CHAPTER 1
INTRODUCTION

The chapter commences by outlining the study's background, followed by the presentation of the problem statement and its rationale. Then, research objectives, research questions, and significance are introduced. Lastly, several important and frequently used terms in this current study are clearly defined.

1.1 Background of the Study

Together with the development of global education, Vietnam's education system has undergone significant transformations in recent decades, reflecting the country's commitment to improving educational opportunities and outcomes for its citizens. In Vietnam, pedagogy is among the most important majors at the tertiary level with a mission to train Pre-service English Teachers (PETs) to become qualified future educators. As noted in the training curriculum of most universities that includes teacher education programs, PETs are required to learn from 130 to 140 credits and are expected to be capable of teaching at public or private high schools after graduation. During 4 academic years, PETs are well-equipped with language components, English linguistics, communication, and public speaking skills, cultural knowledge in their first and second year, and professional knowledge, namely pedagogical psychology, teaching and learning theories, teaching methodologies, and language assessment in the third and fourth year before they participate in a teaching practicum of approximately 6 weeks in public high schools. This aspect of the training program holds significant value, allowing participants to utilize the knowledge and skills they've acquired in authentic teaching settings under the guidance of instructors who play an important role in supporting them to develop the skills necessary to become effective and passionate teachers.

Ongoing development and rapid changes in technology are shown by many studies to have a profound influence not only on the way people live (Kop, 2011; Siemens, 2005) and communicate (Bates, 2019; Marais, 2011) but also on how people teach and learn (Barnett et al., 2013; Bates, 2019; Kop, 2011; Rice, 2018; Siemens, 2005; Trnova & Trna, 2012). Noticeably, such dramatic changes caused by the rapid evolution of technology show no sign of slowing down (Bates, 2019). According to Husaj (2015), technology has brought people closer to each other; enabling them to meet at any

time and to exchange their knowledge and experience anywhere they want by just using small equipment. Dunaway (2011) and Rice (2018) also posited that technology enables individuals to connect, communicate, and collaborate through numerous tools and technological resources.

It should be noted that there is a marked increase in the use of the Internet around the world. As reported by the Global Digital Report (2019), the number of new Internet users is increasing by over one million daily. Additionally, the average daily online presence of Internet users worldwide is recorded at 6 hours and 42 minutes. Similarly, the number of Internet users in Vietnam soared to approximately 61 million according to the latest news released by Thien (2019) in Tuoi Tre newspaper. The article revealed that each Vietnamese Internet user spent an average of 3 hours and 12 minutes on mobile devices and his or her main use of the Internet was for social networking and communications (52%), videos (20%), games (11%), and others (17%). Social networks reported by Huong (2018) were employed in Vietnam by the young in the 15-34 age range to connect and communicate with others, search for updated information, learn, entertain, and do business.

Undoubtedly, the 21st century witnessed a shift in learning paradigms. Since being initiated into the research world by Siemens (2005) and Downes (2006) in the digital age, Connectivism, which perceives learning as a networked phenomenon influenced by technology and social interaction, has captivated the interest of numerous researchers. In the digital age when information is plentiful and accessible (Abhari, 2017), distributive (Downes, 2006), and the duration of knowledge's relevance is quantified in months and years (Shrivasta, 2018), it is too challenging for an individual learner to gain or update all knowledge. Siemens (2006) argues that learning can rely on personal experience and the ability to form connections to enable knowledge sharing and possibly generate current, relevant, and contextually appropriate content or knowledge. In addition to the three prominent learning theories - Behaviorism, Cognitivism, and Constructivism - Connectivism is considered significant for its ability to interpret learning through the integration of advanced technology (Vitoulis, 2017). Numerous studies grounded in Connectivism have utilized online classes with the facilitation of technologies. Within these online learning environments, learners are tasked with establishing connections with a variety of information sources provided by their instructors, and with fellow learners. This interaction is essential for staying current and consistently gaining, experiencing, generating, and connecting with fresh knowledge (Siemens, 2006).

There has been a surge in the availability of online courses at tertiary education levels because of the increasing interest in technology-enhanced learning within higher education (Buchanan et al., 2014). This trend is further propelled by students' preference for more participatory and interactive technologies like wikis, blogs, and social media over traditional content delivery tools (Shrivasta, 2018). Learning landscapes are, by and large, networked, social, and technological (Dunaway, 2011). Numerous educational institutions have utilized social networking websites as a platform for facilitating teaching and learning processes (Tinmaz, 2012), as they provide a conducive context for implementing Connectivism, which is widely regarded as the most pertinent learning theory in the digital age.

1.2 The Statement of the Problem

As previously mentioned, preservice teachers are reported to fully attain both pedagogical knowledge and teaching experience, which enable them to teach at high schools by the time they graduate from the university. However, prior to this study, a preliminary survey research (see appendix A) conducted with 157 PETs who were 4th year students at Ton Duc Thang University (TDTU), where the researcher of this study was currently working revealed that most of them did not feel satisfied with their current general pedagogical knowledge (GPK) (72.5%) and their teaching skills (42.4%) before their professional internship at high schools. In addition, updating GPK was considered essential for the career; however, the time PETs spent updating such knowledge was not much (approximately 1 hour per week). Particularly, more than half of the participants (56.1%) said that they got little or no support for developing knowledge and improving teaching skills from university teachers.

In addition, it is easily seen from the curriculum of the teacher education program that additional autonomous learning environments (e-learning system) where PETs had opportunities to interact with other PETs and teacher trainers to exchange or update pedagogical knowledge were not paid much attention. At a certain point in their learning, PETs may need direct or indirect support from the teacher trainers. However, they were reported to teach many big classes and to cope with time constraints and heavy workloads. As a result, their support for their trainees was likely to be inadequate, leading to stagnation and limited growth opportunities.

There is no doubt that job opportunities for preservice teachers are not many, and more and more requirements of teachers to update their pedagogical knowledge and teaching experience are imposed. It would be very challenging for a PET to find a teaching post if he or she does not meet the requirements of pedagogy innovation.

1.3 Rationale of the Study

Shrivasta (2018) highlights that the advent of the Internet has significantly transformed the dynamics of teaching and learning. Utilizing social media platforms for learning has emerged as a widely embraced and effective approach among university students. Utilizing social media for learning has emerged as a highly popular and effective method among university students. Koha et al. (2021) found that the prevalence of social networking site usage among these students can be attributed to the widespread availability of smartphones and easy access to such sites via home computers. Students' access to information nowadays increases, and their life at the university "evolves around" digital technology, particularly social media in which they immerse themselves. Hence, no differences should be made in university students' way of learning (Bates, 2019).

A growing number of universities in Vietnam are embracing e-learning platforms such as MOODLE, a free and open-source learning management system (LMS), for educational purposes. While many researchers see this adoption as advantageous for fostering connections and information exchange among learners, as well as between teachers and students, the actual practice suggests that e-learning at the tertiary level often operates more as a conventional learning management system. Here, teachers predominantly post assignments or announcements, and students primarily submit assignments or download materials from the LMS, rather than functioning as a social learning networking site where learners actively engage to share knowledge. According to Aldahdouh (2012), LMS such as MOODLE are not extensively utilized to foster communication among students. Instead, most students use MOODLE primarily to submit assignments and take quizzes. Limited social interactions occur between learners and teachers or among students due to such challenges as teachers' time constraints, large class sizes, and students' reluctance to engage in face-to-face or online interactions.

In this study, Connectivism serves as the framework for interpreting learning due to its integration of advanced technology and its innovative approach to learning. Connectivism conceptualizes learning as a process where learners utilize a network of people and technologies to access, store, and retrieve information within a learning environment (Siemens, 2006). There is a widespread understanding that much of the research based on Connectivism has predominantly emphasized personal learning environments (PLEs), which are technologically based environments constructed by students themselves. However, there has been relatively less emphasis on personal learning networks (PLNs), which involve a community of individuals collaboratively

sharing knowledge and resources. Despite receiving less attention in research, PLNs are equally essential for the effectiveness of a Connectivist Learning Environment (CLE).

Therefore, establishing a CLE where participants could enhance their learning and knowledge through anonymous interactions with experienced members seemed practical and applicable to the Vietnamese educational setting. Even though internet access is widespread, students reported having limited opportunities to connect socially with teachers and peers to acquire and exchange information and knowledge. This was primarily attributed to teachers' time limitations and students' apprehension toward face-to-face or online interactions.

1.4 Research Objectives

This research study is conducted to explore:

1) The extent to which Pre-service English Teachers (PETs)' General Pedagogical Knowledge (GPK) is improved through Connectivist Learning Environment (CLE).
2) How Pre-service English Teachers (PETs)' General Pedagogical Knowledge (GPK) is improved.
3) Pre-service English Teachers' (PETs) perceptions of the usefulness of Connectivist Learning Environment (CLE).

1.5 Research Questions

To achieve the four previously mentioned objectives, this study was conducted to seek answers to the following research questions:

1) To what extent is Pre-service English Teachers (PETs)' General Pedagogical Knowledge (GPK) improved through the Connectivist Learning Environment (CLE)?
2) How is Pre-service English Teachers (PETs)' General Pedagogical Knowledge (GPK) improved?
3) What are Pre-service English Teachers' perceptions of the usefulness of the Connectivist Learning Environment (CLE)?

1.6 Significance of the Study

The study holds paramount significance for several reasons:

Firstly, this study is directly beneficial to PETs, who will teach English as a foreign language in the future. Through participation in the CLE, they may have a good opportunity to create connections with others who are likely to help them quickly and

effectively update their GPK, which greatly impacts their English language teaching in the long run. Through interactions and participation in learning activities with other participants, current, relevant, and contextually-appropriate content or knowledge is generated (Siemens, 2006) and continual learning is facilitated (Dunaway, 2011; Li, Dong, & Huang, 2009). Indeed, for PETs, the CLE is believed to contribute highly to their continuous education. This is possibly a learning model which is applicable to their lifelong learning. The CLE is a place for experienced EFL teachers who participate in this study to share their expertise and learn current professional knowledge from other teachers. This may result in positive changes in their teaching behaviors and methodology.

