Can a Virtual Task-Based Language Learning Environment Enhance Pre-Service Teachers' Performance? Comparing Non- and Users of iPad

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ABSTRACT

The integration of task-based language teaching (TBLT) and virtual learning environments (VLEs) has shown potential in improving students' learning outcomes. However, mixed results suggest that further investigation is needed to determine the most effective use of mobile technology devices in language learning. This study aims to contribute to the growing body of literature on the effectiveness of VLEs by exploring the use of a Virtual Task-Based Language Learning Environment (VTLLE) in teacher preparation programmes, specifically using an iPad in Thailand. The study was conducted using a mixed-methods approach. First, a survey was administered to 523 student teachers, and the data was analysed using exploratory factor analysis to identify key factors for an effective VTLLE. Based on the survey results, a sample of 88 students from three Bangkok-based universities participated in a 12-week trial of the VTLLE. The results of the study revealed that there was a statistically significant difference between pre- and post-test scores for the use of Thai, English for communication, and digital technology for education for the students using the VTLLE. However, there was no statistically significant difference in academic performance between students who studied with an iPad and those who did not. These findings suggest that the VTLLE was effective in improving language learning outcomes, but that the specific device used did not significantly impact academic performance. The study provides important insight for educators and practitioners who aim to use VLEs in teacher preparation programmes. By identifying key factors for an effective VTLLE, the study offers practical recommendations for the design and implementation of technology-enhanced language learning environments.

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1 INTRODUCTION

The COVID-19 pandemic has prompted educational institutions to adopt online platforms as a precautionary measure against the spread of the virus, leading to significant transformations in the field of education (Adedoyin & Soykan 2020; Lavidas, Apostolou & Papadakis 2022). This shift has presented challenges for educators in higher education, particularly in effectively engaging digitally adept students, as many teachers had limited prior experience with online teaching methods (Boonmoh et al. 2022). In response, educational institutions and teachers have explored innovative technologies, such as virtual classrooms and portable devices, to create contemporary and enriched learning environments.

Research on the integration of technology in education has demonstrated the benefits of virtual learning environments (VLEs) for both students and educators (Champney et al. 2017; Tick 2013; Pellas & Kazanidis 2015). These benefits include opportunities for self-directed learning, efficient communication and collaboration, and access to a wide range of resources and materials. VLEs also provide a safe and controlled environment for pre-service teachers to practice and enhance their skills.

The use of VLEs in teacher education programmes has the potential to transform the way teachers are trained, offering opportunities for enhanced effectiveness and efficiency (Straub et al. 2014). Additionally, VLEs can address academic challenges that students may face in traditional classrooms. The increasing utilisation of VLEs in teacher development programmes is supported by evidence that they can improve student academic performance (Peterson-Ahmad, Pemberton & Hovey 2018; Straub 2013). However, further research is needed to fully understand the impact of VLEs on teacher education and identify the factors necessary for the development of effective VLEs.

Task-based language teaching (TBLT) has garnered significant interest among language educators and academics as an effective pedagogical approach to enhance the academic performance of undergraduate students (Nychkalo et al. 2020; Viriya 2018). However, the shift to online learning in the post-COVID-19 era has introduced new challenges that need to be addressed for the effective implementation of TBLT and VLEs. One such challenge is ensuring students' access to reliable VLEs through devices like tablets or computers, which involves overcoming technological barriers, ensuring internet connectivity, and providing technical support to students navigating the virtual environment. Additionally, adapting TBLT to the online context requires careful planning and instructional design to replicate the experiential and goal-oriented nature of TBLT. Educators must consider how to deliver tasks effectively online, maintain student engagement, and provide appropriate guidance and feedback to support the language learning process.

Furthermore, the limited empirical evidence on the implementation of TBLT in VLEs accessed via tablets is another challenge. Existing literature predominantly focuses on text-based online platforms within synchronous VLEs (Guo & Möllering 2016; Martin, Parker & Deale 2012; Martin & Parker 2014), necessitating further research on the effectiveness of TBLT in diverse online contexts and with different devices. This challenge underscores the need for empirical studies that investigate the impact of specific devices on student learning outcomes and the overall effectiveness of TBLT in VLEs.

The study aims to address these challenges by exploring the effective integration and deployment of TBLT and VLEs in the online learning environment. It seeks to identify the essential components of an effective VLE, considering factors such as accessibility, task design, instructional support, and student engagement. By examining the academic performance of both non- and iPad users, the study aims to contribute to the ongoing discussion on the influence of specific devices on student learning achievements, providing insights to guide device selection in language education.

2 RESEARCH QUESTIONS AND OBJECTIVES

This study aims to explore the design and implementation of an effective VLE using the TBLT approach for student teachers in response to recent regulations by the Secretariat Office of the Teachers' Council of Thailand. Previous research by Chumkong and Sinprajakpol (2015) indicates the need for teacher development in language and technology skills, as teachers' self-awareness and proficiency in these areas are currently lacking.

