LEARN Journal: Language Education and Acquisition Research Network
ISSN: 2630-0672 (Print) | ISSN: 2672-9431 (Online)
Volume: 17, No: 1, January – June 2024

Language Institute, Thammasat University
https://so04.tci-thaijo.org/index.php/LEARN/index

Factors Fostering General Pedagogical Knowledge Development of Vietnamese Pre-service English Teachers in the Connectivist Learning Environment

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APA Citation:
Nguyen, V.T., & Seepho, S. (2023). Factors fostering general pedagogical knowledge development of Vietnamese pre-service English teachers in the Connectivist Learning Environment. *LEARN Journal: Language Education and Acquisition Research Network*, *17*(1), 30-54.

Received 22/11/2023

Received in revised form 03/11/2023

Accepted 29/11/2023

ABSTRACT

Due to the COVID-19 pandemic, online learning has gained significant attention within the educational context of Vietnam. Nonetheless, there is a shared concern among educators about the effectiveness of the online platform that supports positive learning outcomes. To address this, the Connectivist Learning Environment (CLE), where learning activities were designed and aligned with connectivism theory, was introduced. This study explored whether or not the CLE helped develop the general pedagogical knowledge (GPK) of Vietnamese pre-service English teachers (PETs) and the possible factors that led to their GPK development. This study involved 40 pre-service English teachers at a university in Vietnam and 15 Vietnamese and foreign teachers of English. Data were collected through pre-tests, posttests, online reflective journals, an online survey, and a semi-structured interview. An independent paired sample t-test and repeated measures ANOVA were used to analyze quantitative data, while content analysis was used with

qualitative data. The findings revealed that the GPK of pre-service English teachers is significantly higher after 9-weeks of participation. The participants stated that the CLE is a beneficial learning platform with various positive attributes. In addition to the theoretical and pedagogical implications, this study offers insights for future research studies.

Keywords: connectivism, connectivist learning environment, general pedagogical knowledge, online activities, pre-service English teachers

Introduction

In the digital age, rapid and considerable technological advances exert a robust impact on people's lives, communication, and particularly learning (Ghory & Ghafory, 2021). Technology allows users to connect, communicate, and collaborate across various tools and technologies. Shrivasta (2018) stated that the teaching and learning process has been radically changed with the presence of the web in people's everyday life. Without exception, learning through social media has become one of the most popular and successful methodologies among university students.

Noticeably, more and more online courses at tertiary educational levels have been offered because of growing enthusiasm within higher education for technology-enhanced learning (Buchanan et al., 2014), along with students' strong passion for more participatory and interactive technologies such as wikis, blogs, and social media, rather than traditional content delivery tools (Shrivasta, 2018). Many educational institutions have taken advantage of social network websites to enhance their teaching and learning by providing context for the implementation of connectivism, which is considered the most relevant learning theory in the digital age. This platform is expected to solve the challenges posed by constantly changing knowledge.

In Vietnam, several universities utilize e-learning or MOODLE, which is a free and open-source learning management system (LMS) for teaching and learning. It is a platform for connecting and exchanging information among learners or between teachers and learners. However, in reality, it shows that e-learning at the tertiary level is more likely to utilize a formal LMS, where teachers mainly post assignments or notices, and students only submit assignments or download materials from that LMS, rather than through a social learning networking site where learners can interact with others to exchange or share knowledge. AlDahdouh (2018) argued that LMSs are not employed to initiate student communication. Social connections

between learners and teachers or among learners were technologically limited for face-to-face or online interactions and this was still the gap for further development.

For this study, connectivism is interpreted as involving advanced technology integration, thus suggesting a new way of learning. In such a context, a network of people and technologies are relied upon by learners to access, store, and retrieve information (Siemens, 2005). It is commonly known in the field that most connectivism-based research has focused much more on personal learning environments (PLEs), which are technologically based environments created by students. Less has been done on personal learning networks (PLNs), which are groups of people sharing knowledge and resources despite their equal contribution to the success of the Connectivist Learning Environment or CLE. This CLE was used with the PETs of an English teaching program at a university in Vietnam.

With regard to general pedagogical knowledge **(GPK),** it is defined as a crucial kind of knowledge to create and optimize teaching and learning environments for students (Voss et al., 2011). In this study, it focuses on 3 main aspects: a) classroom management (Shulman, 1987), b) lesson planning (König et al., 2011), and c) learning theories and teaching methods (Grossman & Richert, 1988) specified by PETs in the survey results. As GPK serves as foundational knowledge for designing effective teaching and learning environments (Blömeke, 2017), this content was offered in several requisite courses. Based on the curriculum of the English teaching program, most of the GPK and profession-related courses are offered in the third year to prepare the pre-service teachers for their teaching practicum in the fourth year. However, GPK was not extensively discussed nor enhanced after coursework or outside of the classroom. Therefore, many students admitted that they were not confident about their GPK before doing their teaching practicum and requested some assistance from the lecturers. However, due to the teachers' time constraints and the students' fear of face-to-face interactions, not much support was provided.