Secondly, it is identified by the researcher of this study who has over 7 years of experience in instructing PETs at TDTU that updating GPK is of great importance for them. While learning at the university, and after graduating to become high school teachers, PETs face the ongoing need to actively seek and update their GPK to improve their ability to teach. However, this has not been included in the curriculum programs. The construction of the CLE will strengthen the curriculum in a way that it offers a self-regulated learning environment in which PETs can participate to seek and update their PGK from the beginning of their third year. They, therefore, ensure their lifelong learning, which has a great impact on their future career.

Thirdly, this study contributes insight into a practical application of Connectivism in developing a CLE with a focus on the learners' creation of their PLNs that have not received much research attention from researchers in the field for the last fifteen years. The findings of this research may offer additional empirical evidence demonstrating that in CLE, building a personal learning network with a focus not only on the PLEs but also on the PLNs may bring about success in learning. In other words, the results of this present research may help to build a more complete description of a connectivist learning network, which is noticeably the most important concept in Connectivism.

Finally, the findings of this study could have potential implications in developing a similar CLE for in-service teachers and for learners of different subjects at the university who are likely to be geographically isolated but need to seek and update knowledge.

1.7 Scope and Limitations of the Study

The study has potential limitations as indicated below:

Firstly, the sample is not big. It is drawn from a single university, and is not randomly selected; therefore, results may not be generalizable to all universities.

Secondly, numerous variables beyond the researcher's control, such as participants' English proficiency levels, time availability, and Internet access could impact their participation in the CLE.

Thirdly, some in-service teachers considered experienced participants or experts may not actively participate in the discussions as they might think that the CLE is mainly constructed for the sake of PETs.

Finally, it appears that most participants are geographically dispersed, so gathering all of them for the pretests, and the posttest during the implementation of the study may be a challenge for the researcher. Without flexible and logical time arrangements, this may result in incomplete implementation of these research instruments.

1.8 Operational Definitions of Key Terms

This section presents the definitions of key terms employed in this study.

1) Connectivism: Connectivism, as conceptualized by Siemens (2006), is a theoretical framework that views learning as a networked process influenced by technology and social interactions. According to this theory, knowledge and cognition are distributed across networks including individuals and technology. Learning is thus characterized by the dynamic process of connecting, expanding, and navigating these networks (Siemens & Tittenberger, 2009).

2) **Connectivist Learning Environment (so-called ELT Nexus):** refers to a social network site with a user-friendly interface like Facebook. This learning platform facilitates seamless access and communication among its members, allowing them to exchange timely and relevant information.

3) **Connectivist Learning Networks:** as defined by Siemens (2006), are structures deliberately formed to enable individuals to remain current and continuously engage in the processes of acquiring experience, creating, and connecting new knowledge. These networks serve as dynamic platforms for ongoing learning and knowledge development. In a CLE, two main components are PLNs and PLEs. PLNs comprise social networks, while PLEs are constructed using technological networks (Marín et al., 2014).

4) **General Pedagogical Knowledge (GPK):** refers to the understanding of teaching and learning processes. It encapsulates the specialized knowledge teachers possess to create effective teaching and learning environments for their students (Guerriero, 2017). GPK consists of five sub-dimensions: (1) understanding of classroom management, (2) familiarity with teaching methods, (3) comprehension of classroom assessment, (4) insight into learning processes, and (5) awareness of individual student characteristics (Voss, Kunter, & Baumert, 2011).

5) **Personal Learning Environments (PLEs):** are digital environments that learners construct themselves. These PLEs encompass a range of tools, data sources, connections, and activities that individuals typically utilize to facilitate their learning process (Torres Kompen et al., 2015).

6) **Personal Learning Networks (PLNs):** Personal Learning Networks (PLNs) refer to a community of individuals who collaborate to exchange knowledge and resources (Marín et al., 2014). The interaction in a PLN can occur through technology or face-to-face. For this study, PLNs were defined as any network of participants who interact to distribute knowledge.

7) **Pre-service English Teachers:** refers to third or fourth year university students in English teacher education programs who are preparing to become teachers at public or private high schools after their graduation.

1.9 Chapter Summary

To summarize, this chapter starts with an overview of the background, proceeds with outlining the statement of the problem, rationale, purpose of the study, research questions, significance, and the scope and limitations of the study. It concludes by providing operational definitions of key terms used in the research. The subsequent chapter will delve into a critical review of relevant literature and previous empirical studies on the topic under investigation, providing a detailed description, elaboration, and discussion.

CHAPTER 2
LITERATURE REVIEW

This chapter critically examines the literature pertinent to the current research. The review is composed of seven sections. Firstly, it introduces Connectivism, providing a detailed discussion about knowledge, learning, and learning models. Secondly, a brief account of educational technology is introduced. Thirdly, GPK and its dimensions are presented. Fourthly, CLE and factors influencing learning in an online environment are described. Fifthly, related Connectivism-based research studies are reviewed, followed by identifying the theoretical gap and presenting the theoretical framework for the study. The chapter ends with a summary of what has been previously stated.

2.1 Connectivism

In the digital or information age, technology exerts a robust influence over people's lives, communication, and learning (Siemens, 2005, 2006). Rapid technological advances have made the development pace of information and knowledge faster. As pointed out by Siemens (2005, 2006), nowadays, the world's knowledge doubles every 18 months instead of every ten years, resulting in a shorter lifespan, larger quantity, and greater complexity of information and knowledge. With constant change of knowledge, an individual is incapable of handling numerous knowledge or becomes overwhelmed by knowledge abundance. Apart from many other theories that assume that learning is a cognitive process that occurs within the mind of an individual, Connectivism recognizes that learning nowadays is too complex to be processed in this way. Siemens (2006) suggests that learners should rely on a network consisting of both people and technologies to access, store, and retrieve information. Undeniably, network learning has become more and more common. In the digital age, Connectivism should be considered a requirement as it provides insight into a new way of learning (Boitshwarelo, 2011). Since introduced by Siemens in 2005, Connectivism has been widely discussed in relation to its appropriateness as a learning theory, particularly within the realm of online teaching and learning. Despite its limitations, Connectivism is recognized by numerous researchers in the field as a new learning theory (Aldahdouh, 2019; Aldahdouh et al., 2015; Downes, 2008; Goldie, 2016; Shriram & Warner, 2010; Veselá, 2013) and as a pedagogical approach (Conradie, 2014;

Dunaway, 2011; Rice, 2018; Wang et al., 2014) for network learning in e-learning environment.

2.1.1 Definition of Connectivism

Connectivism, as a recently developed learning theory, synthesizes principles from various fields, including network theory (Barabási, 2002), chaos theory (Gleick, 2008), complexity theory (Mason, 2008), and self-organization theories (Wiley & Edwards, 2002). In Connectivism, learning is understood as establishing networks, which include connections among various entities like experts, databases, blogs, and websites (Downes, 2007; Siemens, 2005). These networks are fundamental to the learning process (Barabási, 2002). According to Siemens (2005), connectivist learners can share their ideas with others by using networks. Chaos, which means the failure to make predictions, recognizes the connections of everything to everything (Gleick, 2008). In Connectivism, unpredictability is acknowledged as a fundamental characteristic of all networks. Siemens suggests that "chaos is a new reality for knowledge workers." For connectivist thinkers, "chaos states that meaning exists," emphasizing the task for learners and educators to "recognize the patterns that appear to be hidden" (Siemens, 2005, p.4). Complexity, as a science, refers to learning as a process of 'emergence and co-evolution of the individuals, the social group and the wider society'. It emphasizes the relationship between elements and considers the human mind as 'a complex adaptive system' as knowledge is emergent (Morrison, 2008, p.21). According to Strong & Hutchins (2009), the complexity of learning in the world of rapidly growing information is attempted to be captured and reflected in Connectivism. Self-organization is defined as the "spontaneous formation of well-organized structures, patterns, or behaviors, from random initial conditions" (Rocha, 1998, p.3). Wiley and Edwards (2002) recognize the significance of self-organization as a fundamental aspect of the learning process. Learning, characterized as a self-organizing process, necessitates that the system, whether personal or organizational learning systems, "be informationally open, meaning it should have the capability to categorize its interactions with its environment and adapt its structure accordingly" (p. 4). Self-organization represents a micro-process occurring within broader self-organizing knowledge frameworks established within corporate or institutional settings. The capacity to form connections between information sources and generate meaningful patterns of information is crucial for learning within our knowledge-based economy (Siemens, 2005). On a personal level, self-organization represents a micro-process occurring within broader self-organizing knowledge frameworks established within corporate or institutional settings. The capacity to establish connections between

information sources and generate meaningful patterns of information is crucial for learning within our knowledge-based economy (Siemens, 2005). In summary, in Connectivism, chaos, network, complexity, and self-organization theories are pivotal for learning through discussion and collaboration with peers within an online environment (Aksal et al., 2013).

2.1.2 Connectivism in Relation with Other Learning Theories

It is widely accepted by researchers in the field that Connectivism is just an extension or an updated version of Constructivism in which social constructivist philosophies or principles are principally discussed (Fini, 2009; Kerr, 2007; Kop, 2011; Kop & Hill, 2008; Mackness et al., 2010; Mattar, 2018). Still, others think it draws upon Constructivism and Cognitivism (Conradie, 2014; Mallon, 2013). Hence, these two learning theories should be meticulously reviewed to understand Connectivism completely.

