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The Investigation of Technology Integration: Open Platform to Enhance the Lifelong Learning for 3-Year Students in Sichuan Vocational & Technical College at Sichuan Province

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Abstract
This article explores the impact of the online platform "OPEN" on the lifelong learning of three-year students at Sichuan Vocational and Technical College. The study aimed 1) to examine the impact of the integration of the OPEN platform on the academic achievement of vocational students at Sichuan Vocational and Technical College, and 2) to explore the integration of the "OPEN" platform to contribute to lifelong learning among vocational students at Sichuan Vocational and Technical College. Cluster random sampling selection was used to reduce bias, the samples was classroom No.3.
The research instruments were lesson plans, test, and questionnaire. The results showed that 1) students' academic achievement was improved significantly after using the "OPEN" platform. The pretest was at M=69.83, SD=6.13, the posttest was M=92.31, SD=3.46, 2) the total integration of the "OPEN" platform to contribute to lifelong learning was at M=4.24, SD=0.91, it was the high level. The 4 aspects of lifelong learning presented as follows (1) Academic achievement -knowledge was at M=4.28, SD=0.91, (2) Personal enrichment was at M=4.24, SD=0.91, (3) Professional growth was at M=4.21, SD=0.92, (4) Social engagement was at M=4.24, SD=0.91.
Keywords: Online Learning Platform, Lifelong Learning, Academic Achievement, Independent Learning, Career Development

Introduction

Background and Statement of the Problem

Research Background: In recent years, the educational landscape in Sichuan Province has changed significantly. It is driven by technological advances and the evolution of educational paradigms as part of a global trend toward the digitization of education. As China's most populous province, Sichuan has diverse educational needs covering a wide range of regions from urban to rural areas, and despite education being at the center of its development strategy, there are significant disparities in access to and quality of educational resources between urban and rural areas. Conventional education is confronted with multiple issues like resources being inequitably distributed, and the quality of teaching and learning being disproportionate as well as equity problems especially concerning the far-flung less economically developed regions. The

establishment of online learning platforms like OPEN, proposed additional solutions to these problems which covered the gaps of traditional education by giving learners flexible access to high-quality learning materials over the Internet and multimedia technologies.

Presentation of Findings: Open learning platform is an online learning site found in Sichuan Province aimed at promoting lifelong learning by providing educational resources to learners who qualified after completing the three-year educational cycle in the form of flexible and freely accessible materials. The site facilitates learning beyond the classroom by incorporating multimedia, interactive learning tools, and a simple to use interface to make learning interesting. The survey results indicate that students show a high level of satisfaction with the platform especially with its ease of use, quality of content, and ability to fulfill their user needs. However, they still overcome challenges like unequal access to technology and low digital literacy among some learners. This project is relevant to the education policy and practice of Sichuan Province and the region as it will help policymakers understanding.

These backgrounds and presentations provide an important theoretical and practical foundation for examining the digital transformation of education in Sichuan Province and the role of its online learning platforms, such as "OPEN".

Research Questions

- How does integrating the "OPEN" platform enhance academic achievement among vocational students at Sichuan Vocational and Technical College?
- In what ways does the integration of the "OPEN" platform contribute to lifelong learning among vocational students at Sichuan Vocational and Technical College?

Research Objectives

- To examine the impact of the integration of the OPEN platform on the academic achievement of vocational students at Sichuan Vocational and Technical College.
- To explore the integration of the "OPEN" platform to contribute to lifelong learning among vocational students at Sichuan Vocational and Technical College.

Research Hypotheses

- Hypothesis 1: Students who learn the "OPEN" platform after learning have more academic achievement than before learning.
- Hypothesis 2: Students who learn the "OPEN" platform can contribute to lifelong learning among Sichuan Vocational and Technical College vocational students.

Scope of the Research Study

This study examines the impact of the online platform OPEN on lifelong learning by focusing on three-year students in Sichuan Province, covering different geographic and socio-economic contexts in urban and rural areas, and analyzing the impact of demographic factors (e.g., age, gender, geographic location) on the effectiveness of the platform's use. The study involved multiple types of educational institutions, including primary and secondary schools and vocational training centers. It used a mixed-methods approach (combining quantitative and qualitative methods) to assess the applicability and impact of the platform while focusing on multidimensional feedback from students, educators, and administrators. The study recognizes the limitations of sample size, geographic coverage, and generalizability of findings and adheres to strict ethical guidelines to ensure data privacy protection. The study results are intended to provide recommendations for policy development, improvement of teaching and learning practices, and promotion of educational equity through OPEN, creating an environment for lifelong learning and educational excellence in Sichuan Province.