The regulations by the Secretariat Office of the Teachers' Council of Thailand (2019) highlight the importance of Thai language usage, English communication, and digital technology skills for teachers. These areas are also included as mandatory tests for individuals entering the teaching profession (Secretariat Office of the Teachers' Council of Thailand 2020). Therefore, it is crucial to address these requirements and enhance the language and technology skills of pre-service teachers through effective VLEs. This study aims to answer the following research questions:

RQ1. What are the core factors for an effective VTLLE for teacher preparation programmes?

RQ2. To what extent does the VTLLE enhance the academic performance of pre-service teachers?

RQ3. Are there differences in terms of academic achievement between participants who utilised the iPad in the VTLLE and those who did not?

By investigating these research questions, the study intends to provide insights into the design of a successful VLE for teacher preparation programmes and the potential benefits of employing the TBLT approach in this context. Additionally, the study aims to examine the impact of using different devices, such as the iPad, on academic achievement within the VTLLE. The findings of this study will contribute to efforts aimed at enhancing language and technology skills among educators, ensuring they are well-prepared to meet the demands of the teaching profession.

3 LITERATURE REVIEW

The integration of technology-mediated TBLT and VLEs has been recognised as an effective instructional strategy for promoting language use in real-world contexts (Ellis 2003; Van den Branden 2006). Previous research on TBLT in VLEs has highlighted the unique benefits of online learning, including promoting student-centered and authentic approaches to learning (Lin et al. 2014), improving grammatical complexity (Chen 2020), and enhancing second language students' pragmatic English writing skills and technological self-efficacy (Abdallah & Mansour 2015). Positive learning outcomes and increased learner autonomy have been reported in online TBLT settings (Collentine 2011; Granena 2016; Lan et al. 2016; Lee 2016; Yanguas & Bergin 2018; Lai, Zhao & Wang 2011), with participants providing positive feedback on TBLT delivered through online platforms, indicating its potential (Tusino et al. 2020).

While TBLT and VLEs have shown potential in improving language learning outcomes, there are mixed results regarding the effectiveness of mobile technology devices in language learning. Some studies have reported positive effects of tablet use on various aspects of student learning, including learning outcomes, reading, literacy, phonological awareness, vocabulary, and writing skills (Aliagas & Margallo 2017; Dunn & Sweeney 2018; Javed & Samara 2019; Zhang & Quinn 2020). However, other studies have reported negative results in terms of learning achievement, participation, and knowledge comprehension (Aspiranti et al. 2022; Zhu & Levesque 2021). For example, Carr (2012) and Perry and Steck (2015) conducted quasi-experimental studies with fifth-grade children and secondary-level students, respectively. Both studies employed a pre-test/post-test design with a non-tablet control group and a tablet-based intervention group. Carr (2012) found no significant difference between the control and experimental group's scores, while Perry and Steck (2015) found that the experimental group performed worse than the control group and exhibited higher levels of off-task behaviour.

Therefore, further empirical research is necessary to determine the most effective use of mobile technology devices in TBLT implementation within VLEs. It is essential to investigate the effectiveness of VLEs in diverse contexts and with different student populations, considering the unequal access to technology and internet connectivity that some students may face, which could hinder the implementation and effectiveness of online delivery and TBLT in certain circumstances. Moreover, comparing the results of using VLEs between tablet users and non-users is crucial to understanding the impact of specific device usage on academic performance.

3.1 PRELIMINARY DESIGN OF TBLT

This study is part of an ongoing research project aimed at developing and implementing the VTLLE to enhance language proficiency and digital technology expertise among pre-service teachers in Thailand. The project seeks to establish the VTLLE that meets Khurusapha's standards and can be utilised by classroom teachers and teacher candidates nationwide (Khurusapha is formally recognised under the title of the Teachers' Council of Thailand). The research project consists of four interconnected phases progressing towards these objectives. This study, as the second phase of the project, focuses on designing the VTLLE specifically for pre-service teachers who may have limitations in attending traditional classroom settings. The VTLLE provides a flexible and accessible learning environment that enables students to develop their skills and knowledge despite any difficulties they may face.

The study employs a three-stage design approach, informed by scholars (Ellis 2003; Van den Branden 2012; Juan-Garau & Jacob 2015; Van Gorp & Bogaert 2006; Willis & Willis 2007). The approach comprises pre-task, during-task, and post-task phases, emphasising the use of real-world tasks to promote language learning and develop communicative competence. It is worth noting that the TBLT approach adopted in this study aims to enhance Thai, English, and digital technology proficiency aligned with Khurusapha's professional standards. The VTLLE is designed for nationwide use by classroom teachers and teacher candidates. The study synthesises findings from six separate studies, as shown in previous research, to ensure the effectiveness of the instructional methods.