Cognitivism

It is not surprising that Cognitivism emerged as a reaction to behaviorists' perceived "simplistic" and "rigid" focus on predictive stimulus and response patterns (Harasim, 2012, p.58). Cognitivists view the human mind as a computer that should be opened and understood. Input and data are believed to be obtained, managed in short-term memory, stored in long-term memory, and retrieved into short-term memory when necessary (Darrow, 2009). Knowledge is not only facts but also opinions negotiated through experience. Therefore, learners' logical capability for learning, like thinking, inferring, contrasting, and problem-solving, should be employed in processing information (Aldahdouh et al., 2015). In the cognitivist learning model, learners are seen as passive recipients of knowledge (Foroughi, 2015), and learning is often understood as the process of encoding input into short-term memory where the coding of information for future recall is done (Miller, 2003).

Constructivism

Constructivism, grounded in a learner-centered view of teaching, recognizes the complexity of real-life learning. Masethe et al. (2017) believe this learning theory is grounded in cognitive psychology. As knowledge does not move into a learner, it is their responsibility to actively construct knowledge to understand their experience when interacting with an environment. Learning requires the learner's active involvement in a self-directed process, during which the learner designs, assesses, and establishes learning strategies (Eskelinen et al., 2004). Obviously, the learner is not regarded as an empty vessel to be filled with knowledge (Mason & Rennie, 2008) but as a dynamic recipient and controller of knowledge (Eskelinen et al., 2004).

Connectivism

Such principles as chaos, self-organization, complexity, and networks provide a basis for Connectivism as an educational theory. The epistemological framework for Connectivism is provided by the notion of connected, emergent, and adaptive knowledge (Siemens, 2005). Knowledge is now believed to exist in the outside world rather than in an individual's mind. As it is fundamentally distributed across a network (Siemens, 2005; Techakosit & Wannapiroon, 2015), knowledge is not assumed as an object to be transferred or constructed but as a network of information (Chatti et al., 2010). For connectivists, learning is a process in which a learner forms connections with a learning community and feeds information into it. Learning happens not only inside and outside of an individual but also outside to the world (Barnett et al., 2013; Siemens, 2004, 2005) through interactions and connections within networks (Downes, 2012).

Connectivism is believed to bear the closest resemblance to Constructivism, particularly social Constructivism, which focuses its principles on learners' social interaction and collaboration. Knowledge and learning in Connectivism are believed to be fundamentally social (Chatti et al., 2010). This implies that knowledge is actively co-constructed through the learners' process of negotiating meaning. (Song, Liang, Liu, & Du, 2012). It is essential to acknowledge that learners hold a central position in the learning process within both Constructivism and Connectivism (Kizito, 2016). Like Constructivism, Connectivism does not consider a learner as a recipient of knowledge. Instead, it authorizes and facilitates learners to drive different actions that are not determined and predicted in advance (Chatti et al., 2010). Learners possess the ability to autonomously direct their learning and produce knowledge through interactions with others within networks consisting of both individuals and technological elements.

It is pointed out by Downes (2005, 2010) and Duke et al. (2013) that Connectivism was born as an alternative to Behaviorism, Cognitivism, and Constructivism in response to the increasing use of educational technology (Mattar, 2018). It emerges as an innovative theoretical framework for comprehending learning in the digital era (Voskoglou, 2022). Different from the three above-mentioned theories which view knowledge as a personal possession and the individual brain as a container on which learning depends largely to understand and facilitate the learning process. As knowledge is assumed to be distributed across networks of information, learning is believed to happen through social interaction with and between networked nodes to tackle problems (Downes, 2007). This also means that knowledge in Connectivism is not exerted as a goal, and learning is not only the coding of input but the construction

of knowledge based on experience as well. Additionally, in Connectivism, the value of the content rather than the process of learning is emphasized (Veselá, 2013). As Connectivism explicitly considers the effects of technologies on learning, it is more likely to provide a valuable framework for understanding learners' activities in the technology-enabled environment.

In a CLE, learners are not assumed to be taught usually in the classroom by the teachers who actively collect resources based on his or her interests and present them to their students (Bell, 2011). However, the learners readily access the resources and perhaps before the teachers with the facilitation of different technologies (Siemens, 2018). According to (Al-Shehri, 2011; Bell, 2009, 2010, 2011; Siemens, 2004, 2005), Connectivism is proposed to succeed Behaviorism, Cognitivism, and Constructivism by more effectively meeting learners' requirements in the digital era, in which information is continually being developed, distributed, and obtained.

In short, the review of learning theories shows that Connectivism is closely related to Cognitivism and Constructivism. The literature suggests that in a Connectivism-based learning environment, connectivist learners make social connections with knowledgeable others who can provide sound and updated knowledge. When they get new information from their connection or interaction with others, they cognitively code or critically process it and finally construct their knowledge. Therefore, it is seen in this study that principles of Cognitivism and Constructivism also play a crucial role. Connectivism is where knowledge is gained whereas Cognitivism involves the thinking process, and Constructivism refers to the concept of knowledge construction.

2.1.3 Knowledge and Learning in Connectivism

As indicated by Miller (2009), Connectivism is defined as “a merger between learning and knowledge using technology as a medium, and this is presented within personal learning networks” (p. 20). The literature review shows how knowledge and learning are viewed differently in Connectivism compared to other dominant learning theories. Therefore, knowledge and learning in Connectivism should be investigated to comprehend this learning theory further.

2.1.3.1 Knowledge in Connectivism

Knowledge in Connectivism differs from that in other dominant learning theories, namely Behaviorism, Cognitivism, and Constructivism. According to the behaviorist view, knowledge is considered a physical product that should be obtained, and learning is a fact-transferring process to a learner’s mind from an educator through rewarding-punishing mechanisms (AlDahdouh et al., 2015).

Cognitivists argue that knowledge is not only facts but theories and opinions. According to this perspective, learning is regarded as a process wherein a learner engages their logical capacity to process information. Constructivists recognize the complexity of knowledge and see learning as “messy and complex”. They assert that knowledge is situated within the mind of the learner and is constructed through the process of creating meaning. It is widely accepted that knowledge in Connectivism is not suitable as a product as it may be revised, connected, and indefinitely changed in a myriad of ways by the individual. Connectivist knowledge is seen as “a river” and “not a reservoir” (Siemens, 2005, p.2). As knowledge is characterized as emergent (Siemens & Tittenberger, 2009), dynamic, living, and evolving (Marhan, 2006; Pegrum, 2009), it is believed to be gained through learner's interaction with other people and information resources.

2.1.3.2 Learning in Connectivism

Learning in Connectivism is said to occur both inside and outside the world and in technology devices, and learning is to make and update connections with other people and knowledge sources (Siemens, 2006). As information is believed to be continually and rapidly changing, the connection that makes it possible for us to gain more knowledge outweighs our current state of knowledge. Siemens (2004) emphasizes that "the pipe is more important than the content within the pipe" (p.6). This implies that learners' capability to establish connections and utilize networks to access necessary information is crucial. What is currently learned is not as important as the capability to learn. “Know where” and “know who” is more important than “know what” and "know how” (Siemens, 2006, p.32). The capacity to differentiate between important and unimportant knowledge is the key element for learners to succeed in their learning journey (Shrivasta, 2018; Vas et al., 2018).

2.1.4 Principles and Characteristics of Connectivism

As stated by Siemens (2004, 2005), Connectivism integrates the principles from such theories as network, chaos, complexity, and self-organization. All eight core principles identified by Siemens (2005) (see Figure 2.1) are found to be most relevant to the current study and, therefore, adopted.

1. Learning and knowledge rests in diversity of opinions.
2. Learning is a process of connecting specialized nodes or information sources.
3. Learning may reside in non-human appliances.
4. Capacity to know more is more critical than what is currently known
5. Nurturing and maintaining connections are needed to facilitate continual learning.
6. Ability to see connections between fields, ideas, and concepts is a core skill.
7. Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
8. Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision

Figure 2.1 Conceptual Principles for Learning in the CLE (Siemens, 2005)

Downes (2006, 2010, 2012) overtly claimed that openness, autonomy, diversity, and connectedness are four conditions proven to bring about success in learning in a Connectivism learning environment. In this research project, these four conditions are believed to play a crucial role in making learning happen:

(1) Autonomy or learner agency is identified by “concepts of choice, expression of self-control, and independence” (Abhari, 2017, p.2). In an autonomous learning environment, learners are capable of guiding themselves according to their own goals and objectives (Downes, 2010) and have a free choice of “where, when, how, with whom, and even what to learn” (Mackness et al., 2010, p.4).

(2) Connectedness or connectivity is the connection between nodes in networks (Downes, 2012) to facilitate continuous learning (Dunaway, 2011). In connectivist learning environments, connectivity suggests encouraging 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 widest possible scope of viewpoints from its members, and

(4) Openness refers to open communication through networks to gain knowledge, share resources, ideas and expertise and create new information and insight (Firdausiah & Yusof, 2013). It also allows learners to freely log in and out the learning environment (Downes, 2012).

2.1.5 Learning Model in Connectivism

It is easily seen that connectivist learning models view learning and knowledge differently from those in former learning theories. According to Aldahdouh et al., (2015), former learning theories follow an identical educational process. Sequentially, the phenomenon is first recognized and debated by scientists. Then, the content or knowledge, usually in the form of books, is generated before it is transferred to learners by teachers. In this content learning model, the teacher may be a transferring agent (Behaviorism) or a facilitator (Cognitivism, Constructivism), and the content plays a critical role. Scientists may generate the aim, and the learners consume or put the product in their minds. This model, however, may not work well in the digital age any longer. Knowledge is said to be significantly and rapidly altered, and its lifespan is becoming shorter than it was before. Therefore, knowledge or content in a book may expire soon after it is written.