To address this gap, the development of a CLE, in which participants could manage and improve their knowledge through anonymous interactions with peers and those with greater experience, appeared to be practical and relevant to the Vietnamese educational context. Though it was easy to access the Internet, the students reported that they did not have many opportunities to socially connect with teachers and other students to gain and exchange information and knowledge. Thus, to attain the purpose of this study, this research was conducted to answer the following questions:

1. After participating in the CLE, to what extent do pre-service English teachers improve their general pedagogical knowledge, i.e., learning theories and teaching methods, classroom management, and lesson planning?

2. What are pre-service English teachers' perceptions of the characteristics of the CLE that help enhance their general pedagogical knowledge?

Literature Review

Connectivism Learning Theory

Connectivism, a newly developed learning theory, integrates principles from network, chaos, complexity, and self-organization theories (Siemens, 2005). In Connectivism, learning is considered a process of forming networks which are connections among various entities such as experts, databases, blogs, and websites (Siemens, 2005) and serve as a basis of the learning process. Similar to social constructivism, learning in connectivism is *f*undamentally social in nature, with knowledge actively constructed through learners' meaning-negotiating process (Song et al., 2012). In CLE, students are authorized and facilitated to take different actions freely. Additionally, they are required to self-direct their learning and create new knowledge through interactions with others within networks of people and technologies.

According to Downes (2006, 2012), Connectivism possesses four characteristics: autonomy, connectedness, diversity, and openness. (1) Autonomy or learner agency was identified by "concepts of choice, expression of self-control, and independence" (Abhari, 2017, p. 2). In an autonomous learning environment, learners could guide themselves according to their own goals, and objectives and had a free choice of "where, when, how, with whom and even what to learn" (Mackness et al., 2010, p. 4). (2) Connectedness or connectivity was the connection between network nodes to facilitate continuous learning. In the CLE, connectivity encourages learners to find and elaborate connections among resources and seek answers through discussions with others (Abhari, 2017). (3) Diversity refers to different opinions and perspectives from different individuals. According to Downes (2012), the learning environment should foster the broadest possible scope of viewpoints from its members. (4) Openness refers to open communication through networks to gain knowledge, share resources, ideas, and expertise, and create new information and insight (Firdausiah Mansur & Yusof, 2013). It also allows learners to freely log in and out of the CLE (Downes, 2012).

Social Technology and Connectivism

In a rapidly evolving information ecology, technology has an integral role in the learning process. It can perform most cognitive activities such as

organizing, storing, and retrieving information, making connections with others, and making the flow of information more feasible while increasing learners' access to information, and keeping learners updated (Downes, 2006; Siemens, 2005). Facilitated with social technologies, learners can experience the distributed nature of knowledge, discover, and navigate connecting ideas, entities, and events, while nurturing and maintaining social connections (Smidt et al., 2017). They can also express their ideas in public domains and openly share their perspectives. Remarkably, four characteristics of connectivism, namely openness, autonomy, diversity, and connectedness, are believed to be effectively operationalized by social technologies. Therefore, these encourage collaboration among learners.

Connectivist Learning Environment (CLE)

According to Brindley et al. (2009), having access to education means having access to available content and a rich learning environment that allows for interaction and connectedness. Banihashem & Aliabadi (2017) stated that connectivism-based online learning provides an environment where "learners can get access to network nodes and learn through interaction, communication, and flow of knowledge" (p. 6). The CLE is an environment that supports and inspires learning by establishing a network while sharing and gaining information facilitated by technology (Techakosit & Wannapiroon, 2015). In the CLE, learning management is shifted from educators to learners with opportunities to interact with others to generate or develop their knowledge. They can also autonomously contribute based on their knowledge, values, and decisions. In this learning environment, all perspectives are welcomed, as diverse viewpoints are particularly encouraged. According to Downes (2006) and Siemens (2005), networks are connections between or among nodes such as experts, databases, and websites to share different sources of information. These networks vary in size and length depending on the amount of information concentrated in them and the number of people navigating through a particular node. Siemens (2005) highlighted that knowledge life was rapidly diminishing; therefore, creating networks could help learners keep themselves updated and enable them to gain and create knowledge.

Marín-Juarros et al. (2014) identified two critical components of connectivist learning networks: personal learning environments (PLEs) and personal learning networks (PLNs). PLEs are learner-created technological environments encompassing tools, data sources, connections, and activities used for learning (Torres et al., 2015). Yen et al. (2016) argued that PLEs are not merely technological but also pedagogical, empowering learners to personalize and manage their learning. They found that PLEs enhanced

intrinsic motivation and personalized learning experiences. Learners actively used PLEs to access information and acquire knowledge.

According to Harding and Engelbrecht (2015), PLNs are valuable networks where learners can gain knowledge, express ideas, and share perspectives within the community. In a PLN, knowledge contributions are made from each individual's PLE when collaborating with others (Marín-Juarros et al., 2014). PLNs are highly crucial for learners whose level of self-regulation is not high because the PLNs can help these types of learners increase help-seeking behaviors which also increase their learning management ability. To conclude, both PLEs and PLNs are essential for learners to collaborate to gain shared information. PLEs are said to be a core part of PLNs (Marín-Juarros et al., 2014), and true PLNs and PLEs are believed to be controlled by learners, not instructors (Torres et al., 2015).