Research Framework

The independent variables for this study include: 1. Deliver educational content, 2. facilitate interactive learning experiences, 3. support collaboration among users. The dependent variables include: 1. Academic achievement-knowledge, 2. Personal enrichment, 3. Professional growth, 4. Social engagement.

Definition of Key Terms

In order to ensure clarity and accuracy in the study of the online platform OPEN, the following key terms are defined in this study:

Lifelong Learning: Refers to the process by which individuals continue to acquire knowledge, skills, and competencies throughout their lives, encompassing both formal and non-formal learning activities, which support personal development, career progression, and social participation and are of particular importance to vocational students;

OPEN Platform: This is a digital learning environment designed to deliver educational content, facilitate interactive learning experiences, and support user collaboration, including multimedia resources, adaptive learning paths, and assessment feedback tools.

Three-Year Students: Typically refers to learners enrolled in a three-year educational program (e.g., vocational training or a specific higher education pathway) who are at the critical stage of transitioning from secondary education to the world of work or higher education and who face the challenge of balancing academics and practical training.

Technological Integration: Integrating digital tools and resources into educational practices to enhance the teaching and learning process, involving digitizing curriculum delivery, student engagement, and administrative functions.

Literature Review

Embracing and incorporating technology in learning processes especially among the vocational students can improve the teaching and learning outcomes to a great extent. That was observed in a study on the digital competence and the acceptance of technology among teachers, where the beliefs of teachers concerning their competencies in the use of digital tools ended up positively affecting the intention of taking up digital tools (Antonietti et al., 2022).

Cooperative and active learning strategies have been found to be very successful in boosting the academic abilities and self motivation of the vocational learners. These learning techniques are essential to the development of such skills that are needed to achieve lifelong practice and meet the demands of a vibrant professional world (Ruijuan et al., 2023).

Artificial intelligence (AI) in reforming lifelong learning has gained more and more resonance. AI would be a facilitator of both requiring lifelong learning through social transformations to take place and how it can be provided in such a way. These two functions of AI in the educational process indicate that the latter tends to change the learning process into an integrated and persistent form (Palenski et al., 2024).

The Industry 5.0 and Education 5.0 are aimed at changing how vocational education is done by using human to machine cooperation and customized services using intelligent technologies, which is more relevant to the modern economy (Zhang & Leong, 2024).

Artificial intelligence and new technologies reform the study of professional education due to the possibility of presenting a complex and customized approach to career planning. This metamorphosis makes education practices more in line with labor market needs, and this guarantees that students will be adequately ready to face these challenges (Duan & Wu, 2024).

Gender issues in vocational training continue to be critical considering that the policies are still changing steadily. The development of solutions to such problems may result in the more equal and efficient educational opportunities of all students (Fenwick, 2004).

Research Methodology

Research Design

In this study, a one-group pretest-posttest design (quasi-experimental) was utilized to assess the effect of the OPEN platform on academic achievement of the students. A group of participants (n = 52) was measured at two time points, which consisted of a pre-test that established a measure of academic achievement and a post-test which measured outcomes following the use of the OPEN platform. The methodology was quantitative, utilizing measurable data and statistical methods to evaluate changes in performance. A paired-sample t-test was subsequently used to analyze differences between pre-test and post-test scores. Thus, it provided

an objective measure of the impact made by the intervention.

Research Population and Samples

Population

This research examines the practical application of the OPEN platform among 155 third-year Chinese major students at Sichuan Vocational and Technical College, divided into three classrooms classroom. 1(51 students); classroom. 2(52 students); classroom. 3(52 students)

Ensuring the Validity of the Study and Implementing Necessary Measures

Cluster random sampling selection was used to reduce bias, with participants voluntarily signing informed consent forms while ensuring data confidentiality and anonymity to protect privacy, as the sample's representativeness is vital for the universality of the research results. The samples was classroom No.3.

Characteristics of Respondents

Age: Mainly 20-22 years old college students. Students in this age group usually have a high acceptance and learning ability for new technologies.