The Connectivist learning model proposed by Siemens is conceptualized as a new framework that exclusively views learning as the interaction between learners and content. In this learning model (see Figure 2.2), knowledge is considered to flow through a technology-facilitated network containing “nodes" that can be a database, a human, a content, or a website (Bell, 2009). Learners have a wide choice of nodes they may or may not want to put into their minds. As autonomous nodes in the network, learners differ in their learning aims and how they use the content. They become content generators and not content consumers, while the teacher plays the role of "a specialized node" who has already gained more experience and has more connections with good networks in the field (AlDahdouh et al., 2015).

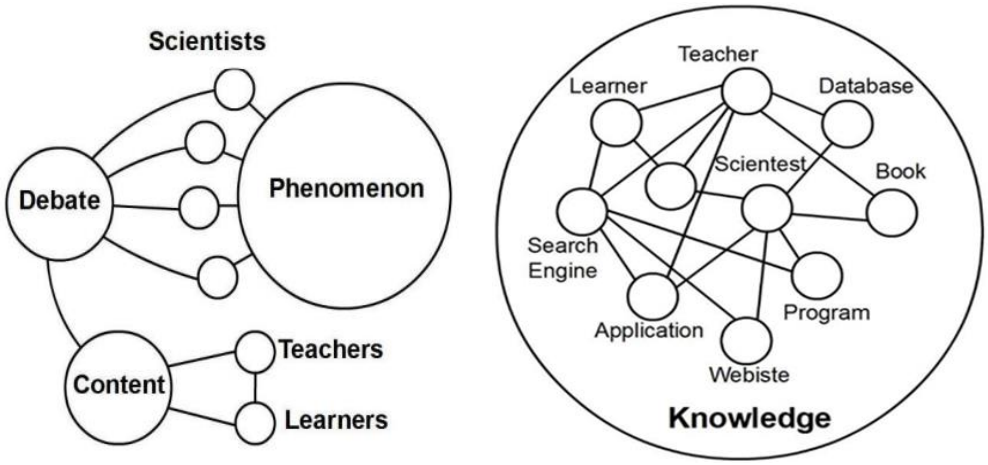

Figure 2.2 Connectivism & Previous Learning Theories Learning Model (AlDahdouh et al., 2015)

2.2 Technology

It is generally agreed that in any online learning, technology plays a vital role in supporting learners in their learning process. Technology can help them perform most of the cognitive activities such as organizing, storing, and retrieving information (Garcia & Ferreira, 2014), makes the connections with others and the flow of information more feasible (AlDahdouh et al., 2015), increases learners' access to information (Ergen & Kanadli, 2017), and keeps learners up-dated (Downes, 2005, 2006; Siemens, 2006). According to Bates (2019), technology is defined in many ways, ranging from the basic notion of tools to systems. Technologies in education are referred to as things or tools employed to support teaching and learning activities. In this respect, computers, software programs such as a learning management system, networks, and web applications are all technologies.

2.2.1 Characteristics of Technology Selection

In a digital age when learners are immersed in technology, technology selection for teaching and learning is critical to the teacher's teaching and students' learning. The appropriately selected technology can help students achieve their learning goals and may bring about positive learning outcomes. Therefore, some researchers have proposed valuable technology selection models. As suggested by Siemens and Tittenberger (2009), the following should be done to use technology for learning effectively. First, the learning context should be carefully evaluated. Then, the extent to which the technology is integrated into the learning context should be determined. Next, features of technologies need to be rationally planned for use. Finally, planned technologies should be evaluated against learning principles. Bates (2019) introduces a model for technology selection and application. The SECTIONS model is research-based and has been found effective and practical (see Figure 2.3). The eight criteria for selecting technology for learning are:

1) "Students" which involves three issues such as students demographics, their access to technology, and their differences in the ways they learn;
2) "Ease of use" which mentions quick and easy-to-use technology, orientation for "novice" students, computer information literacy, interface design, reliability, and robustness of the technology;
3) "Cost" is put into different categories, such as development, delivery, maintenance, and infrastructure costs;
4) "Teaching functions" which include affordances of media or technology;
5) "Interaction" which explains how numerous types of technology enable various types of interaction;

6) “Organizational issues” introduce issues such as an institution’s willingness to employ technology for teaching;
7) “Networking” discusses the selection of media or technology to help learners create connections with others who are experts and professionals in the field; and
8) “Security and privacy” which stresses the necessity of confidentiality for teaching and learning in a digital age (pp. 457-515).

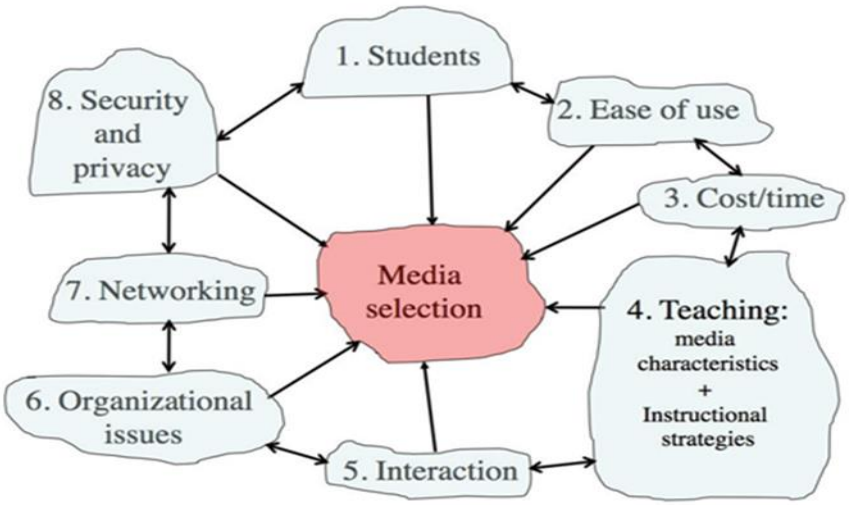

Figure 2.3 The SECTIONS Model (Bates, 2019)

2.2.2 Social Technologies

2.2.2.1 Definition of Social Technology

According to Alberghini et al. (2010), social technologies can be defined as technologies used on any social basis and include social hardware (traditional communication media), social software (internet-enabled computer-mediated media), and social media (social networking tools). With the facilitation of social technologies, learners can experience the distributed nature of knowledge and discover and navigate connections of 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 (Meichenbaum, 2017). In particular, four characteristics of Connectivism, namely openness, autonomy, diversity, and connectedness, are believed to be effectively operationalized by social technologies (Abhari, 2017).

2.2.2.2 Social Networking Sites (SNSs)

In social technology, social networking sites (SNS), or social networking websites, provide platforms for interaction, connectivity, and access that encourage interactions and socially negotiated experiences as a base for social learning (Aksal et al., 2013). Learners use them to share ideas, information, images, audio, and video files (Álvarez Valencia, 2014; Manjunatha, 2013). Many research studies have proved that social networking sites such as Facebook, Twitter, LinkedIn, My Space, and others have become an integral part of university student's daily lives and play an active role in facilitating learning and teaching activities as well as academic performance (Jain et al., 2012; Lalnunpuii & Verma, 2019). In their research study, Mehmood and Taswir (2013) found that students were engaged in their learning and spent more than two hours per day on social networking sites, likely improving their academic performance. Other researchers recognized that social networking sites played an essential role in enhancing students' social presence (Helou & Rahim, 2014; Joksimović et al., 2015; Lim & Richardson, 2016) and their collaboration with others (Yu et al., 2010). SNSs were also found to facilitate communication and improve student interactions (Samad et al., 2019). "Through involvement, collaboration, peer-supported learning, and feedback, SNSs might potentially improve students' learning experiences" (Dash et al., 2022, p. 10). Noticeably, in a survey on students' perception and use of SNSs conducted by Haneefa and Sumitha (2011), SNSs users were mainly distressed because of the lack of security and privacy. Therefore, security and privacy should be guaranteed to ensure that SNSs work best for students.

2.3 General Pedagogical Knowledge (GPK)

GPK is widely discussed among researchers due to its paramount importance for teaching (König et al., 2014). According to Guerriero (2017), GPK helps build effective teaching-learning spaces. GPK is also viewed as a teacher's foundation of knowledge (Blömeke, 2017; König et al., 2011).

2.3.1 Definitions of GPK

The literature review of many empirical studies regarding GPK revealed various definitions, some of which shared the same components (see Table 2.1). It is pointed out by König (2017) that teacher knowledge is comprised of content knowledge (CK), pedagogical content knowledge (PCK), and general pedagogical knowledge (GPK) among which pedagogical content knowledge (PCK), and general pedagogical knowledge (GPK) are indispensable for a teacher (Sothayapetch et al., 2013). Voss, Kunter, and Baumert (2011) defined it as a crucial kind of knowledge to

create and optimize student teaching and learning environments. It includes "broad principles and strategies of classroom management and organization that appear to transcend subject matter," as well as knowledge about learners and learning, assessment, and educational contexts and purposes (Shulman, 1987, p. 8). Grossman and Richert (1988) asserted that GPK involves "knowledge of learning theories and general principles of instruction, knowledge about various educational philosophies, and general understanding of learners and principles and techniques of classroom management" (p. 54). König et al. (2011) suggested a model of GPK that includes dimensions such as learning objectives, lesson plans, lesson process, lesson evaluation, learner motivation, classroom management, teaching methods, and types of assessment. In addition, Voss et al. (2011) proposed another model of GPK which combines both pedagogical and psychological aspects. GPK is seen as a multi-dimensional construct that includes knowledge of classroom management, teaching methods, classroom assessment, learning processes, and individual student characteristics. To conclude, three broad areas constituting GPK are student-related, teaching-related, and contextual characteristics (Leijen et al., 2022). Mainly, it involves nine dimensions or components: assessment, educational context and purpose, motivation, classroom management, learning theories and methods, learning processes, individual student characteristics, lesson planning, and general principles of instruction.