The three principal phases identified in TBLT—introducing tasks, performing tasks, and reflecting on tasks—are integrated into the VLE's educational process. The first stage, "introducing tasks," aims to motivate and prepare student teachers for the task by providing explicit instructions on the task's purpose and how to perform it in a virtual environment. This stage ensures they have the necessary background knowledge and understanding to effectively engage in the task.

The second stage, "performing tasks," allows pre-service teachers to acquire complex skills by working on the tasks independently and collaborating with their peers. Research indicates that providing learners with unlimited time to perform tasks results in language production that is more complex and accurate (Yuan & Ellis 2003). In the VTLLE, students have considerable autonomy to complete the given tasks without a specified time frame.

The final stage, "reflecting on tasks," involves students presenting a report on how they performed the task and what they learned. At this stage, the teacher encourages task reflection and assesses students' knowledge through academic testing. Additional learning resources are provided to facilitate review and enrichment of knowledge. Overall, the VTLLE is designed to be self-directed, with students engaging in the three phases of task-based learning: introduction, performance, and reflection. This approach aligns with the TBLT approach proposed by various educators and has demonstrated effectiveness in previous studies.

4 METHOD

4.1 PARTICIPANTS

The sample size for this study was determined using the G*Power software programme, which calculated that a total sample size of 436 individuals would be required to achieve a confidence level at 95%, medium effect size (0.20), alpha value of 0.05, and power of the test at 0.95. However, in the current study, 523 participants were recruited through a multiphase sampling process, providing an adequate sample size for generalised analysis. The demographic information of the respondents can be seen in Table 1.

	VARIABLE (*n* = 523)	NUMBER (*n*)	PERCENTAGE (%)
Gender	Male	143	27.30
	Female	380	72.70
Academic Year	First	201	38.40
	Second	98	18.70

Table 1 Demographic information.

(Contd.)

	VARIABLE (*n* = 523)	NUMBER (*n*)	PERCENTAGE (%)
	Third	65	12.40
	Fourth	54	10.30
	Fifth	105	20.10
Region	Bangkok Metropolitan	257	49.20
	Central	97	18.50
	Northern	54	10.30
	Northeastern	68	13.00
	Eastern	12	2.30
	Southern	35	6.70

To address Research Question 1 (RQ1) regarding the components of the VTLLE, this study utilised exploratory factor analysis (EFA) on data collected through an online questionnaire from a nationwide sample of pre-service teachers. To investigate the effectiveness of the VTLLE on academic performance, Research Questions 2 (RQ2) and 3 (RQ3) were formulated. For the VTLLE testing, 88 pre-service teachers from three Rajabhat universities were recruited using cluster sampling. The participants were stratified into three cohorts based on their respective institutions.

Rajabhat Universities, previously known as Rajabhat Institutes, are integral to the teacher education system in Thailand, providing teacher training programmes. Including pre-service teachers from three Rajabhat universities aimed to ensure a diverse and representative sample for evaluating the effectiveness of the VTLLE.

The participants in this study were divided into three distinct groups: Group A, Group B, and Group C. Group A, consisting of 24 third-year students, utilised iPads as required instruments in their academic pursuits within an anonymous Rajabhat university. In contrast, Group B comprised 31 third-year undergraduates from a different unnamed Rajabhat university who did not integrate tablets into their studies. This group served as a comparison group to Group A, allowing for a comparison between iPad users and non-iPad users within the same educational context. Expanding the scope, Group C, composed of 33 additional participants, also belonged to a separate undisclosed Rajabhat university and did not employ iPads. The inclusion of Group C provided a larger sample size of non-iPad users, further strengthening the comparison between iPad users (Group A) and non-iPad users (Groups B and C).

It is important to note that the experiment took place during a significant COVID-19 outbreak in Thailand, which necessitated a shift to online learning for the participating students. To facilitate learning activities, the non-tablet groups were provided with personal computers or notebooks to access the VTLLE, while the tablet group continued using their iPads for online learning activities as usual.

4.2 QUESTIONNAIRE

The questionnaire used in this study aimed to address RQ1 by identifying the essential components for the VTLLE that would contribute to academic success. The questionnaire consisted of two main sections, namely, a survey of personal information (Section A) and an evaluation of judgements (Sections B–D). The design of the questionnaire followed Brown's (2009) concept of questionnaire building.

Section A included demographic questions related to gender, academic year, and location of the students. Sections B, C, and D consisted of 33 items each, rated on a six-point scale, focusing on the development of Thai language, English for communication, and digital technology for education. To ensure the content validity of the questionnaire, an index of item-objective congruence (IOC) was utilised. Six specialists with extensive expertise in Thai language, English, or educational technology were involved in scoring and providing feedback on the questionnaire's content to enhance its quality. The IOC results ranged between 0.83 and 1.00.