Educational background: The survey subjects are all Chinese students with basic knowledge of related professional writing.

Sample Group

In order to ensure the diversity and representativeness of the data and make the research results more general, we adopted the cluster random sampling method to select the sample group. Therefore, the researcher selected the classroom number and finally chose classroom 2 as the sample.

Specific Sample Information

- Number of students: 52
- Gender ratio: 22 men and 30 women
- Academic background: Both are first-year students majoring in Chinese.

Data Collection

Questionnaire Survey

- **Quantitative Data Collection**: A structured questionnaire "will collect quantitative data from students, faculty, and administrators about their experiences with the OPEN platform.
- **Content covered**: The questionnaire may include the platform's usability, satisfaction, perceived impact on learning outcomes, frequency of use, challenges faced, and suggestions for improvement.

Test

- Fixed exam content: Test students' mastery of the content by completing test questions
- Content covered: Based on lesson plans, 6 questions are set for each subject.

Research Instrument

Part 1. To answer research question 1

Lesson Plans

Five comprehensive Chinese language lesson plans were developed, each carefully crafted to last 120 minutes.

The Test

The paper test consists of 30 multiple-choice questions to assess students' knowledge and understanding of five key areas. Each question provides four options (a, b, c, and d) from which students must choose the correct answer. Out of 100 points.

- Lesson Plan 1 Storytelling (6 questions)
- Lesson Plan 2 News (6 questions)
- Lesson Plan 3 Newspaper (6 questions)
- Lesson Plan 4 E-mails (6 questions)
- Lesson Plan 5 Announcement (6 questions)

Part 2. To answer research question 2

Questionnaire

Using the OPEN platform, a structured questionnaire will collect quantitative data about students', teachers', and administrators' experiences. Questions may include the usability of the platform's perceived impact on academic achievement – knowledge, personal enrichment, professional growth, and social engagement. Respondents are likely asked to rate their agreement with each statement on a scale from 1 to 5, where 1 could represent "strongly disagree," and 5 might represent "strongly agree." However, the exact scale metrics are not specified here.

Data Analysis

Descriptive statistical analysis was conducted on the collected data, including calculating the mean to measure central tendency, standard deviation to

assess data dispersion, and frequency distribution to understand data patterns. Inferential statistics, such as hypothesis testing, were used to test assumptions about population parameters and determine relationships between variables. These analyses provide a statistical foundation for evaluating the impact of the "OPEN" platform on lifelong learning for third-year students, helping researchers draw conclusions and assess the platform's effectiveness.

Analysis Result

Research Finding

This chapter examines the impact of the "OPEN" platform on 52 second-year students majoring in Chinese at Sichuan Vocational and Technical College by comparing their academic achievement before and after using the "OPEN" platform. Descriptive and factor analyses of the test data will reveal the differences in academic achievement. and provide insights for improving student achievement. In addition, the data analysis of the questionnaire survey aims to provide useful insights into the lifelong learning of vocational students at Sichuan Vocational and Technical College.

Research Questions Include:

- How does integrating the "OPEN" platform enhance academic achievement among vocational students at Sichuan Vocational and Technical College?
- How does integrating the "OPEN" platform contribute to lifelong learning, specifically in terms of personal enrichment, professional growth, and social engagement, among vocational students at Sichuan Vocational and Technical College?

The OPEN platform has significantly improved students' academic achievement., lifelong learning capacity, and career development by providing rich learning resources, personalized learning paths, and flexible learning arrangements. Students are delighted with the resources and interactive functions of the platform and report improvements in independent learning, career preparation, and social responsibility. Test results indicated that students who used the platform exceeded their previous learning levels, had no significant problems, exceeded expectations, and were consistently satisfied with their courses. In contrast, students who did not use the platform met expectations but had minor deficiencies. The platform effectively supported student learning, growth, and future development.

Descriptive Statistics

Part 1. To answer research question 1: How does integrating the "OPEN" platform enhance academic achievement among vocational students at Sichuan Vocational and Technical College?

The investigation of technology integration: The OPEN platform, which enhances lifelong learning, was designed for the lesson plan and test.