Table 2.1 Definitions of General Pedagogical Knowledge (GPK)

Authors	Shuman (1987)	Grossman and Richert (1988)	König et al. (2011)	Voss, Kunter and Baumert (2011)
Categories of GPK	• classroom management & organization • knowledge about learners and learning • knowledge about educational contexts & purposes • assessment	• classroom management • learning theories • learners and learning • general principles of instruction • educational philosophies	• motivation & classroom management • use of teaching methods • structure of learning objectives, lesson planning, process, & evaluation • assessment	• classroom management • teaching methods • individual student characteristics • learning processes • classroom assessment

2.3.2 Dimensions and Subdimensions of General Pedagogical Knowledge

As previously mentioned, only three dimensions of GPK were the main focus of this study. Therefore, dimensions such as lesson planning, classroom management, learning theories, and teaching methods were elaborated. The first dimension, lesson planning, is identified as one of the important dimensions of GPK in many studies. It mainly refers to the teacher's selection of the appropriate teaching strategies and methods (Choy et al., 2012, 2013; Hudson et al., 2015; Wong et al., 2008), as well as structuring the lesson process and learning objectives (König, 2013; König et al., 2014; König & Pflanzl, 2016; König & Rothland, 2012) and selecting and preparing appropriate content (Choy et al., 2013; Hudson, 2004) and resources to implement a curriculum (Choy et al., 2012; Happo & Määttä, 2011; Wong et al., 2008), writing down lesson plans (Choy et al., 2012).

Capel et al. (2009) defined GPK as the 'broad principles and strategies of classroom management and organization that apply irrespective of the subject' (p. 52). Building rapport in the classroom includes, for example, developing trust, not discouraging or embarrassing students, establishing a relaxed atmosphere, and so on (Gatbonton, 1999). To make contact with students and to be aware of appropriate relationships between teachers and students (Mullock, 2006), behavior and discipline management, and students' support and management on task completion (Leijen et al., 2022).

2.3.3 Measurements of General Pedagogical Knowledge

The results of the literature review showed that teachers' GPK has been assessed using two different methods, including perceived level of knowledge, and testing of knowledge. The first method, perceived level of knowledge, means that participants' opinions of their knowledge levels were asked for using a survey. In their empirical study to assess the levels of primary and secondary school teachers' knowledge and skills, Wong et al. (2008) made use of a 34-question survey which was based on a Likert scale (1- no knowledge at all, 2- not so knowledgeable, 3- uncertain, 4- knowledgeable, 5- highly knowledgeable). The respondents indicated their perceptions of their knowledge level at the beginning and the end of the study across five subgroups: facilitation, care, assessment, management, preparation, and concern. An identical study of self-perceived knowledge and skills conducted by Choy et al. (2012) also employed a survey in which the participants rated four to seven elements per factor on a 5-point Likert scale to report their perceptions of their knowledge level. The second method, testing of knowledge, involved teachers in a test situation to directly assess their knowledge level (Malva et al., 2020). According to König et al.

(2011), the dominant instrument in this field of study, the TEDS-M (Teacher Education and Development Study in Mathematics) test, was jointly developed among teacher educators from Germany, the United States, and Taiwan to measure teachers' GPK. This TEDS-M test includes four main topics, namely structure, motivation/classroom management, adaptivity, and assessment, and was claimed to provide evidence for test validity and reliability (König et al., 2011).

2.4 Connectivist Learning Environment (CLE)

It is highlighted by Brindley, Blaschke, and Walti (2009) that having access to education means having access to available content and a rich learning environment that allows for interaction and connectedness. According to Banihashem and Aliabadi (2017), Connectivism-based online learning provides an environment in which "learners can get access to network nodes and learn through interaction, communication, and flow of knowledge" (p. 6).

2.4.1 Definitions of Connectivist Learning Environment (CLE)

Many researchers in the field of Connectivism clearly defined the Connectivist learning environment (CLE) and the learners 'roles. Techakosit and Wannapiroon (2015) defined it as an environment that supports and inspires learning through establishing a network and sharing and gaining information with the facilitation of technology. Siemens (2005) asserted that in the CLE, the learning management or control was shifted from educators to learners. Learners were allowed to interact with others to generate or develop their knowledge. They can also autonomously make contributions based on their knowledge, values, and decisions; therefore, all perspectives are welcomed as diversity of viewpoints is encouraged (Thota, 2015). As learning in a CLE is a more complex type of learning; therefore, learners themselves can navigate their learning by deciding which information is essential and valuable for them (Wang et al., 2014), aggregating various resources, identifying relations between old and new knowledge, creating learning materials, and sharing their insights with others in such a learning environment (Kop, 2011).

2.4.2 Connectivist Learning Networks

The idea of using networks to understand learning in the connectivist learning environment has been brought together by Downes (2007) and Siemens (2005). According to these two founders of Connectivism, networks are connections between or among learning nodes such as databases, experts, and websites to share different sources of information. Networks are believed to connect to form more extensive networks. As a matter of fact, "each node in a larger network can be a

network of nodes itself. A community, for example, is a rich learning network of individuals who in themselves are completed learning networks" (Siemens, 2005, p.1). Therefore, connections are formed not only between nodes but networks of nodes as well. Everything (people, groups, and systems) can form networks within which changes may affect the entire system (Veselá, 2013). Downes (2007, 2008) claimed that networks may 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 (2006) believes that networks are a way to successfully face the challenges in the information age. He highlights that knowledge life is rapidly diminishing; therefore, creating learning networks can help learners keep themselves updated and enable them to gain and create knowledge. It is possible to state that Connectivism learning networks put the responsibility of learning on learners, which requires them of abilities to regulate their learning (Rice, 2018); hence, successful learning networks are suggested by Downes (2006, 2007, 2012) to have such characteristics as diversity of viewpoints, autonomy of participants, openness, and connection and interaction between nodes.

Networks are believed by Siemens (2006) as a way to successfully face the challenges in the information age. He highlights that knowledge life is rapidly diminishing; therefore, the creation of learning networks can help learners to keep themselves up-dated and enable them to gain and create knowledge. It is possible to state that Connectivism learning networks put the responsibility of learning on learners, which requires them of abilities to regulate their learning (Rice, 2018); hence, successful learning networks are suggested by Downes (2006, 2007, 2012) to have such characteristics as diversity of viewpoints, autonomy of participants, openness, and connection and interaction between nodes.

2.4.2.1 Learning Nodes

It is well-understood that networks require nodes and connections. According to Siemens & Tittenberger (2009), a node refers to a neuron in the neural network, a concept in a conceptual network, and a person or a connection-accepting entity in an external network. Among the three types of nodes (neural, conceptual, and external), external ones include other types, such as people, websites, databases, organizations, and other sources of information (Siemens, 2006). Noticeably, Downes (2007) pointed out that in a node, every individual entity is comprised of supplementary entities. Therefore, a node may be a group of people that belong to a larger network. According to Barabási (2002), there is continual competition among learning nodes for connections to ensure their survival in an inextricably intertwined

world. It is shown in the literature that within a network, nodes of less value will be weakened and may lose connections within the network (Siemens, 2006), whereas those that are exposed more in the network gain in popularity when they are increasingly connected by other nodes (Darrow, 2009). Nodes that acquire more excellent profiles will be more successful at acquiring additional connections (Marhan, 2006). It should be noted that in a network, learners are autonomous nodes, and teachers are “mature” or “specialized” nodes who have already connected to an excellent network in the field, such as other researchers, books, journals, websites, databases, mobile applications, and others (Aldahdouh et al., 2015).

2.4.2.2 Learning Connection

Learning in Connectivism is a learner’s connections with different learning nodes in a network. When learners refer to a book, ask a teacher, interact with fellow learners, visit a website, and even talk to themselves, they are all considered connections (Aldahdouh, 2019). Internally and externally made connections are links between both nodes and networks of nodes. It can be understood that connections are an integral part of a node, as the more robust the connection is, the faster information will flow between the nodes (Anderson, 2008). In other words, there will be no flow of information without connection and vice versa.

Within a network, technology makes the connections and the flow of information more feasible (Aldahdouh et al., 2015). It becomes clear that connections enable learners to share knowledge (Vas et al., 2018), and nurturing and maintaining connections are necessary for facilitating continual learning (Siemens, 2004, 2005).

2.4.2.3 Personal Learning Environments (CLEs) and Personal Learning Networks (PLNs)

It is pointed out by Marín et al. (2014) that connectivist learning networks are composed of personal learning environments (PLEs) and personal learning networks (PLNs). Learners use technological networks (multiple technologies) to create his or her PLE and social networks in their PLN. PLEs are technologically based environments created by learners. Torres et al. (2015) state that "A PLE may be described as the set of tools, data sources, connections, and activities that each person commonly uses to learn" (p. 120). However, Yen et al. (2016) argue that PLEs are both technological and pedagogical concepts because they allow learners to manage and personalize their learning. The research by Dabbagh and Fake (2017) demonstrates that learners are intrinsically motivated by the feeling that their learning is made more personal and connected by PLEs. PLEs are employed by learners to gain access to

information and acquire knowledge. They, for instance, actively and autonomously collect and organize information through PLEs.

PLNs are, on the other hand, a group of people who share knowledge and resources. In a PLN, knowledge contribution is made by each individual's PLE to collaborate with others (Marín et al., 2014). As PLNs aim to help one another succeed in learning (Harding & Engelbrecht, 2015), all individual contributions to learning must be offered to build a successful PLN (Rice, 2018).