Previous Connectivism-based Empirical Studies & Theoretical and Practical Gaps

The investigation of previous studies on connectivism reveals that in the early stages of theory development for example Shrivasta (2018) concentrated on the debate over whether connectivism was indeed a learning theory or just a learning approach or a pedagogical view. However, the primary focus of recent empirical studies has been on the practical application of connectivism in online learning and teaching environments, such as Massive Open Online Courses (MOOCs)- an open educational system available on the web. Torres et al. (2015) asserted that successful learning involved (1) personal learning environments (PLEs), technological networks or resources employed by learners to gain knowledge, and (2) personal learning networks (PLNs), a group of people who share knowledge and learning resources via technologies. However, PLEs seem to have received more focus from researchers in the field than PLNs. According to Huong & Giau (2020), who studied the revolution in online learning and its implications for Vietnamese universities, there were problems despite the advantages. They reported that online learning in Vietnam proposed numerous problems, such as unreliable automatic online assessments, limited student and teacher interaction, inconveniences for students collaborating on assignments, ineffective personal learning management, online meeting time conflicts for consultation and advice, and high dropout rates. To study online, the students were expected to be highly self-motivated and self-directed and be able to seek help and find other resources when they encountered difficulties. Moreover, hiring a group of effective and enthusiastic lecturers and experts who normally had a full-time job to work in the evenings or on weekends was also challenging and expensive. Though it is proved that online learning

platforms seem to respond to the needs of teaching and learning in this era, studies related to the creation of effective PLN and PLE are still scarce. Therefore, this study aimed to create a theory-informed CLE to enhance PGK for pre-service English teachers and to find possible facilitating factors that would reduce problems reported by previous studies and increase learning opportunities for CLE participants.

Methodology

Research Methods

To explore the effects of the CLE on the pre-service English teachers' GPK development, and the factors related to CLE that helped enhance the GPK, a mixed methods design was employed. Quantitative results of the tests were expected to display the statistical effect of the CLE on PETs' GPK development after 9-week participation in CLE, and qualitative data from semi-structured interviews, online surveys, and online reflective journals revealed possible factors related to CLE that led to GPK development.

Context

In accordance with the curriculum framework for Pedagogical English for Teaching program, students follow a structured preparation process within four academic years. In the initial two years, the focus is placed on improving language proficiency skills. Subsequently, in the third year, students engage in profession-related coursework pertaining to English language teaching. Within this context, they also partake in micro-teaching, closely supervised by experienced lecturers. This preparatory phase is intended to equip students with the necessary pedagogical competencies before undertaking their teaching practicum in their fourth year. This research was conducted when the students finished their third-year coursework and waited for teaching practicum.

Participants

Pre-service English Teachers (PETs)

The total population was 126 students who had already completed the required coursework, namely teaching methodology, learning theories, technology for language teaching, testing and evaluation, and so on. These courses aimed to prepare PETs for teaching practicum at high schools. The participants of this study included 40 fourth-year students who voluntarily

applied, and all of them were recruited. Their English proficiencies were at the B1 and B2 levels of the CEFR. They were considered 'novice' English teachers because they had no direct teaching experience. They joined this study because they would like to improve their general pedagogical knowledge. Personal consent forms were reviewed and signed by the participants, and they were notified that they could withdraw at any time.

Experienced In-service English Teachers

Fifteen in-service English teachers and researchers regarded as experienced in English teaching and learning were purposely invited to join this study. They were selected by using convenience sampling with some criteria and voluntarily participated in this study. They included 5 in-service high school EFL teachers; 5 in-service university English teachers from different provinces in Vietnam and other countries, and 5 M.A and Ph.D. graduate students in Applied Linguistics from 5 different countries. In addition, they, irrespective of age, gender, and nationality, had at least 5 years of experience in English teaching or doing research relating to ELT. They were responsible for sharing their teaching knowledge and experience with participants in the CLE by suggesting learning resources, e.g., books, articles, or clips, answering questions, commenting on participants' posts, and providing advice. All of them were anonymous.

Instruments

Connectivist Learning Environment (CLE)

The Connectivist Learning Environment (CLE) referred to the social networking site called 'ELT Nexus,' which enabled users to access or contact one another to exchange up-to-date information. Before joining the CLE, every participant was trained to use it and became anonymous by choosing their own pseudonyms. The participants were expected to openly share expertise, understanding, and opinions, to be autonomous, and to manage their own learning by making their own social and conceptual connections to suit their own needs. The Vietnamese PETs could access the learning environment anywhere and anytime using PCs, laptops, iPads, and smartphones. The CLE members were required to regulate their own learning through various learning activities such as Livestream, live chat or discussion, posts, audio, and video calling. The learners 'self-regulation and anonymity on the CLE were operationalized to maximize their safety and confidence. Another feature of the CLE was that it granted the participants permission to store their data online in different formats. Different from other current

learning environments which focus on the personal learning environment (technology network), the CLE mainly focuses on the creation of the personal learning network (human network), to facilitate learning.

Learning Activities

To improve pre-service English teachers' GPK, various online and offline activities (see Table 1) with clear guidelines were elaborately designed so PETs could connect, exchange, and share real teaching experiences with one another.