Table 1 Mean Standard Deviation of the Pre-Test and Post-Test

	n	M	S.D	df	t
Post-test	52	92.31	3.46	51	27.17
Pre-test	52	69.83	6.13		

$t_{.05,\,51}$=1.68; t compute=27.17 >$t_{.05,\,51}$=1.68

Table 1 shows that the mean pre-test score is 69.83, and the standard deviation is 6.13. The mean score on the post-test was 92.31, and the standard deviation was 3.46. Since t compute = 27.17 > $t_{.05,51}$ = 1.68, the results indicate that the difference between the pre-test and post-test is statistically significant.

The use of the OPEN platform has resulted in a significant increase in students' academic achievement on the post-test (average score increased from 69.83 to 92.31). t compute=27.17>$t_{.05,51}$=1.68, further confirms that this boost was statistically significant.

The data suggests that students who use open platforms for learning have better academic achievement after using them. This indicates that the OPEN platform has a significant positive impact on students' academic achievement academic achievement.

Table 2 Comparative Analysis between Pre-Test and Post-Test Results

Aspect	Pre-Test	Post-Test	Key Findings
Sample Size (n)	52	52	Both tests were conducted with the same group of participants for consistency.
Mean Score (M)	69.83	92.31	The mean score increased by 22.48 points, indicating significant improvement.
Standard Deviation (SD)	6.13	3.46	Post-test scores showed less variability, suggesting more consistent performance.
Degrees of Freedom (df)	51	51	Statistical analysis was performed with the same degrees of freedom.
t-Value (t)	–	27.17	The computed t-value exceeds the critical value ($t_{0.51}$ = 1.68), confirming statistical significance.

Table 2 showed that the comparative analysis between pre-test and post-test results highlights that the use of the OPEN platform significantly improved students' academic achievement as evidenced by higher mean scores and reduced variability in post-test results. This suggests that digital learning platforms can enhance comprehension and consistency in student outcomes when implemented effectively.

Part 2. To answer research question 2: In what ways does the integration of the "OPEN" platform contribute to lifelong learning, specifically in terms of personal enrichment, professional growth, and social engagement, among vocational students at Sichuan Vocational and Technical College?

Table 3 Questionnaire Data

Item	M	SD	Interpretation
1. Academic Achievement - Knowledge			
1.1 Using open platforms has helped me better understand academic subjects.	4.19	0.98	high
1.2 I have acquired new theoretical knowledge relevant to my field of study through open learning.	4.44	0.84	high
1.3 Open platform learning has improved my ability to analyze and apply academic concepts.	4.23	0.89	high
1.4 I have enhanced my research skills through resources available on open platforms.	4.29	0.86	high
1.5 Open learning has increased my motivation to pursue further academic studies.	4.25	0.94	high
Total	4.28	0.91	high
2. Personal Enrichment			
2.1 Learning through open platforms has boosted my confidence in self-directed learning.	4.12	0.91	high
2.2 I have developed better problem-solving skills through open platform courses.	4.37	0.88	high
2.3 My ability to think critically has improved due to open learning.	4.19	0.92	high
2.4 I feel more capable of managing my time and learning independently.	4.29	0.91	high
2.5 Open platform learning has helped me discover new interests and passions.	4.25	0.92	high
Total	4.24	0.91	high
3. Professional Growth			
3.1 Open platforms have provided me with skills applicable to my professional career.	3.98	0.93	high
3.2 I have enhanced my technical expertise through open learning.	4.37	0.88	high
3.3 Learning from open platforms has improved my ability to adapt to workplace challenges.	4.19	0.92	high
3.4 I have gained certifications or qualifications that enhance my employability.	4.25	0.90	high

3.5 Open learning has increased my confidence in networking and professional communication.	4.25	0.92	high
Total	4.21	0.92	high
4. Social Engagement			
4.1 Participating in open platform courses has expanded my ability to collaborate with others.	3.98	0.93	high
4.2 I have engaged in meaningful discussions with peers through online learning communities.	4.37	0.88	high
4.3 Open platforms have exposed me to diverse perspectives and global learning experiences.	4.31	0.89	high
4.4 I have improved my communication skills in an academic or professional setting.	4.23	0.89	high
4.5 Learning through open platforms has motivated me to contribute to my community.	4.33	0.89	high
Total	4.24	0.91	high
Total of 4 aspects	4.24	0.91	high

Table 3 shows that the questionnaire data of 52 students' interpretations was high. "The "open" platform analyzed above has significantly impacted student learning and development at the academic, personal, professional, and social levels. It contributes to lifelong learning by promoting students' enrichment through self-directed learning and self-improvement, supporting professional growth through improved skills and study habits, and encouraging social engagement through collaborative learning opportunities.