Furthermore, a pilot study involving 30 pre-service teachers was conducted to assess the questionnaire's reliability. The results of this pilot study demonstrated high internal consistency, as indicated by a Cronbach's alpha value in the range of 0.972–0.973 (Taber 2018). These findings suggest that the questionnaire is a valid and reliable instrument for measuring the components of the VTLLE that are crucial for enhancing academic success.

4.3 VIRTUAL TASK-BASED LANGUAGE LEARNING ENVIRONMENT

The VTLLE was developed based on the findings from EFA and an extensive review of relevant literature, addressing RQ2. To deliver the VTLLE, TalentLMS was selected as the preferred platform due to its alignment with the TBLT approach. TalentLMS offers robust course tools that are adaptable to various instructional objectives and can be configured to meet specific requirements (Pappas 2020). The platform supports cross-device compatibility, allowing for seamless learning experiences across different devices, and it also provides multilingual capabilities, enabling tasks to be conducted in any location. In the VTLLE, the units within each module must be completed sequentially, and TalentLMS supports offline usage, automatically synchronising once internet access is restored.

To ensure the content validity of the VTLLE, a panel of 15 experts assessed the importance of each item using the non-Face-to-Face (F2F) method. The Content Validity Index (CVI) was employed to evaluate the validity, including the Item-Level Content Validity Index (I-CVI) and the Scale-Level Content Validity Index (S-CVI). The calculated CVI scores demonstrated that the preliminary versions of the instrument had high content validity for individual items (I-CVI range: 0.93 to 1.00) and high content validity for the VTLLE as a whole (S-CVI/Ave = 0.99; S-CVI/UA = 0.93) (Yusoff 2019). These results indicate that the VTLLE has a strong level of content validity, confirming its suitability as a valid instrument for measuring the effectiveness of the VTLLE on academic performance.

4.4 MOCK EXAMS

In this study, quantitative data were collected using mock examinations or pre- and post-tests. The initial phase of exam preparation involved creating question items and alternatives based on the test design of the 1st teacher professional competency testing and assessment mapping BE 2564 (Secretariat Office of the Teachers' Council of Thailand 2020). Three mock tests were developed, covering the usage of Thai, English for communication, and digital technology. Each exam consisted of 120 questions with five possible answers. To ensure the clarity and appropriateness of the questions, three experts in accomplishment exams were consulted. Incomprehensible questions and unfamiliar terminology were revised or removed to maintain the integrity and purpose of the exam. A pilot study was conducted with 96 pre-service teachers to assess the reliability of the mock tests. Half of the participants took 180 prepared items, while the other half took an additional 180 questions.

Data analysis revealed that the discrimination values of the test items ranged from –0.30 to 0.84. The variation in discrimination values may be attributed to the difficulty level of the questions, as items that are either too easy or too difficult may not effectively differentiate between high and low-performing individuals. The use of multiple-choice questions with five possible answers could also contribute to the variation, as some questions may have more plausible distractors than others. To finalise each 60-question exam, items with discrimination values below 0.20 and exceeding 0.80 were eliminated and replaced with new questions to ensure the quality and reliability of the test (Crocker & Algina 2008).

4.5 PROCEDURE

Prior to data collection, ethical approval was obtained from the author's Institutional Review Board, and the study adhered to the ethical guidelines issued by the university's Ethics Committee. Participants' privacy and confidentiality were respected throughout the research process. The study began by administering questionnaires to 523 respondents, emphasising their voluntary participation and their right to withdraw from the investigation at any time. Subsequently, the VTLLE was planned, constructed, and tested between December 2021 and February 2022. The research was conducted in two phases to achieve the study's objective.

The first phase involved a comprehensive literature review of TBLT and VLEs to identify critical factors for improving the academic success of student teachers. This review informed the development of the VTLLE structure, protocol, and beta system. A questionnaire was designed based on this information, and the responses were analysed using EFA to identify the major components of the VTLLE framework. A panel of content experts evaluated the quality and suitability of the VTLLE components and procedures, leading to the development of a VTLLE prototype.

The second phase of the project aimed to evaluate the efficacy of the VTLLE prototype in enhancing the performance of pre-service teachers in Thai language proficiency, English communication, and digital technology for education. A selected sample of undergraduate students enrolled in teacher development programmes participated in the investigation of VTLLE utilisation. Among the 88 pre-service teachers in the sample, 24 were assigned to use an iPad as a learning tool. The sample groups underwent a 12-week intervention with the VTLLE, following three pedagogical sequences for TBLT, to assess the effectiveness of the intervention in enhancing the targeted skills (see Preliminary design of TBLT and Pedagogical implications sections for details).