It is essential to recognize that PLNs have obvious implications for teaching and learning as they meet all requirements for successful collaborative learning and are considered practical tools for improving social and collaboration skills (Harding & Engelbrecht, 2015). To illustrate, learners discover they can find knowledge, express their ideas, and share their standpoints with the learning community (Marín et al., 2014). According to Lin et al. (2015), PLNs are highly valuable 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 increases their learning management ability.

Both components mentioned above of connectivist learning networks (PLEs and PLNs) are essential for learners to collaborate with others to gain shared information. PLEs are said to be a core part of PLNs (Marín et al., 2014), and true PLNs and PLEs are believed to be controlled by learners, not the instructors (Torres et al., 2015).

2.4.3 Connectivist Learning Process

In Connectivism, knowledge is believed to be distributed over networks. Learning is described as a process in which learners create connections and develop networks to enable knowledge sharing with the facilitation of technology. This learning process is believed to occur when a learner connects with others to feed information (Anderson & Dron, 2011). According to Kop and Hill (2008), learners' ability to see the information patterns and make decisions based on the newly acquired information is considered crucial for the learning process because, in reality, learners continuously look for knowledge, filter necessary or irrelevant knowledge and decide the currency of new knowledge.

Downes (2010) shows learners' process through four stages in a connectivist learning environment (see Figure 2.4). In the first stage, learners seek and collect information online. In the next stage, remixing, information collected from different sources is synthesized and organized. The third stage, repurposing, involves many learners' repurposing activities, such as localizing, modifying, editing, and creating new

content. In the final stage, feed-forwarding, learners are expected to share their knowledge and learning experiences with others through their networks.

It is important to note that the connectivist learning process is cyclical. Kop and Hill (2008) indicated that in the learning process, connectivist learners begin their learning with their connections to a network for information-seeking and sharing. They will then modify their assumptions based on newly gained knowledge. Before searching for new or further knowledge, they reconnect to the network to share what they have understood or perceived. Like Constructivism, learners are central to the learning process in Connectivism. This implies that teachers no longer play a vital role in the learning process once it has begun (Bessenyei, 2008). Therefore, connectivist learners can actively participate in and successfully control their learning process.

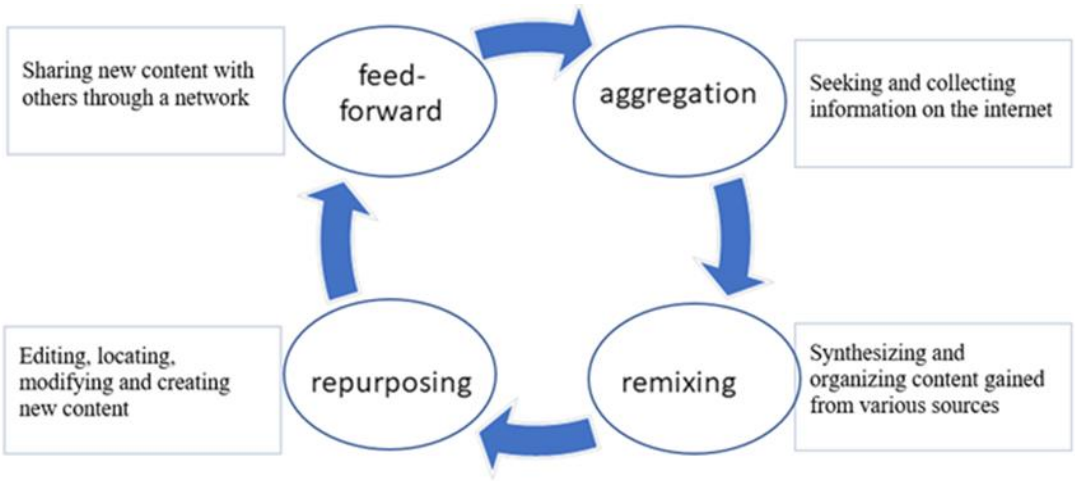

Figure 2.4 Four-stage Connectivist Learning Process (Downes, 2010)

2.4.4 Connectivist Learning Interaction

Interaction, which can be synchronous, asynchronous, or both (Darrow, 2009), plays an essential role in a connectivist learning environment. Interaction has always been highly valued in teaching and learning experiences (Conrad, 2014; Banihashem & Aliabadi, 2017) because learning needs interactions (Mattar, 2018). According to Banihashem and Aliabadi (2017), both connections and interactions refer to "links of nodes in a network that provide the flow of information and knowledge" (p. 5). In this regard, the stronger and closer the connections and interactions between or among the nodes are, the more rapid the flow of information and the deeper the learning content is (Downes, 2012). Admittedly, interactions among people and digital artifacts critically function in the creation of connections, the formation of networks, and the generation of knowledge (Wang et al., 2017). Therefore, interactions are

claimed to be an indispensable part of connectivist learning (Wang et al., 2014). A close review of the literature reveals that learners are more motivated (Mahle, 2011; Wen-chi et al., 2011), cognitively engaged (Wang et al., 2014), and more persistent (Joo et al., 2011; Tello, 2007) if their connections and interactions between and among the nodes are solid and close. A recently constructed framework for interaction and cognitive engagement in connectivist learning by Wang et al. (2014) is based on the framework of the 4-stage learning process by Downes (2010). It includes four levels of interaction: operation, wayfinding, sensemaking, and innovation (see Figure 2.5). This framework truly reflects the learning process, learning interaction, and level of cognitive engagement.

The first level of interaction is considered the most concrete, as the learners use different media and technology to create a PLE. The construction of the PLE at this level seems complicated and may serve as the foundation for online learning.

The next level of interaction involves learner-content and learner-learner interactions. To navigate in the complex Connectivist Learning Environment, learners should be able to determine the value and the importance of the information or knowledge gained during the interaction with others. To do so, finding the right people or relevant information is considered essential for learners.

The third level of interaction is essential to the information networks and the creation of connections. At this level, seeking information, recognizing information patterns, and collaborating, including activities such as aggregation, discussion, reflection, and decision-making, are integral to the learning process. Various nodes in technological, social, and concept networks are tightly connected. Compared to the learner-learner and learner-content interactions in level 2, those in the third one are of greater depth.

The last level of interaction referred to is considered the most abstract. In this level, learners reach the deepest level of connectivist learning as they further reflect and present the outcomes of what has been done in the previous level. This implies that the scope of the other three types of interaction is indeed expanded through this level. These four levels of interaction are reported to be interdependent, as changes in one level of interaction may cause changes in another. As demonstrated in Figure 2.5, the two arrows of different directions refer to the process of circulation and transaction. This shows that each level of interaction influences each other. The lower levels are considered as the base for the development of the higher ones. In contrast, the need for learning at lower levels is extended due to the development of higher levels.

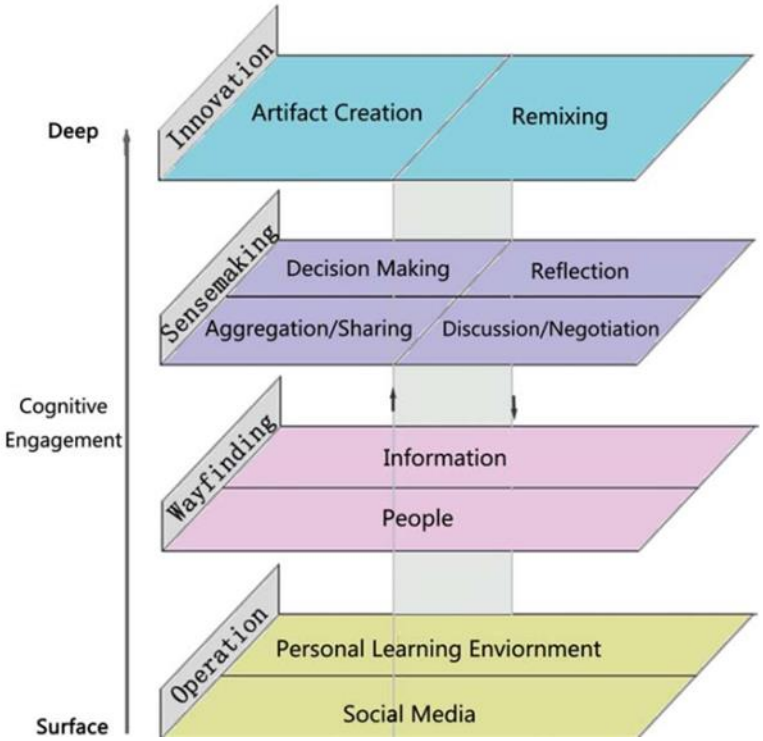

Figure 2.5 Connectivist Interaction and Cognitive Engagement Framework (Wang et al., 2014)

2.4.5 Connectivist Learning Skills

The review of the literature related to learning skills required for successful learning in Connectivism or the digital age shows that learning skills provided by Connectivism are said to be essential for learners to succeed in a digital age (Rennie & Morrison, 2013; Siemens, 2005) and that most connectivist researchers emphasize a learner's utilization of metacognitive skills which are defined as the regulatory activities connected to problem-solving (Brown, 1978) to regulate and control their learning processes.

According to Veenman et al. (2014), learning outcomes are affected by learning behaviors directly shaped by metacognitive skills. Metacognitive skills involve planning, monitoring, and evaluation (Schraw et al., 2006). Delvecchio (2011) explains that planning entails a learner's connection to previous knowledge, planning for using strategies and time. In contrast, monitoring is the learner's self-checking at each stage of the task, and evaluation involves the learner's appraisal of the outcome and reflections on what new knowledge is gained. Metacognitive skills also involve searching, analyzing, and evaluating information (Darrow, 2009), managing information and network connections and recognizing information patterns (Couros, 2009), finding current information, filtering, and making decisions based on that information (Armatas

et al., 2013, 2014; Goldie, 2016; Kop & Hill, 2008), locating, manipulating and evaluating information and knowledge, integrating and applying knowledge to work and life (Brown, 2006), access, analyze, synthesize, evaluate, apply, and reflect on what they learn (Berge, 2002).