Table 1

A Summary of Learning Activities in the CLE

No	Activity	Purpose	Module	Time	Duration	People involved
1	Live Stream	To exchange real teaching experiences between participants and experts	**M1:** Learning theories & teaching methodology	Every Friday-week 2, 3 (8-9pm)	60 minutes	All participants
			M2: Classroom management	Every Friday-week 5, 6 (8-9pm)	60 minutes	
			M3: Lesson Planning	Every Friday-week 8, 9 (8-9pm)	60 minutes	
2	TKT Mocked Test	To stimulate learning, help identify gaps in knowledge, build confidence and retain information; to prepare students for the standardized TKT tests for ELT teachers	30 item TKT Practice test (3 related modules)	Every Sunday (any time)	30 minutes	All participants

3	Live Chat and Discussion	To provide instant responses to questions related to pedagogical knowledge through live chat and/or discussion among participants	**Week 1-3:** Module 1 Learning theories & teaching methodology **Week 4-6:** Classroom management **Week 7-9:** Lesson Planning	Every Tuesday and Thursday (9-10pm)	60 minutes	All participants
4	Posts	To share relevant teaching and learning resources related to each module. To give comments, replies, and reactions on posts	**Week 1-3:** Module 1 Learning theories & teaching methodology **Week 4-6:** Classroom management **Week 7-9:** Lesson Planning	Every day	Any time	All participants
5	Reflective Journal Writing	To reflect how the pedagogical knowledge is improved	**Week 1-3:** Module 1 Learning theories & teaching methodology **Week 4-6**: Classroom management **Week 7-9:** Lesson Planning	Weekly (any time)	10 minutes	Pre-service English teachers
6	Audio/ Video Calling	To motivate instant contact / communication among online members for necessary pedagogical knowledge	**Week 1-3: Module 1** Learning theories & teaching methodology **Week 4-6:** Classroom management **Week 7-9:** Lesson Planning	Every day (any time)	Any time	All participants

Pre-test 1, Pre-test 2, and Posttest

In this study, pre-tests 1 and 2 and the posttest were parallel and the test items were selected from the standardized Cambridge English Teaching Knowledge Test (TKT), which was used to assess general teachers' pedagogical knowledge. In terms of the content, they consisted of 3 main sections: learning theories and teaching methodology, classroom management, and lesson planning which were the core topics discussed in the CLE. They were to measure the extent the PETs' GPK was improved before and after participating in the CLE. They were 40-minute paper-based tests

with 40 multiple-choice and matching questions. Pre-test 1 and 2 were given four weeks apart before attending the CLE and the posttest was administered after 9 weeks of participation.

Online Reflective Journals

Online reflective journals were used to keep track of PETs' varied learning experiences in the CLE. The online reflective journal included open-ended questions regarding their opinions on the characteristics of the CLE, which helped them improve GPK. The journal writing format with clear guidelines and prompts was provided online for each participant. During their learning on the CLE, the participants were asked to write a weekly online reflective journal in English or Vietnamese. The data from these journals were used to triangulate with those of the pre-tests and posttest.

Online Survey

The online survey consisted of both open and close-ended questions investigating the participants' perceptions of the characteristics of the CLE that might be the factors leading to the development of GPK. Before the launch of this survey, an email with a clear explanation of the purpose and the method of conducting the survey was sent to all participants to invite them to complete the survey. The survey did not require their email addresses to ensure the anonymity and confidentiality of the participants.

Semi-structured Interview

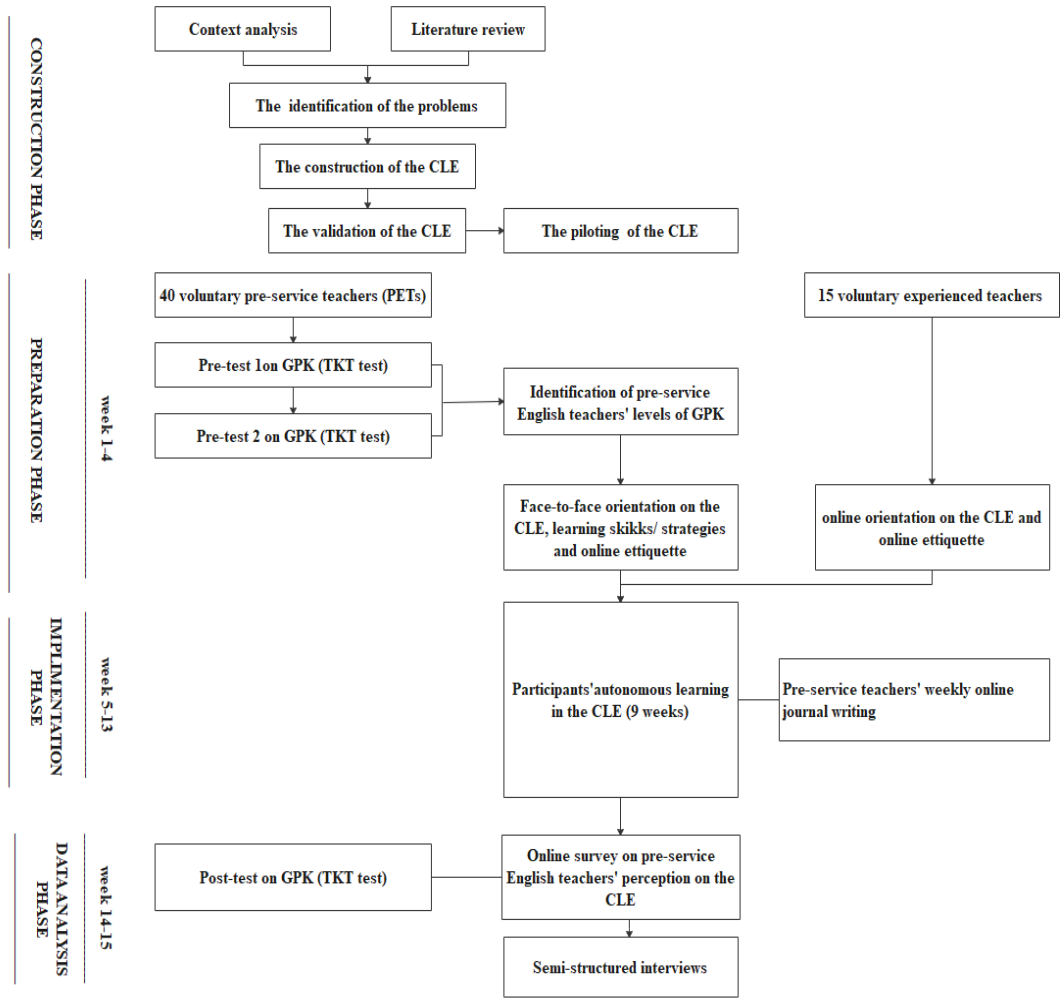
Semi-structured interviews were conducted with some prepared questions to gain an in-depth understanding of the participants' perceptions of the characteristics of the CLE that might affect their learning. It was used to triangulate with the data gathered from other instruments. Sixteen active participants in the CLE whose responses were noticeable were purposively selected. The interviews were conducted face-to-face in Vietnamese and audio recorded with permission. Each interview lasted between 10 to 15 minutes.