Part 2 to Answer Research Question 2

The students were high-level. The "open" platform analyzed above has significantly impacted student learning and development at the academic, personal, professional, and social levels. It contributes to lifelong learning by promoting students' enrichment through self-directed learning and self-improvement, supporting professional growth through improved skills and study habits, and encouraging social engagement through collaborative learning opportunities.

Conclusion

Part 1 to Answer Research Question 1

So, students who learn open platforms after learning have more academic achievement than before. Learning achievement through traditional teaching methods fluctuates greatly, the distribution of grades is more dispersed, and the proportion of low-scoring students is higher. The traditional method mainly realizes the teaching objectives through the teacher's explanation, demonstration, and students' practice. The teacher plays the main role in the whole teaching process, and the students only passively accept the knowledge and seldom think actively. By using the "open" platform for learning, students, as the main body, can independently access learning resources and can flexibly arrange their learning according to their own actual situation to achieve personalized learning and mobilize students' learning motivation to achieve the effect of improving learning performance.

Discussion

Part 1: Students who learn open platforms after learning have more academic achievement than before learning.

Learning achievement through traditional teaching methods fluctuates greatly, the distribution of grades is more dispersed, and the proportion of low-scoring students is higher. The traditional method mainly realizes the teaching objectives through the teacher's explanation, demonstration, and students' practice. The teacher plays the main role in the whole teaching process, and the students only passively accept the knowledge and seldom think actively. By using the "open" platform for learning, students, as the main body, can independently access learning resources and can flexibly arrange their learning according to their own actual situation to achieve personalized learning and mobilize students' learning motivation to achieve the effect of improving learning performance.

Constructivist learning theory posits that learners actively construct knowledge and meaning from their experiences (Vygotsky, 1978). It emphasizes the role of prior knowledge, social interactions, and hands-on activities in fostering meaningful learning. In the context of "OPEN", this theory suggests that the platform's interactive and collaborative learning experiences can enhance students' understanding and retention of educational content (Garrison, 2011; Laurillard, 2012).

The Technology Acceptance Model (TAM) explores factors influencing users' adoption and acceptance of new technologies (Davis, 1989; Venkatesh et al., 2003). It proposes that perceived usefulness and ease of use significantly impact users' attitudes and intentions toward using a technology (Davis, 1989; Venkatesh & Davis, 2000). In the study, TAM can help understand students' perceptions of "OPEN" utility in supporting their learning goals and its ease of integration into their educational routines. For instance, if students perceive the platform as helpful in improving their academic achievement. and easy to navigate, they are more likely to adopt it and use it regularly (Venkatesh et al., 2003).

Universal Design for Learning (UDL) advocates creating flexible learning environments accommodating diverse learner needs and preferences (Rose & Meyer, 2002). It proposes multiple means of representation, engagement, and expression to optimize student learning (Rose & Meyer, 2002). "OPEN" can align with UDL principles by offering customizable learning pathways, adaptive technologies, and varied multimedia resources to cater to individual learning styles and abilities (Rose et al., 2005). For example, the platform can provide text, audio, and video resources to accommodate different learning preferences and tools for self-assessment and feedback to support diverse learning needs (Rose & Meyer, 2002).

Part 2: The students were high-level. The "open" platform analyzed above has significantly impacted student learning and development at the academic, personal, professional, and social levels. It contributes to lifelong learning by promoting students' enrichment through self-directed learning and self-improvement, supporting professional growth through improved skills and study habits, and encouraging social engagement through collaborative learning opportunities.

Experiential Learning Theory, proposed by David Kolb, emphasizes the importance of concrete experiences, reflective observation, abstract conceptualization, and active experimentation in learning (Kolb, 1984; Kolb & Kolb, 2005). Within "OPEN," interactive simulations, case studies, and real-world applications can allow students to apply theoretical knowledge, reflect on their experiences, and refine their understanding through active engagement (Kolb, 1984; Kolb & Kolb, 2005). For example, students can engage in virtual internships or project-based learning activities that allow them to apply what they have learned in a practical context, thereby enhancing their understanding and retention of the material (Kolb, 1984; Kolb & Kolb, 2005).