Siemens (2006), the founder of Connectivism, proposes several skills learners need to flourish in a digital age. These skills include: 1) 'anchoring', the ability be well-concentrated despite distractions; 2) 'filtering', the ability to handle streams of knowledge and critically select essential and relevant content or information; 3) 'connecting with each other', the ability to build networks to keep oneself updated and well-informed; 4) 'being human together' , the ability to interact with other people; 5) 'creating and deriving meaning', the ability to understand meaning and implication; 6) 'evaluation and authentication' , the ability to evaluate knowledge and ensure validity; 7) 'altered processes of validation', the ability to validate people and their opinions in different situations or contexts; 8) 'critical and creative thinking', the ability to question and look at problem from different perspectives; 9) 'pattern recognition', the ability to recognize patterns and trends; 10) 'navigate knowledge landscape', the ability to direct oneself among people, technology to achieve their intended purposes; 11) 'acceptance of uncertainty', the ability to balance of what is known with the unknown to see how existing knowledge relates to what is not known; and 12) 'contextualizing', the ability to understand the prominence of context (p. 113).

More recently, Bate (2019) claimed that a successful learner in a digital age needed to master such skills as 1) 'communication skills' (the ability to communicate with various groups of people through internet); 2) 'independent learning skill' (the ability to learn independently); 3) 'teamwork and flexibility' (the ability to work collaboratively with others); 4) 'ethnics and responsibility'; 5) 'thinking skills' including a) problem-solving which comprised of understanding and making use of information (Butterworth & Thwaites, 2013), b) critical thinking which refers to a person observing a situation, identifying the problem, analyzing it through the lens of experience and arriving at a conclusive decision to solve it rationally (Richards, 2015), c) creative thinking, and d) strategizing and planning; 6) 'knowledge management' which involves the ability to find, analyze, evaluate, apply, and share information; and 7) 'digital skills' which contain a framework of 6 key aspects such as a) 'operational skills' (the ability to use technology), b) 'formal skills' (the ability to navigate networked technologies), c) 'information skills' (referring to searching, selecting , and evaluating) , d) 'communication skills' (referring to the employment of different communication channels), e) 'content creation skills' (referring to content generated by learners), and

f) ‘strategic skills’ (the ability to use computer and network to reach particular goals) (p. 26).

It can be summarized from the above review of the literature that the skills needed for being successful at learning in the connectivist learning environment (see figure 2.6) should mainly include the following: 1) communication skills, 2) independent learning skills, 3) collaborative working skills, 4) digital skills, and 5) metacognitive skills which consist of various skills like a) accessing, searching and locating information, and planning; b) manipulating or navigating information by filtering, analyzing, synthesizing information, contextualizing and building networks; c) evaluating information by reflecting on what to learn; d) making decision-based on the information gained, recognizing information patterns, and applying knowledge; and e) creating materials and their new knowledge with others.

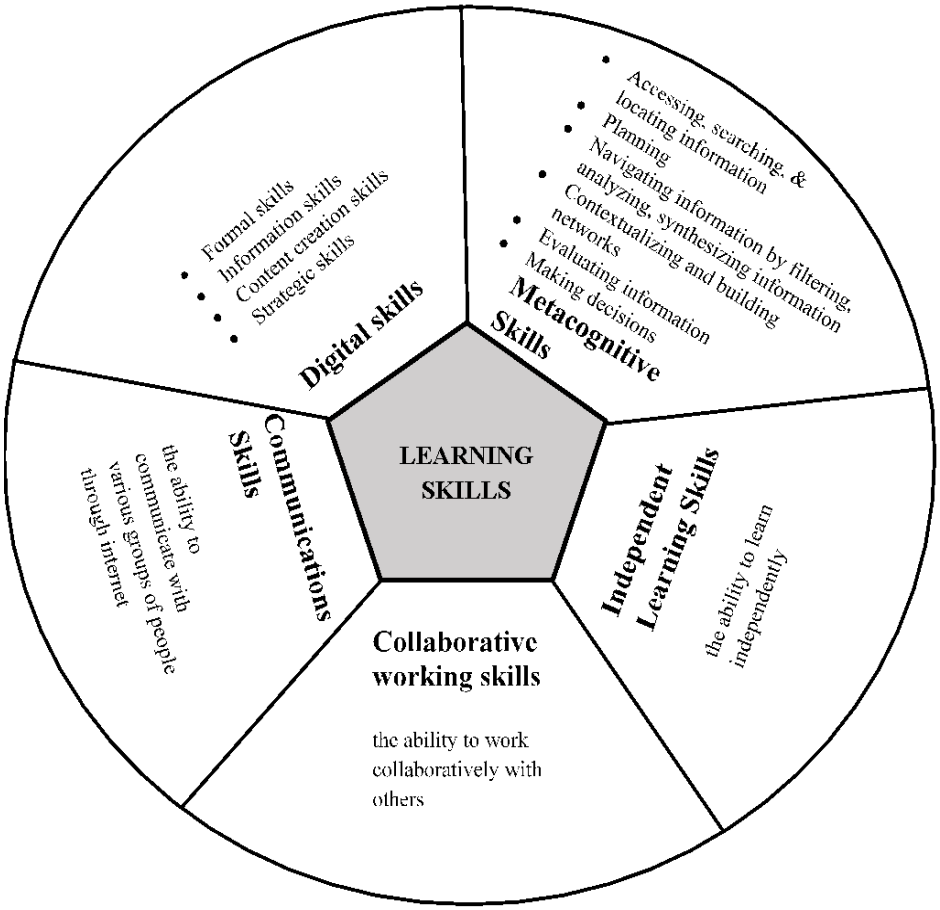

Figure 2.6 A Conceptual Framework of Essential Skills for Learning in a CLE

2.4.6 Connectivist Learning Activities

Connectivism emphasizes the importance of collaboration and networking among learners. It is based on the idea that knowledge is created and maintained through networks of people, ideas, and resources. In the research that examined the possible characteristics and the value of designing connectivist learning activities, Kizito (2016) suggested that the learning activity should be designed to develop, support, and maintain network formation and human connections. According to the researcher, two possible characteristics that are central to a connectivist notion of learning activity design include 1) “a stimulating and motivating learning activity that asks of and allows for learners to create artifacts in personal networks linked to other social networks and 2) a technologically supported environment that supports meaningful dialogue and collaboration’ (p. 24). Hence, such learning activities as Live Chat, Live Stream, Direct Communication, and Social Feeds might benefit learning in a connectivist learning environment as they offer opportunities for knowledge sharing, new information relaying, mutual communication, and interaction.

2.5 Challenges of Connectivism and Factors influencing Learning in an Online Environment

2.5.1 Challenges of Connectivism

Connectivism is a complex learning environment in which learners encounter challenges to have successful learning. Three challenges mentioned by Kop (2011) are the level of learner autonomy for connectivist learning, the need for critical literacies, and the level of presence:

1) learner autonomy or learner agency is defined by Bouchard (2011) as a four-dimensional concept that requires the learner's exercise control over his or her learning in four aspects: a) "conative" dimension of learner autonomy has to do with learner's motivation, personal involvement, learning intention, and satisfaction experienced from the learning process; b) "Algorithmic" dimension of autonomy involves a learner's learning goals setting, selections of necessary learning resources and of appropriate learning activities, and definition of workload and evaluation methods; c) "Semiotic" aspect of learner autonomy refers various information formats which are available to today's learner. The choice of the medium and its organizational form will "largely determine the quality of the learning experience"; d) the last dimension is the "economic aspect," which is related to knowledge value and education cost. Despite its indirect relation to the learning process, this dimension is important in today's knowledge economy (Bouchard, 2011, p. 4).

It is true that in a connectivist learning environment, the learner is not an educator or an educational institution in charge of his or her learning. Specifically, connectivist learners autonomously structure their learning activities and goals (Kop, 2011), evaluate and adjust information, and seek help from knowledgeable others (Downes, 2009). They must also deal with some issues regarding their control over learning activities, language use, communication, motivation, and confidence (Bouchard, 2009).

2) Apart from autonomy, a successful connectivist learner should be digitally and critically literate. The term "digital literacy" is related to "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers" (Gilster & Glister, 1997, p. 1). Although young people today, a so-called "digital native," are believed to feel at ease when working in the online environment as their level of digital literacy is considered high (Prensky, 2001; Tapscott, 2009), they are not as homogeneous as they are thought (Hague & Williamson, 2009). Learners' access to technology is possibly restricted due to their level of education, the status of the economy, geographic region, and gender and race (Hockly, 2012). Another term, "critical literacy" refers to learners' ability to access, evaluate, and filter information. According to Pegrum (2010), it has three different facets, which include 1) the ability to employ different search engines to serve their learning needs smartly and 2) the ability to evaluate different information sources critically. Mainly they should be able to evaluate "the origins, authorship, history, accuracy, objectivity, completeness, currency and relevance of every digital document they encounter; they must learn to notice and see through slick graphic design; and they must learn to compare any given online source with other sources, online or offline" (Pegrum, 2010, p. 5); 3) the ability to critically filter information which is believed to be highly advantageous for learners as there exists too much information for them to access and assess. Due to the absence of an educator who may guide and support learners in selecting, accumulating, and acquiring information, information validation must be made by themselves, and their learning activities are possibly helped by those they can find (Kop, 2011).