Data Collection Procedure

There were four main phases in this study. Data collection took place from Phase 2 to Phase 4 as shown in Figure 1.

Figure 1

Data Collection Procedure



In phase 1, the researcher reviewed relevant literature, designed and developed the CLE which was in turn verified by 2 ELT and 2 IT experts and finally piloted with 25 students before implementing. In Phase 2, pre-tests 1 and 2 were administered before implementing the CLE. In phase 3, each participant was asked to keep an online reflective journal to reflect on their learning progress. During this phase, the participants started interacting with others through different activities. For example, in Live Stream, after the guest lecturer's presentation, different related questions were asked via chat box, and the lecturers and other experts answered them immediately. In

Posting activities, the participants could post their questions on the Posting Board, where anyone could provide answers, comments, or reactions to the posted items. In addition, the participants were also provided with storage space where they could store information that they downloaded from the CLE, which could be accessed 24 hours. In addition, a reminder was automatically emailed to inactive participants if they did not access the system for a few days. The posttest on GPK was given in week 10. In phase 4, the online survey was sent out to pre-service teachers by the end of week 14. They had a week to answer the questionnaires. After that, the semi-structured interviews with 16 purposively selected participants were carried out. The interview was in Vietnamese and audio recorded with permission.

To ensure the quality of this research, every instrument such as tests, interview questions, survey guidelines, and CLE was validated by 4 experts in the field and piloted before being employed in the actual study. Regarding ethical values, the study was approved by the Human Rights Protection Board and the consent form was sent to every participant for their agreement to participate in this study.

Data Analysis

For research question 1, the scores of pre-tests 1 and 2 and the posttest were analyzed using descriptive statistics. A repeated measures ANOVA was performed to see if there were any differences in mean scores among these 3 tests to confirm the participants' improvement in GPK. For research question 2, content analysis was conducted with qualitative data from online surveys, semi-structured interviews, and online reflective journals using adapted frameworks for website evaluation of Allison et al. (2019) and Nievas-Soriano et al. (2021). To enhance its credibility, inter-coding by two other researchers was employed. The intercoder agreement rate was more than 90%. The disagreements about the coding were discussed afterward.

Results

PETs' Development of General Pedagogical Knowledge

A repeated measures ANOVA in SPSS was conducted to see if there were any statistically significant differences in mean scores between pre-test 1 and the post-test, and pre-test 2 and the posttest. The results showed that the participants significantly progressed in general pedagogical knowledge over 9 weeks. The pairwise comparison compared each set of scores to see whether there was a statistically significant difference between them. The results (see Table 2) revealed that the differences in mean scores between pre-

test 1 and the post-test (M = 9.775), SD = .530, P <.005) and that of pre-test 2 and the post-test (M = 8.150), SD = .411, P <.005) were significant. However, no significant difference was found between pre-test 1 and pre-test 2 (M = 1.625), SD=.690, 12.12, P >.005).

Table 2

Pairwise Comparisons Among Pre-tests 1, 2, and Posttest

(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference Lower Bound	Upper Bound
1	2	-1.625	.690	.071	-3.353	.103
	3	-9.775*	.530	.000	-11.102	-8.448
2	1	1.625	.690	.071	-.103	3.353
	3	-8.150*	.411	.000	-9.178	-7.122
3	1	9.775*	.530	.000	8.448	11.102
	2	8.150*	.411	.000	7.122	9.178

*. The mean difference is significant at the .05 level.

