 6.44 points, though intention gains were smaller, suggesting a need for further course or teaching method optimization. Consequently, the null hypothesis was rejected, affirming the effectiveness of the intervention in enhancing the measured indicators.

In conclusion, the hypothesis testing process revealed that based on the results of the one-way ANOVA, hypotheses H01 and H04 were rejected, whereas H02 and H03 were not rejected. Additionally, the paired samples t-tests indicated that hypotheses H05 and H06 were also rejected, as detailed in Table 17.

Table 17 Summary of Hypothesis testing and results

Hypotheses	Statement	Result after Analysis
$H_0$1	There is no difference between the treatment group and the control group in Entrepreneurial knowledge.	Rejected
$H_0$2	There is no difference between the treatment group and the control group in Entrepreneurial Skill.	Do not reject
$H_0$3	There is no difference between the treatment group and the control group in Entrepreneurial intention.	Do not reject
$H_0$4	There is no difference between the treatment group and the control group in Entrepreneurial self-efficacy.	Rejected
$H_0$5	There is no difference between pre-test and post-test for the control group.	Rejected

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Hypotheses	Statement	Result after Analysis
$H_0$6	There is no difference between pre-test and post-test for the treatment group.	Rejected

Descriptive Statistics of Variables

In the study, attitudes towards each measured variable were collected using a 5-point Likert Scale questionnaire. An arbitrary scale was used to interpret the mean value for each variable.

Table 18 Arbitrary Level for Interpretation of Questionnaire Data

Likert scale score	Range	Interpretation
5	4.51 - 5.00	Strongly Agree
4	3.51 - 4.50	Agree
3	2.51 - 3.50	Neutral
2	1.51 - 2.50	Disagree
1	1.00 - 1.50	Strongly Disagree

Source: Norman, G. (2010)

The students' perceptions toward the course, measured through a 5-point Likert scale, reveal consistent positive feedback on three dimensions: student engagement, learner interaction, and satisfaction.

Table 19 Descriptive Statistics of Students' Perceptions in Summary

	Dimensions	Mean	SD	Interpretation
1	Students' engagement	4.20	0.708	Agree
2	Learner Interaction	4.26	0.670	Agree
3	Student Satisfaction	4.23	0.691	Agree
	Total	**4.23**	**0.69**	**Agree**

Table 19 presents the descriptive statistics of students' perceptions across three dimensions, using a 5-point Likert scale: Students' Engagement: Average score is 4.2 with a standard deviation of 0.708, indicating a general agreement among students on their engagement level in the course. Learner Interaction: Average score is 4.26 with a standard deviation of 0.670, showing that students agree they experienced effective interactions throughout the course.Student Satisfaction: Average score is 4.23 with a standard deviation of 0.691, reflecting general satisfaction with the course among students. Overall, the combined average score of 4.23 with a standard deviation of 0.69 across all dimensions suggests a consistent and positive perception of engagement, interaction, and satisfaction. The low standard deviations indicate uniformity in students' positive responses.

Discussion

Linking Findings to the Research Questions

Research Question 1: How does the Superstar Learning Platform (SLP) affect the learning performance of the experimental group?

The Paired Samples T-Test revealed significant improvements across four key dimensions: Entrepreneurial Knowledge, Skills, Intention, and Self-Efficacy. These results confirm that the SLP positively influences students' entrepreneurial competencies, with mean differences of 15.0 in knowledge, 14.7 in skills, 2.24 in intention, and 6.44 in self-efficacy, all statistically significant at $p < 0.001$.

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These findings are particularly relevant in vocational education, where developing practical competencies is essential for career readiness. Vocational education management literature emphasizes that self-efficacy and hands-on skills are crucial for students' successful transition into the workforce. The observed improvements align with the principles of competency-based education, which stress learning through practice and real-world application. Furthermore, experiential learning theory (Kolb, 1984) suggests that active engagement in learning processes fosters deeper understanding and skill acquisition, which is reflected in the effectiveness of SLP.

Research Question 2: What is the difference in students' performance between using the Superstar Learning Platform and traditional teaching methods for the "Start Your Business" course? The one-way ANOVA results showed that students using the SLP outperformed those in traditional teaching methods in terms of entrepreneurial knowledge and self-efficacy. These findings led to the rejection of hypotheses H01 and H04, supporting the conclusion that digital platforms like the SLP provide a more effective learning environment.

From a vocational education perspective, these findings highlight the benefits of digital learning for skill development and workplace preparation. Enhanced self-efficacy and knowledge directly contribute to students' ability to apply entrepreneurial concepts in real-world scenarios. Previous research, including studies by Shane and Venkataraman (2000) and Fayolle and Gailly (2008), has emphasized the effectiveness of digital tools in fostering entrepreneurial competencies. The results suggest that digital learning platforms are particularly well-suited for vocational education, where interactive and applied learning approaches are essential.

Research Question 3: What is the business administration major students' perception of the Superstar Learning Platform in the "Start Your Business" course?

Descriptive statistics indicated that students had positive perceptions of the SLP across engagement (mean = 4.2), learner interaction (mean = 4.26), and satisfaction (mean = 4.23). The high mean scores suggest that the platform is effective in fostering engagement, interaction, and overall satisfaction with the learning experience.

From a vocational education management perspective, these positive perceptions are crucial. Research highlights that increased student engagement and satisfaction contribute to improved skill development and knowledge retention, ultimately enhancing students' readiness for real-world application. Higher engagement levels are also associated with greater student motivation and retention rates, key indicators of successful vocational education programs (Bahati et al., 2019). These results advocate for integrating digital platforms like SLP into vocational training programs to enhance student engagement and learning effectiveness.