4.6 ANALYSIS

For RQ1, descriptive statistics, including means and standard deviations, were analysed to examine demographic information and proficiency levels of participants. An EFA was performed using the 22nd edition of the IBM SPSS Statistics software programme to estimate the dimensionality of the VTLLE. To simplify the interpretation of the results, a Principal Components Analysis (PCA) and Orthogonal Rotation Analysis with Kaiser-Varimax rotation was conducted on the intercorrelations of the items. Cronbach's alpha coefficient was used to estimate the internal consistency and reliability of multiple Likert questions in the questionnaire. For RQ2 and RQ3, an independent t-test was performed to determine significant differences in pre- and post-test outcomes between the two groups.

5 RESULTS

5.1 WHAT ARE THE CORE FACTORS FOR AN EFFECTIVE VTLLE FOR TEACHER PREPARATION PROGRAMMES?

The collected data in this study were categorised into three groups: Thai language development, English language development, and digital technology. Each dataset consisted of 30 variables, and the analysis extracted two components with a weight greater than 0.30 and more than three variables (see Appendix C).

In the Thai language development dataset, the Kaiser-Meyer-Olkin (KMO) value was found to be 0.861, indicating suitability for EFA. The results were significant, $\chi^2(45) = 1689.723$, $p < .001$, demonstrating the adequacy of the matrix for factor analysis. Two factors were extracted, explaining 54.598% of the variance. Factor 1, with component weights ranging from 0.397 to 0.831 and eigenvalues of 4.154, was termed *"Blended Virtual Learning Environment"* (BVLE) due to its association with virtual environments used in both traditional and online classrooms. Factor 2, with component weights ranging from 0.607 to 0.736 and eigenvalues of 3.953, was referred to as *"Supporting Technology"* (STECH) since technological variables were most common and carried the most weight.

Similarly, in the English language development dataset, the KMO value was 0.821, and the results were significant, $\chi^2(45) = 1623.433$, $p < .001$. Two factors were identified, accounting for 54.100% of the variance. Factor 3, with component weights ranging from 0.607 to 0.736 and eigenvalues of 3.953, was also termed *"Blended Virtual Learning Environment"* due to the prominence of virtual environment factors. Factor 4, with three variables and component weights ranging from 0.607 to 0.736, had eigenvalues of 3.953 and was named *"Supporting Technology"* due to its emphasis on technology-related factors.

Regarding digital technologies, the KMO value was 0.734, and the results were significant, $\chi^2(45) = 1294.973$, $p < .001$. Two factors were discovered, explaining 48.402% of the variance. Factor 5, with component weights ranging from 0.607 to 0.809 and eigenvalues of 3.087, was named *"Supporting Technology"* due to its association with technology-related elements. Factor 6,

with three variables and component weights ranging from 0.753 to 0.799, had eigenvalues of 1.754 and was termed *"Blended Virtual Learning Environment"* due to the prevalence of virtual environment aspects.

The essential components for designing the VTLLE to improve the academic achievement of pre-service teachers, as determined by the EFA analysis and literature review, are presented in Figure 1. These components play a crucial role in enhancing the academic success of student teachers and should be taken into consideration when designing any VLE for teacher preparation programmes.
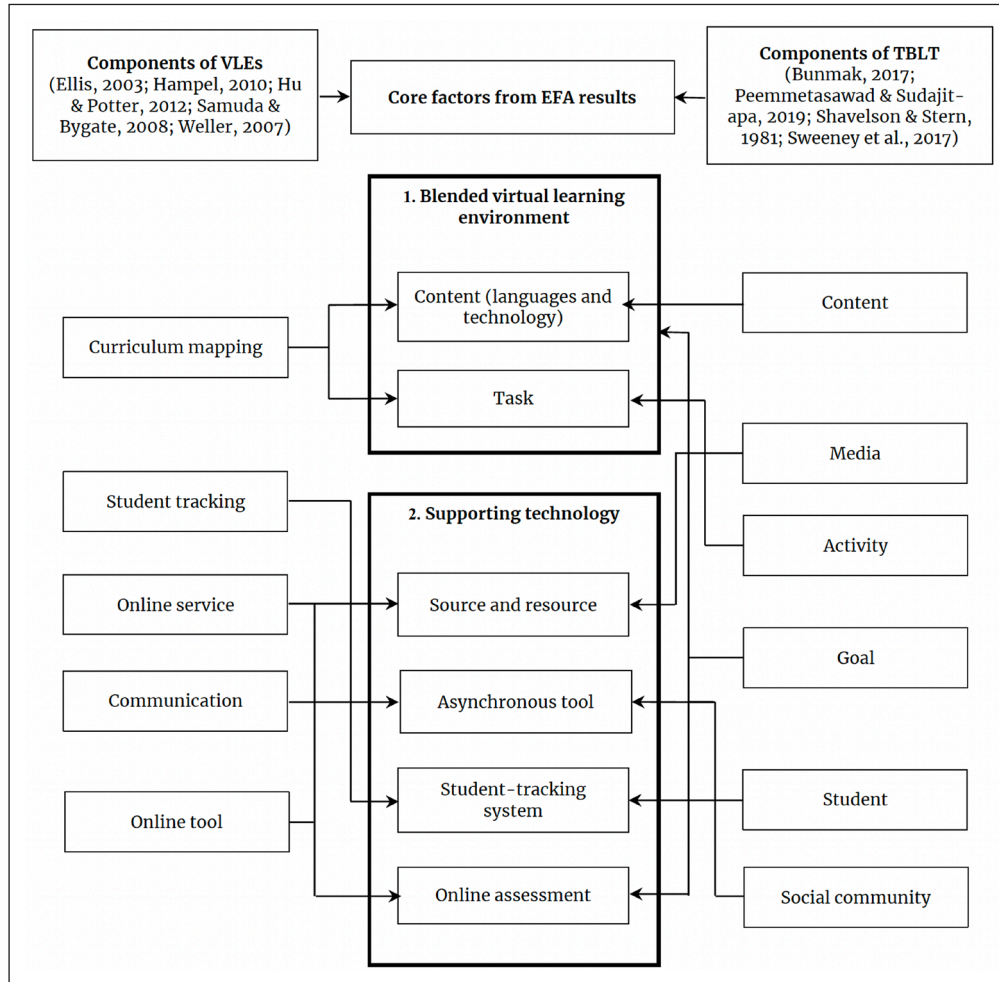