In summary, statistically significant differences in the mean scores of the three tests (pre-test 1, pre-test 2, and the posttest) confirmed that the pre-service English teachers' general pedagogical knowledge substantially increased (M= 8.15 = 31.90%) after 9-week participation in the CLE. On the contrary, there was no improvement in GPK without the intervention (CLE).

Factors Relating to the CLE that Helped Develop PETs' GPK

Regarding the participants' perceptions about the factors related to the CLE that led to the improvement of GPK, data from the online survey, online reflective journals, and semi-structured interviews were analyzed and classified into 12 themes based on Allison et al.'s (2019) and Nievas-Soriano et al.'s (2021) and frameworks. Table 3 presents the characteristics of the CLE that helped develop PETs' GPK.

Table 3

Pre-service English Teachers' Perceptions on the Characteristics of the CLE that Helped Develop their GPK

	Characteristics	Description
1	Usability	Easy to use and navigate Familiar and simple language instructions Familiar online activities (Live Stream, Posting)

2	Utility	Useful website Numerous opportunities for interaction Inspiring to use the website with confidence Original website
3	Functionality	Adequate storage space for every participant Automatic reminding functions of new activities Effective searching & filtering tools Speedy functions
4	Confidentiality & Trust	Anonymous users Reliable information from experienced members Trust-worthy sources
5	Appearance	Beautiful user interface Structured content Professional design
6	Availability	Highly accessible for location and time
7	Interactivity	Strong sense of community Timely feedback and comments Active discussion/chatting boards
8	Satisfaction	Positive feelings of the website
9	Fee	Free of charge
10	Characteristics of expert participants	Experienced, enthusiastic, supportive, well-qualified
11	CLE's learning content/ information	Practical, current, relevant, attractive
12	CLE's learning activities	Relevant, useful, fun

The following are extracts from online surveys, online reflective journals, and semi-structured interviews to support the abovementioned characteristics qualitatively.

Usability: Regarding usability, about 50% of the interviewees mentioned 3 favorable attributes, which were that a) the website was user-friendly; it was easy to use and navigate; b) the language used on the website was simple, and c) it was easy to join the provided activities. One of the typical examples of their answers is presented below:

> "I find the language used on this website familiar and easy to understand. I did not have so many problems with the language as I did when I participated in other websites." (Participant # 5)

Utility: In terms of utility, which was referred to considerably in most of the interviewees' responses, the participants specifically mentioned the usefulness of the content on the website which was directly relevant to their needs, the

opportunities for active interaction with experienced in ELT and teachers in real classroom settings where they would be teaching, the inspiration to join the activities, and the originality of the website which were very responsive and attractive. One of them stated:

> "This website is useful for both pre-service and in-service teachers of English because it creates a favorable learning environment for them to exchange pedagogical knowledge and to help each other solve problems in teaching." (Participant # 15)

Functionality: The functionality of this CLE attracted considerable attention from the participants. Such functions as online searching and filtering, online storage, website notifications, anonymity, and website speed were mentioned substantially in different ways. The participants liked these functions because they could not do them on other websites. One of the responses is shown below:

> "The website function, MY SPACE, is like Google Drive as it allows us to easily store or save information of different types like Word documents, pictures, videos, ppt slides, and so on …" (Participant # 29)

Confidentiality: Confidentiality was claimed by most of the participants to be one of the best features of the CLE because it allowed them to join the CLE confidently. Once they felt confident and safe, they became more active participants. Some strongly emphasized this as follows:

> "Everyone is open to each other because we are all anonymous. Moreover, anonymity helps us feel confident when we ask questions, discuss, and give comments on posts. We don't have to worry about the disclosure of our social identities." (Participant # 10)

Trust: Most participants stated that the information, knowledge shared, and learning resources on the website were very reliable because most of the experts were experienced in ELT and had extensive experience in teaching in both Vietnam and overseas. They felt more secure adopting and believing what the members had shared in the CLE. The interviewees explained:

> "As many website members are experienced English teachers, the pedagogical knowledge on the website is very reliable." (Participant # 7)

Appearance: The participants also noted the importance of the visual appearance of the website. They described it as "user-friendly and well-structured" within a "professional and appealing" design:

> "This website has a stunning and intuitive user interface, good-looking design, and clearly arranged contents. I have no problem using it at all." (Participant # 13)

Availability: To the participants, availability was also referred to as accessibility. They reported that the website could be accessed at any time at their convenience and at any place where there was an internet connection. This is extremely useful for them because whenever they have problems, they can leave their questions on the website right away. Moreover, responses could be expected to be timely, since many experts were joining the CLE. Whether day or night, it was not a problem. One participant replied:

> "This website is convenient for me as I can access it anytime. Moreover, many members were online at the same time, so for every question that I posted on the website, I always got the answers in just a few minutes. This usually takes a few days or longer on other websites I used to join." (Participant # 2)

Interactivity: A little less than half of the participants (17 out of 40) mentioned that the ELT Nexus website provided ample opportunities for interaction, which motivated them to visit and join in the activities actively. The learning problems posted were reported to be addressed rapidly, carefully, professionally, and timely. One participant shared his view about this as follows:

> "This website encourages interactions among the participants through interesting activities such as live stream and live chat. People can help each other in many ways, such as sharing learning resources, asking and answering questions, and commenting on posts. Many participants are often available online, which makes interactions easier." (Participant # 5)

Satisfaction: About half of the interviewees held significantly positive attitudes towards the CLE and considered it as a community where both inexperienced and experienced English teachers meet to exchange general pedagogical knowledge. The pre-service teachers needed professional and academic assistance which could not be found anywhere, as expressed below:

> "I am happy and thankful because I am introduced to this website where I can find wholehearted support. Instead of spending much time searching for information I need online, I

> now join in the learning activities on this website and get instant support from experienced and enthusiastic teachers." (Participant # 8)

Fee: Some participants mentioned that they favored the website because it was free of charge. One of the following perspectives was shared:

> "I think I prefer this website to others because it provides not only relevant and useful knowledge but also everything is free of charge." (Participant # 15)

Characteristics of Participants (Pre-service and In-service Teachers): The participants on this website were highly active during the 9-week study, as seen from their presence in each activity. Eighty percent of the participants expressed that active participation resulted from a warm and welcoming learning community. They felt the teaching experts were experienced, enthusiastic, supportive, and well-qualified, and the learning environment was constructive. The extract below illustrates the opinion:

> "I personally think that the website members are very active and supportive. They are willing to share their knowledge and experiences with others. Their responses to questions are quick and their feedback is very timely, relevant, and practical." (Participant # 8).

Website's Learning Content/Information: The participants also revealed their positive perceptions of the learning content or information shared on the website. Fifteen out of 40 participants believed that knowledge or information shared in this learning community was practical and relevant to their needs, new or updated, captivating, and diverse. The following is an example:

> "I learned a lot from different aspects of pedagogical knowledge that was shared on the website. Personally, most of them are new, interesting, and relevant to my learning needs." (Participant # 6)

Relevancy and Usefulness of the Website's Learning Activities: Learning activities were also relevant and useful for the participants. Most of the activities were believed to serve their own learning goals. 85% of the participants postulated that such activities as Livestream, live chat, and posts created opportunities to interact directly with others to exchange knowledge and experience. Two of the participants disclosed their viewpoints:

> "The activities are very useful for me. I think that I learn a lot from reading posts. Most of them contain relevant, practical, and new knowledge that is useful for my major and for my future teaching career." (Participant # 33)

Discussions

Research Question 1: After participating in the CLE, to what extent do pre-service English teachers improve their general pedagogical knowledge, i.e., learning theories and teaching methods, classroom management, and lesson planning?

Based on the results of the pre-tests 1 and 2 and posttest, it can be concluded that the developed CLE of this study has had significant impact on developing GPK of pre-service English teachers. To elaborate, the results from paired sample t-test indicated no statistically significant differences in scores between pretests 1 and 2, signifying minimal improvements in GPK prior to their participation in the study. Many students expressed a lack of formal opportunities to improve their GPK. Some admitted that they did nothing to prepare themselves for teaching practicum while some occasionally read articles, posts, blogs available online. However, some content they accessed was not directly aligned with their specific needs. Thus, GPK development was not substantial. On the contrary, the results of the pairwise comparison from the repeated measures ANOVA demonstrated considerable in PET's GPK regarding learning theories, teaching methodology, classroom management and lesson planning after 9-week participating in the developed CLE. This underscores the pivotal role of the CLE in fostering their GPK development.

Research Question 2: What are pre-service English teachers' perceptions of the characteristics of the CLE that help enhance their general pedagogical knowledge?

The findings from reflective journals, semi-structured interviews, and online surveys illustrate twelve characteristics of CLE that led to successful learning experiences of participants. They include use-friendly usability, useful utility, effective functionality, reliable confidentiality & trust, beautiful appearance, high availability, dynamic interactivity, positive satisfaction, no fee, qualified expert participants, practical and relevant learning contents, and various learning activities. These positive features aligned with the online platform construction theories and the findings of the studies of Allison et al. (2019), Cinganotto and Cuccurullo (2016), and Nievas-Soriano et al. (2021). In relation to learning development, these characteristics motivated

participants to regularly join the activities, actively engage in discussions, post and respond to comments, and interact with other participants in the networked community. Consequently, overall learning and knowledge were developed. Among these 12 facilitative characteristics, four key features stand out as crucial factors contributing to the success of CLE implementation and deserve further discussion as follows:

The first factor involves the characteristics of expert participants. In this study, the Personal Learning Network (PLN) offered students a unique networked environment, as it encompasses a broader array of experienced English teachers. The findings suggested that both the quality and quantity of selected experts crucially drive the participants' engagement and stimulate their involvement within the CLE. To illustrate, the 15 experienced teachers present within the CLE comprised 3 native and 12 non-native in-service teachers, who were from three different levels of experience: high school teachers, university instructors, and Master's and PhD students. This diversity contributed to extensive and diverse responses, knowledge, perspectives, and experiences regarding GPK and teaching practicum for the pre-service teachers. High school teachers brought their invaluable real-life experiences and practical insights about high school teaching, while university instructors discussed more the relevant learning theories and teaching methods. The last group was graduate students, who offered relatively new and challenging ideas to PETs. That was probably because they were in the process of learning or ongoing research about innovative aspects of the field. Since they were all experts in English teaching, the participants perceived that their comments were reliable, knowledgeable, and practical. Based on the findings, the favorable characteristics of experts mentioned by PETs included being experienced, enthusiastic, supportive, and well-qualified. These attributes could create a safe and constructive learning community. Additionally, an adequate number of experts in CLE facilitated their regular access to the website to provide timely responses to the PETs' questions. In turn, their responses and consistent presence online had a direct effect on participants' frequent access, collaboration, and extended discussions within the CLE. It was also interesting to see that at the end of the study, no participants dropped out, which contradicts the research finding of Smith (2010), who reported that up to 40-80% of participants dropped out of online classes.