Comparison with Existing Literature

The findings align with several key studies in the literature but also reveal certain nuances. The significant improvements in entrepreneurial knowledge and self-efficacy align with the positive impacts of digital learning platforms observed by Shane and Fayolle, and Gailly (2008). Similarly, the boost in self-efficacy among students using the platform corroborates the work of Drnovšek et al. (2010), who emphasized the importance of engaging, interactive environments for enhancing self-confidence in entrepreneurship.

However, the marginal differences in entrepreneurial intention scores suggest that entrepreneurial intention may require longer-term interventions. This finding aligns with prior research indicating that entrepreneurial intentions develop over time through experiential learning and exposure to entrepreneurial experiences. Future studies should explore how extended or more intensive interventions influence entrepreneurial intention development.

Theoretical Implications

This study contributes to the theoretical framework of experiential learning and competency-based education in entrepreneurship. The significant improvements in entrepreneurial knowledge and self-efficacy observed among students using the SLP underscore the importance of interactive,

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immersive learning environments that are central to both theories. Kolb's experiential learning theory suggests that learning is most effective when students actively engage in the learning process, a principle strongly supported by the findings.

Moreover, the results align with competency-based education models, which focus on developing applied skills and self-confidence in professional settings. The SLP's ability to provide continuous feedback, facilitate peer interaction, and offer simulation-based exercises fosters an educational environment well-suited for vocational students preparing for real-world business challenges.

Limitations of the Study

Despite its contributions, this study has several limitations. The quasi-experimental design, while valuable, lacks the full control of a true experimental setup. Future studies could use randomized controlled trials to strengthen causal inferences. Additionally, the sample size was relatively small and purposively selected, which may limit the generalizability of the findings to broader populations.
Furthermore, the study assessed only the immediate effects of the SLP on students' entrepreneurial competencies, and longer-term impacts were not explored. Future research could investigate whether these improvements are sustained over time and how digital platforms influence long-term entrepreneurial behavior.

The study also focused exclusively on business administration students, meaning the results may not be fully applicable to other vocational disciplines. Future research should explore the effectiveness of digital learning platforms in different fields to determine whether similar benefits can be observed across various vocational education programs.

Practical Implications

Given the positive findings regarding SLP's impact on entrepreneurial knowledge, skills, and self-efficacy, vocational education institutions should consider integrating similar digital platforms into their curricula. These platforms can serve as valuable tools for enhancing student learning, engagement, and career preparedness.
Additionally, future research should investigate the long-term effects of SLP and similar platforms on entrepreneurial competencies. Moreover, examine how different digital platform features (e.g., interactive simulations, gamification, real-world case studies) contribute to learning outcomes and explore strategies for improving entrepreneurial intention through more immersive and extended interventions. In addition, conduct cross-disciplinary studies to evaluate the effectiveness of digital learning tools across various vocational education fields.

Conclusion

This study demonstrates that the Superstar Learning Platform significantly enhances students' entrepreneurial knowledge, skills, intention, and self-efficacy. The results confirm the positive impact of digital learning tools on entrepreneurship education and support the integration of such platforms into vocational education curricula. By strengthening the link between experiential learning, competency-based education, and real-world application, this study underscores the importance of digital platforms in preparing students for entrepreneurial careers. However, the study also suggests that entrepreneurial intention may require additional or different interventions to produce significant improvements. As digital platforms continue to evolve, their role in shaping the future of vocational education will become increasingly critical, offering students more engaging, interactive, and personalized learning experiences.

Recommendations

To maximize the effectiveness of digital learning platforms in vocational education, several key recommendations are proposed as follows.

Firstly, Integration of Digital Platforms in Vocational Education

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Vocational institutions should incorporate digital platforms like the Superstar Learning Platform (SLP) into their curricula to enhance entrepreneurial competency development. These platforms facilitate interactive, engaging, and personalized learning experiences that align with competency-based education models. By leveraging multimedia features, simulations, and real-world case studies, vocational students can develop practical skills essential for their careers.

Secondly, Faculty Training for Effective Technology Integration

Institutions should provide structured and continuous professional development programs to train educators in the effective use of digital learning platforms. Research indicates that successful technology integration in education requires instructors to be proficient in digital pedagogy and instructional design. Training should focus on optimizing digital tools for experiential learning, fostering student engagement, and integrating platform analytics for personalized instruction.

Thirdly, Curriculum Enhancement through Gamification and Simulations

Curriculum designers should strategically incorporate interactive elements such as gamification and business simulations to enhance student engagement and skill acquisition. Studies in vocational education highlight that these approaches improve motivation, critical thinking, and workplace readiness. By embedding scenario-based challenges and real-world problem-solving exercises, students can bridge the gap between theoretical knowledge and practical application.

Fourthly, Policy Advocacy and Investment in Digital Education

Policymakers should prioritize funding and support for digital learning initiatives in vocational education. Investing in educational technology infrastructure can improve access to high-quality training resources, align vocational curricula with industry needs, and enhance workforce preparedness. Additionally, policies should encourage industry-academia collaborations to ensure that digital learning tools remain relevant and aligned with evolving labor market demands.

Fifthly. Future Research on Long-Term Impact and Cross-Disciplinary Application

Further research is needed to explore the long-term effects of digital learning platforms on entrepreneurial intention, career success, and workplace performance. Longitudinal studies could assess how digital education influences graduates' entrepreneurial ventures and employment outcomes. Additionally, cross-disciplinary research should investigate the effectiveness of digital learning tools in various vocational fields beyond business administration, ensuring their adaptability and scalability in different professional domains.

By implementing these recommendations, vocational education institutions, educators, and policymakers can create a more dynamic and effective learning environment, preparing students with the skills and confidence needed for success in entrepreneurial and professional careers.

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