Figure 1 The main components for the successful VTLLE.

The VTLLE is a learning platform that combines the features of TalentLMS with the principles of task-based language instruction. The VTLLE is designed to improve the academic success of pre-service teachers by providing a comprehensive and engaging learning experience. The VTLLE is composed of several key components, including:

1) Content: The VTLLE organises its content into three modules: Use of Thai, English for Communication, and Digital Technology for Education. These modules provide students with comprehensive and up-to-date information in their respective areas of focus.

2) Tasks: Tasks are assignments given to students after they have studied the material. These tasks are designed to be engaging and relevant and are intended to help students apply their knowledge in real-world contexts.

3) Sources and Resources: The VTLLE provides students with access to multimedia resources and external online learning resources that are recommended to supplement their learning. These resources are intended to help students gain a deeper understanding of the material and explore new knowledge.

4) Asynchronous Tools: The VTLLE includes a variety of communication tools and channels for students and teachers to interact, such as email, discussion boards, and comment boxes. These tools are designed to foster collaboration and support student learning.

5) Student-Tracking System: The VTLLE includes a system for tracking students' access to the platform, completion of tasks, and progress throughout the course. This system enables teachers to monitor student performance and provide targeted support and feedback.

6) Online Assessment: The VTLLE includes both internal and external evaluations of student knowledge and performance. These assessments provide students with regular feedback on their progress and allow teachers to evaluate the effectiveness of the VTLLE in improving academic performance.

For the purposes of this study, the VTLLE is defined as a learning environment that combines the benefits of a learning management system (in this case, TalentLMS – (https://drpaul.talentlms.com).

Overall, the VTLLE is designed to provide pre-service teachers with a comprehensive and engaging learning experience that incorporates the latest developments in language instruction and digital technology. The system is based on TalentLMS, a cloud-based e-learning platform that is highly configurable and adaptable to a wide range of instructional objectives.

5.2 TO WHAT EXTENT DOES THE VTLLE ENHANCE THE ACADEMIC PERFORMANCE OF PRE-SERVICE TEACHERS?

There were 88 student teachers who participated in the study and they were divided into three groups, namely Group A (n = 24), Group B (n = 31), and Group C (n = 33), in order to address the research questions. While Group A was required to use iPads to access the VTLLE as per their curriculum, Groups B and C were not compelled to do so. The academic performance of the student teachers was measured in terms of their proficiency in Thai, English, and digital technology for education, through pre- and post-tests that consisted of simulated teacher-entry examinations.

The results of the t-test on independent samples revealed statistically significant differences between the pre- and post-test scores of students in all three groups. Table 2 provides an overview of the pre- and post-test results of Groups A, B, and C students with respect to their proficiency in Thai, English, and digital technology for education. It was found that all the student teachers exhibited an improvement in their academic performance after using the VTLLE.

Table 2 Students' pre- and post-test average scores in each group.

* p < .05.