Social Learning Theory emphasizes the importance of social interactions and observational learning in shaping individuals' behaviors and attitudes (Bandura & National Inst of Mental Health, 1986). Within "OPEN," features such as collaborative learning spaces, peer-to-peer interactions, and shared resources can facilitate knowledge sharing and cooperative learning among students. This theory suggests that such social interactions can enhance learning outcomes by promoting active engagement and collective problem-solving (Vygotsky, 1978). For example, students can learn from each other's experiences and perspectives, leading to a deeper understanding of the material and improved problem-solving skills (Bandura & National Inst of Mental Health, 1986).

Universal Design for Learning (UDL) advocates creating flexible learning environments accommodating diverse learner needs and preferences (Rose & Meyer, 2002). It proposes multiple means of representation, engagement, and expression to optimize student learning (Rose & Meyer, 2002). "OPEN" can align with UDL principles by offering customizable learning pathways, adaptive technologies, and varied multimedia resources to cater to individual learning styles and abilities (Rose et al., 2005). For example, the platform can provide text, audio, and video resources to accommodate different learning preferences and tools for self-

assessment and feedback to support diverse learning needs (Rose & Meyer, 2002).

Recommendation

In order to better academic success the platform should enhance its functionality by introducing personalized and adaptive learning paths, diversifying educational resources, and introducing more interactivity through community forums and providing and soliciting feedback immediately.

In order to encourage lifelong learning the platform could raise awareness through rewards, such as badges for completing learning tasks, could provide resources to jump start a career, and could enhance student usability and accessibility through optimized mobile and offline functions.

To further strengthen causal inference toward its effectiveness, further studies should be designed to implement control groups in order to further triangulate results.

It would also be useful to look at the impact of using the OPEN platform across different age groups, disciplines, and environments to identify where it is most effective.

The policymakers should consider a hybrid pathway to leverage best instructional practices from both the online and traditional portions while addressing the complexities associated with postsecondary education for career-ready students.

References

Antonietti, C., Cattaneo, A., & Amenduni, F. (2022). Can teachers' digital competence influence technology acceptance in vocational education?. *Computers in Human Behavior*.

Bandura, A., & National Inst of Mental Health. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice Hall.

Davis, F. D. (1989). Perceived usefulness, ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340.

Duan, J., & Wu, S. (2024). Beyond traditional pathways: Leveraging generative AI for dynamic career planning in vocational education. *International Journal of New Developments in Education*, *6*(2).

Fenwick, T. (2004). What happens to the girls? gender, work and learning in Canada's 'new economy'. *Gender and Education*, *16*(2), 169-185.

Garrison, D. R. (2011). *E-Learning in the 21st Century: A Framework for Research and Practice.* Routledge.

Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of Management Learning & Education, 4*(2), 193-212.

Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Prentice Hall.

Laurillard, D. (2012). *Teaching as a Design Science: Building Pedagogical Patterns for Learning and Technology.* Routledge.

Mayer, R. E., & Fiorella, L. (2005). *The Cambridge Handbook of Multimedia Learning.* Cambridge University Press.

Palenski, T., Hills, L., Unnikrishnan, S., & Eynon, R. (2024). How AI works: Reconfiguring lifelong learning. *Postdigital Science and Education*, *6*, 1216-1239.

Rose, D. H., & Meyer, A. (2002). *Teaching Every Student in the Digital Age: Universal Design for Learning.* ASCD.

Rose, D. H., Meyer, A., & Hitchcock, C. (2005). *The Universally Designed Classroom: Accessible Curriculum and Digital Technologies*. Harvard Education Press.

Ruijuan, L., Srikhoa, S., & Jantharajit, N. (2023). Blending of collaborative and active learning instructional methods to improve academic performance and self-motivation of vocational students. *Asian Journal of Education and Training*, *9*(4), 130-135.

UNESCO. (2015). *Education for All 2000-2015: Achievements and Challenges*. UNESCO.

UNESCO. (2017). *A Guide for Ensuring Inclusion and Equity in Education*. UNESCO Publishing.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Vygotsky, L. S. (1978). *Mind in Society: Development of Higher Psychological Processes*. Harvard University Press.

Zhang, H., & Leong, W. Y. (2024). Industry 5.0 and education 5.0: Transforming vocational education through intelligent technology. *Journal of Innovation and Technology*.

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