The second factor concerns the anonymity of participants. In this study, every member was required to register with their pseudonym from the beginning. Thus, nobody knew who they were. The findings from the three instruments strongly affirmed that anonymity in any online activity in the CLE crucially fostered the participants' engagement. This finding agrees with Chen (2019), whose study demonstrated that being anonymous by using pseudonyms positively affected active participation in learning activities.

These findings also indicated that in an online learning environment, where experienced teachers or experts whose role was equal and whose identity was kept confidential, students felt safer and more comfortable appearing in the CLE. Anonymity could reduce concerns about status, education level, English proficiency, and pedagogical knowledge, enabling members to contribute openly. They confidently asked questions, expressed ideas, commented, and discussed unclear points without fear. As a consequence, their knowledge substantially improved. To confirm this point, the data also showed that the participants of this CLE never used audio and video calling functions though they were fast and could provide instant answers. They stated that with these tools, their identity would be revealed. In other words, being anonymous within the CLE amplifies the freedom of interaction and the formation of a personal learning environment (PLE) not only among students but also with teachers and experts, where knowledge is acquired.

The third aspect involves the content shared and online learning activities within this networked environment. Different online activities such as Livestream, Live chat and discussion, Posts, Audio/Video calling, TKT mocked test, and Reflective journal writing were carefully selected and designed based on the recommendations of previous research (AlDahdouh, 2018; Banihashem & Aliabadi, 2017; Torres et al., 2015). They were intentionally included to serve different learning styles and levels and provide opportunities for interactions and connection. In addition, the topics of the discussions and talks given by the guest speakers emphasized 3 main areas of GPK that were necessary and useful for the teaching practicum. The results also underscored the importance of every step of activity design, starting from the conceptual plan, identifying the topics of the talk, selecting guest speakers, determining appropriate lengths of time, and choosing the proper types of activities. Furthermore, these activities were scheduled in the evening when most participants were available. As a result, the attendance for each activity was high. All participants from the online survey valued the practicality of the content, appropriateness of the schedule, and the variety of the learning activities.

The last factor deals with the design of the website and the inclusion of some technological features within the CLE. The participants mentioned that this website was easy to navigate, the language use was simple and the design was professional. Therefore, the appearance and user-friendliness of the website had a positive impact on participants' impressions. Moreover, the participants reported that some online features, such as instant notifications, bookmarking activities, following function, storage space, automatic reminders to join the activities, and online dictionaries that cannot be found in other LMS systems, made this CLE far more favorable with the easy flow of knowledge, as found in Smidt et al.'s (2017) study. Since it was well-

equipped and convenient, the participants' learning process, knowledge exchange, and acquisition were facilitated.

In summary, to create a successful social learning environment that is highly interactive, engaging, and effectively enhances learning opportunities, these four major factors are strongly recommended to be considered together with other factors as they optimize openness, connectedness, autonomy, and diversity of the CLE.

Conclusion

In conclusion, the results of this study expanded the work of previous researchers in the field of online learning environments. They offer a better understanding of the Connectivist Learning Environment (CLE), where pre-service English teachers can connect with knowledgeable in-service teachers to share and exchange information, knowledge, and teaching and learning experiences. The findings provided clear and sufficient support for the significant effects of CLE on Pre-service English Teachers' pedagogical knowledge development after their 9-week participation and their perceptions of the valuable characteristics of the CLE. For pedagogical implications, in addition to 12 facilitating conditions, this study emphasized 4 crucial factors that made the CLE implementation successful. They were reliable and adequate essential resources (experts), anonymity, focused content, and well-designed learning activities, and the appealing design of the website and availability of necessary tools. This CLE environment and concrete examples of learning activities provided in this study can be adopted and adapted to be used in different teacher training contexts. Theoretically, it discovered that an effective CLE should optimize learning opportunities, motivate learners to remain online, engage learners' cognition through resourceful connections and active interactions and thus bring about positive learning outcomes.

For future research, a more comprehensive study could follow the participants during their actual teaching practicum and document their reflections on how the knowledge acquired from the CLE could be applied in their real-life situations. Furthermore, it will be helpful to investigate the viewpoints of experienced teachers from various educational levels. Given the diversity of experienced sharers regarding nationality, age, gender, educational background, teaching contexts, and expertise, it would be interesting to explore the potential impacts of these variables on their online participation, regular presence, and contributions to knowledge within the CLE. These findings could prove invaluable in incorporating expert input, a crucial element for successfully implementing the CLE.

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