PARTICIPANT	ASSESSMENT	USE OF THAI				ENGLISH FOR COMMUNICATION				DIGITAL TECHNOLOGY FOR EDUCATION			
		M	SD	t	*p*	*M*	SD	t	*p*	*M*	SD	t	*p*
Group A (n = 24)	Pre-test	22.31	4.27	−22.220	.00*	15.95	5.29	−14.366	.00*	21.87	6.56	−8.456	.00*
	Post-test	40.01	4.42			36.66	3.78			36.45	3.41		
Group B (n = 31)	Pre-test	21.06	4.50	−19.509	.00*	16.83	4.31	−20.027	.00*	26.16	4.50	−10.174	.00*
	Post-test	39.58	3.28			36.09	3.70			37.58	4.68		
Group C (n = 33)	Pre-test	22.60	4.49	−12.641	.00*	16.84	4.17	−12.554	.00*	25.81	5.45	−9.031	.00*
	Post-test	40.09	6.05			37.39	4.30			37.42	4.17		

5.3 ARE THERE DIFFERENCES IN TERMS OF ACADEMIC ACHIEVEMENT BETWEEN PARTICIPANTS WHO UTILISED THE IPAD IN THE VTLLE AND THOSE WHO DID NOT?

The RQ3 addressed in this study was to compare the impact of using a tablet versus not using a tablet on academic achievement in the VTLLE. The findings of an independent-samples t-test indicated that there was no significant difference in the pre-test academic performance of iPad users and non-iPad users, except for digital technology for education, implying that the groups were equivalent in terms of their initial knowledge of the subject matter. Subsequently, a paired-sample t-test was conducted to compare the post-test scores of the iPad and non-iPad groups. The results are presented in Table 3 and demonstrate that there was no statistically significant difference between the two groups in terms of their improvement in academic performance in Thai, English, and digital technology for education after using the VTLLE. These results suggest that the use of an iPad did not significantly impact the academic achievement of pre-service teachers in the VTLLE.

ASSESSMENT	CONDITION	USE OF THAI				ENGLISH FOR COMMUNICATION				DIGITAL TECHNOLOGY FOR EDUCATION			
		M	SD	t	p	M	SD	t	p	M	SD	t	p
Pre-test	iPad (n = 24)	23.54	3.27	1.660	.19	15.95	5.29	−.817	.17	21.87	6.56	−3.151	.03*
	Non-iPad (n = 64)	21.85	4.53			16.84	4.20			25.98	4.97		
Post-test	iPad (n = 24)	40.45	2.90	.578	.13	36.66	3.78	−.070	.12	36.45	3.41	−1.174	.29
	Non-iPad (n = 64)	39.84	4.88			36.76	6.48			37.50	4.39		

6 DISCUSSION

The current study aims to contribute to the ongoing discourse in teacher education by investigating the efficacy of the VTLLE in enhancing the language proficiency of pre-service teachers. The VTLLE is a web-based platform designed by teachers to cater to students with diverse educational objectives (Martins & Kellermanns 2004). It provides a secure and suitable learning environment, enabling student teachers to deepen their comprehension and communication skills beyond traditional classroom hours (Al-Kathiri 2014; Al-Ruheili & Al-Saidi 2015; Al-Said 2015; Bicen 2014). The VTLLE platform was selected for the study as it serves as the arena for TBLT assignments and activities. Its flexibility allows participants to access learning materials and assignments across various devices, ensuring accessibility without device constraints. The study's design and implementation of the VTLLE, supported by a web-based learning management system such as TalentLMS, enhance the platform's security and manageability, facilitating effective implementation.

The VTLLE employed in this study is designed to promote language proficiency and technology expertise and consists of three phases of task-based learning: introduction, performance, and reflection. The findings support the effectiveness of the TBLT approach when integrated into the VTLLE, as demonstrated by the significant improvement in the language proficiency of the pre-service teachers based on their pre- and post-test scores. This approach aligns with the TBLT approach advocated by experts in language teaching (Ellis 2003; Guo & Möllering 2016; Juan-Garau & Jacob 2015; Van den Branden 2012; Van Gorp & Bogaert 2006; Willis & Willis 2007) and has been shown to be effective in previous research (Kimhachandra 2015; Ruksuan 2019; Tonpo & Sornjitti 2021). It emphasises learner autonomy, self-directed learning, authentic language use, and the development of communicative competence.

In addition to TBLT, the VTLLE incorporates various digital technology tools such as blogs, discussion threads, Q&A, and wikis, facilitating communication and collaboration among student teachers. These tools align with prior research indicating that interaction, cooperation, and access to learning resources are crucial components for effective learning in virtual environments (Dayag 2018a). They promote collaboration and social learning, which are essential for successful language learning (Warschauer & Matuchniak 2010). The VTLLE also includes features like student tracking, online assessments, and access to supplementary resources, enhancing the learning experience (Bataineh & Mayyas 2017; Dayag 2018b). These elements provide immediate feedback, support, progress monitoring, and personalised learning, fostering engagement, interaction, and language proficiency among student teachers.

The study further demonstrates that the utilisation of the VTLLE contributes to the development of digital technology expertise, aligning with research suggesting that VLEs enhance learning outcomes (Lacka & Wong 2019) and facilitate the acquisition of 21st-century skills, including digital technology proficiency (Cho & Shen 2013; Sobaih et al. 2016). This finding is particularly relevant to teacher education, as teachers need technological proficiency to effectively support student learning in the classroom.

Regarding the use of tablets to access the VTLLE, the analysis revealed no significant difference in academic performance between pre-service teachers who used tablets and those who did not in the VTLLE. This finding suggests that the VTLLE's content and activities were equally effective for both groups. Moreover, pre-service teachers may have had comparable levels of technological familiarity and comfort, regardless of device usage, which could account for the lack of substantial variations between the groups. These results warrant further investigation.

Table 3 Students' pre-test and post-test academic performance of the iPad and non-iPad groups.

* p < .05.

These findings emphasise that the effectiveness of the VTLLE is not dependent on the specific device used to access it, aligning with previous research indicating that learning outcomes are not significantly affected by the type of device as long as it can access the necessary resources and tools (Kim, Lim & Morris 2016; Lim & Morris 2016; Wang et al. 2018). The VTLLE's device-agnostic design allows it to be accessed and utilised on various devices, including tablets, laptops, and desktop computers. Consequently, the VTLLE holds potential as a tool for enhancing the academic performance of pre-service teachers, irrespective of the device used to access it. These findings have significant implications for teacher education, highlighting the potential of VTLLE to improve the language proficiency and digital technology skills of student teachers.

7 PEDAGOGICAL IMPLICATIONS

The findings of this study have several pedagogical implications for teacher education programmes. One important implication is the positive impact of the VTLLE on the language proficiency of student teachers. The study observed improvement in pre- and post-test scores, indicating that the VTLLE effectively enhances language skills. Additionally, the use of the VTLLE also promotes the growth of digital technology expertise in pre-service teachers, addressing the requirements of incorporating technology in education.

Within the VTLLE, the introduction of tasks plays a crucial role in preparing student teachers. Step-by-step instructions, including the expected gains, are provided to emphasise the relevance and usefulness of the tasks in achieving real-life goals. This approach aligns with research focusing on the importance of task objectives and utility in motivating learners (Dörnyei 2001; Lee 2000).

Furthermore, the VTLLE allows students to complete tasks at their own pace, promoting effective time management. A suggested timeline is provided to assist preschool teachers, and the tasks are designed to be meaningful and relevant to pre-service teachers' professional goals. This alignment with the goals of the teaching profession enhances student engagement and investment in the tasks, as suggested by Dörnyei (2001).

The VTLLE also includes a task reflection phase, in which students engage in written reflective journaling. This reflection encourages students to evaluate their own performance, identify areas for improvement, and gain insights into their learning process. It also provides valuable feedback to the teacher regarding the tasks' effectiveness and informs future instructional decisions. Additionally, reflective tasks contribute to the development of metacognitive strategies essential for language learning, such as planning, monitoring, and evaluating (Ellis 2003).

In general, the implementation of the VTLLE in teacher education programmes can enhance language proficiency, digital technology skills, and metacognitive strategies among pre-service teachers. It provides a meaningful and relevant learning experience aligned with professional standards, preparing them for the challenges of the teaching profession in the digital age.

8 CONCLUSION AND LIMITATIONS

The VTLLE is a web-based platform designed to promote language proficiency and technological knowledge. It incorporates task-based learning phases of introduction, performance, and reflection, aligning with the communicative approach in language teaching and emphasising the development of communicative competence and authentic language use. The VTLLE integrates various digital technology tools that facilitate communication and collaboration among pre-service teachers, fostering collaboration and social learning. These tools provide immediate feedback and support, allowing students to monitor their progress and adapt their learning strategies accordingly. The use of the VTLLE also contributes to the development of digital technology expertise, a crucial skill for teachers in supporting student learning in the classroom. The study's findings indicate that the VTLLE is device-agnostic and can effectively enhance pre-service teachers' academic performance in language proficiency and digital technology for education.

However, it is important to note that the study did not account for other potential factors that may have influenced students' academic performance, such as their prior technological knowledge or motivation. Additionally, the study only examined the short-term effects of the

VTLLE, and further research is needed to assess its long-term impact on students' academic performance. Despite these limitations, the study provides valuable insights into the potential of using the VTLLE to improve learning outcomes and emphasises the significance of integrating technology in classroom pedagogy.

ADDITIONAL FILE

The additional file for this article can be found as follows:

- **Appendixes.** Appendix A to C. DOI: https://doi.org/10.5334/jime.802.s1

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The author has no competing interests to declare.

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