3) Dron and Anderson (2007) and Lombard and Ditton (1997) outline the importance of "presence," which is one of the issues about motivation. Like learning in a regular classroom, a successful learner in a connectivist learning environment needs to get support from a teacher and fellow learners in the form of communication, collaboration, and feedback; however, the presence of teachers at all times in a connectivist learning environment (CLE) is not a requirement. They argue that the

"presence" has its links to engagement. The closer the ties between the people are, the higher the level of presence and engagement in the learning activities. Lombard and Ditton (1997) point out that if a learner in an online learning environment is involved in lifelike activities, his or her level of presence will be high.

The challenges mentioned above help raise the researcher's awareness of the problems regarding learner autonomy, learners' need for critical literacies, and the level of presence. To tackle such challenges or problems, the following things are going to be done in the CLE:

1) An adjustable template for goal setting is made available for PETs.
2) Different communication modes are provided, such as audio and video calls and voice and text instant messages.
3) The application of various technological tools employed in the CLE will be carefully guided through in the orientation meeting.
4) Storage space like Google Drive allows PETs to store large and safe files of different kinds.
5) Online dictionaries of different kinds are made ready for PETs to use when they urgently need to check new words or phrases up in the CLE.
6) Information filtering and searching tools are provided to support preservice teachers in searching for information they need or feel interested in the CLE.

2.5.2 Factors Influencing Learning in Online Environment

It is highly recommended by researchers in the field that different factors influencing learning should be carefully considered to build a successful online learning environment.

2.5.2.1 Factors Influencing Learners' Retention

Many researchers agree that dropout rates in online learning environments are likely significantly higher than in traditional learning. (Levy, 2007; Muljana & Luo, 2019; Simpson, 2004; Terry, 2001). Hence, determining factors influencing learners' retention in an online learning environment is paramount.

Online learning is the term that is interchangeably used with "e-learning, internet-learning, distributed learning, networked learning, virtual learning, computer-assisted learning, web-based learning, distance learning, and so on" (Muljna & Luo, 2019, p. 22). According to these authors, online learning has been suffering from low retention rates due to different factors at institutional, instructor, and student levels:

At an institutional level, support from institutions such as student support services, online course orientation (Aversa & Maccall, 2013), tutoring services (Nichols, 2010), technological support (Parkes et al., 2015), and the difficulty level of the academic program or subject matter are "determining factors" of student retention in online courses.

At the instructor level, failure to facilitate student engagement and learning and promote a student's 'sense of belonging' may result in low student retention. As online verbal and visual cues are not obviously exhibited (Alman et al., 2012) and interaction in online and traditional learning environments is expected to be identical (Eliasquevici et al., 2017), online learners do not often have feelings of being connected and supported by their peers when learning in an online (Aversa & Maccall, 2013; Hammond & Shoemaker, 2014; Pinchbeck & Heaney, 2017). Therefore, effective facilitation is essential for deep learning and learner engagement. It should be emphasized that a teacher's presence to encourage learners to acquire knowledge and engage in meaningful discussions with other learners is highly valued by online learners (Alman et al., 2012). Learners always expect teachers to communicate effectively through sufficient and valuable feedback for learning (Shah & Cheng, 2018). Additionally, the findings of research by Shah and Cheng (2018) show that learners seem to be 'quiet' during discussions. They do not actively interact with others and tend to quit classes if they have low or no sense of belonging.

At the student level, behavioral characteristics such as awareness of the learning process, self-regulation (O'Neill & Sai, 2014), metacognition (Lee et al., 2013), self-discipline (Gaytan, 2015), self-efficacy (Gomez, 2013), clear goals, college readiness and technological skills (Shaw et al., 2016) have essential contributions to perseverance, which results in academic success and improvement of student retention (Cochran et al., 2014). Besides, demographic variables are also found among factors leading to student retention (Colorado & Eberle, 2010; Raju & Schumacker, 2015; Wladis & Hachey, 2017).

2.5.2.2 Factors Influencing Learners' Engagement

Engagement is described as an intricate concept composed of factors such as behaviors, cognitions, and emotions. Each of these should be paid careful attention to engage learners effectively (Hollingshead & Carr-Chellman, 2019). Milligan et al. (2013) highlight that understanding learners' nature and engagement is crucial to achieving any online learning environment. According to Hollingshead (2018), keeping learners engaged facilitates learning and prevents them from being bored, which leads to meaningful outcomes and, therefore, prevents learners from dropping out.

Learners are engaged in online learning due to the convenience, accessibility, and flexibility of the learning environment (Hollingshead & Carr-Chellman, 2019) in which the design and the roles of the instructors are considered as determining factors of learner engagement (Pianta et al., 2012). Findings from the research study by Milligan et al. (2013) indicate that confidence, prior experience, and motivation are also essential factors influencing learner engagement in an online environment. Also, in this study, three levels of engagement shown by participants are identified: a) active participants who actively connect with other learners, can overcome challenges, and are highly motivated to pursue the course; b) lurkers who actively follow the course, but do not engage with other learners and do not feel happy with their position; c) passive participants who are frustrated or dissatisfied with the course (pp. 153-155).

2.5.2.3 Factors Influencing Learning Process and Learning Outcomes

According to Keskin and Yurdugül (2020), learner's learning strategies, e-learning readiness, and motivation significantly affect both the learning process and learning outcomes. Pintrich et al. (1991) categorized learning strategies into cognitive, metacognitive, and resource management, enabling learners to manage their learning, process information, and enhance life-long learning. Highlighted by Keskin and Yurdugül (2020), cognitive strategies include 1) 'rehearsal strategy,' which refers to learning through repetition and rehearsal of the learning content to extract it when needed, 2) 'elaboration strategy,' which suggests finding the relationship between new and old information when doing such tasks as summarizing and interpreting, 3) 'organization strategy' which entails selecting and connecting relevant information, and 4) 'critical thinking strategy' which involves applying previously-learned material to a new situation, problem-solving, and critical evaluations (p. 74).

Besides learner's learning strategies, e-learning readiness is viewed as a visible sign of learners' readiness for their learning (Keskin & Yurdugül, 2020). It is believed to help learners flourish in an online learning environment (Yurdugül & Demir, 2017). Learners can use technology tools such as computers and the internet to self-direct, self-control, and self-motivate their learning in an online learning environment (Hung et al., 2010).

The last factor influencing the learning process and learning outcomes is motivation, which is empirically proven to have a strong relationship with learner success and engagement (Baturay & Yukselturk, 2015). According to Şahin et al. (2017), different motivation levels influence interaction patterns in an e-learning environment. Moreover, highly motivated learners are likely to spend more time in an

online learning environment (Rosenberg & Ranellucci, 2017) and employ more cognitive and metacognitive strategies than unmotivated ones (Cho & Heron, 2015).

It is envisaged that learners' retention, engagement, readiness, and learning strategies will be carefully considered in the CLE as they are decisive factors in bringing about successful learning and the success of this research project. To keep preservice teachers engaged, the CLE must be made flexible, convenient, and accessible for them. As mentioned above, various communication modalities and supporting tools are provided to facilitate social interactions among the CLE members. Additionally, the whole system can be easily accessed by personal computers or mobile devices at any time of the day. More importantly, CLE participants are instantly provided help with any problems that they encounter when activating the CLE by the administrator, thanks to the alerting messaging system. To promote PETs' retention in the CLE, only teaching-related knowledge is encouraged to be posted, shared, and discussed to meet their needs. A community of 15 voluntary experienced teachers are also invited to participate in the CLE to provide their practical and updated knowledge and participate in the CLE to provide their practical and updated PGK knowledge and valuable constructive feedback. Besides, all members are anonymous and treated equally in the CLE to motivate them to openly share their pedagogical knowledge and confidently get involved in discussions with others. PETs are mainly introduced to metacognitive strategies and technical skills to facilitate their learning process.

2.6 Previous Connectivism-based Empirical Studies and Identification of Theoretical and Practical Gaps

The investigation of previous studies on Connectivism reveals that in the early stage of the theory development, most of the researchers in the field concentrate their efforts on the debate over whether Connectivism is genuinely a learning theory or just a learning approach or a pedagogical view (Verhagen, 2006; Kerr, 2007; Kop & Hill, 2008; Bell, 2010, 2011; Conradie, 2014; Clarà & Barberà, 2014). However, the primary focus of recent empirical studies has been on the practical application of Connectivism in online learning and teaching environments such as MOOCs and cMOOCs (Abhari, 2017; Aldahdouh, 2018; Shrivasta, 2018; Skrypnyk et al., 2015; Wang et al., 2018).

It is noted that most researchers assert that successful learning involves 1) personal learning environments (PLEs), which are referred to as technological networks or resources employed by learners to gain knowledge, and 2) personal learning

networks (PLNs) which are referred to a group of people who share knowledge and learning resources via technologies (Marín et al., 2014; Torres et al., 2015; Aldahdouh et al., 2015). However, PLEs have received much more focus from researchers in the field than PLNs. Additionally, most of the existing studies conducted in MOOCs involved a few numbers of instructors whose presence or the ability to be online and interact with learners are not clearly focused. The learners usually work together to create knowledge based on the predetermined curriculum that may not suit their needs. In such learning environments, the learners' and instructors' personal information is always disclosed, which is possibly one of the causes leading to significant dropouts or low retention in online learning environments.

The findings from the existing research studies helped to inform the design of this study. Firstly, the connectivist learning environment (CLE) focusing on the facilitation of learners' creation of the PLNs with more experienced teachers to provide professional support should be developed. Secondly, anonymity may be an additional condition for better interactions between CLE members. Finally, learners' self-direction should be encouraged to foster life-long learning.

2.7 Conceptual Framework of the CLE

Based on the literature review, a conceptual framework for this study was eventually developed with a focus on facilitating learners' creation of the PLNs (see Figure 2.7). Learners were provided with certain GPK through different learning activities and were trained to use online learning strategies to interact with others with the facilitation of social technology within five learning conditions.

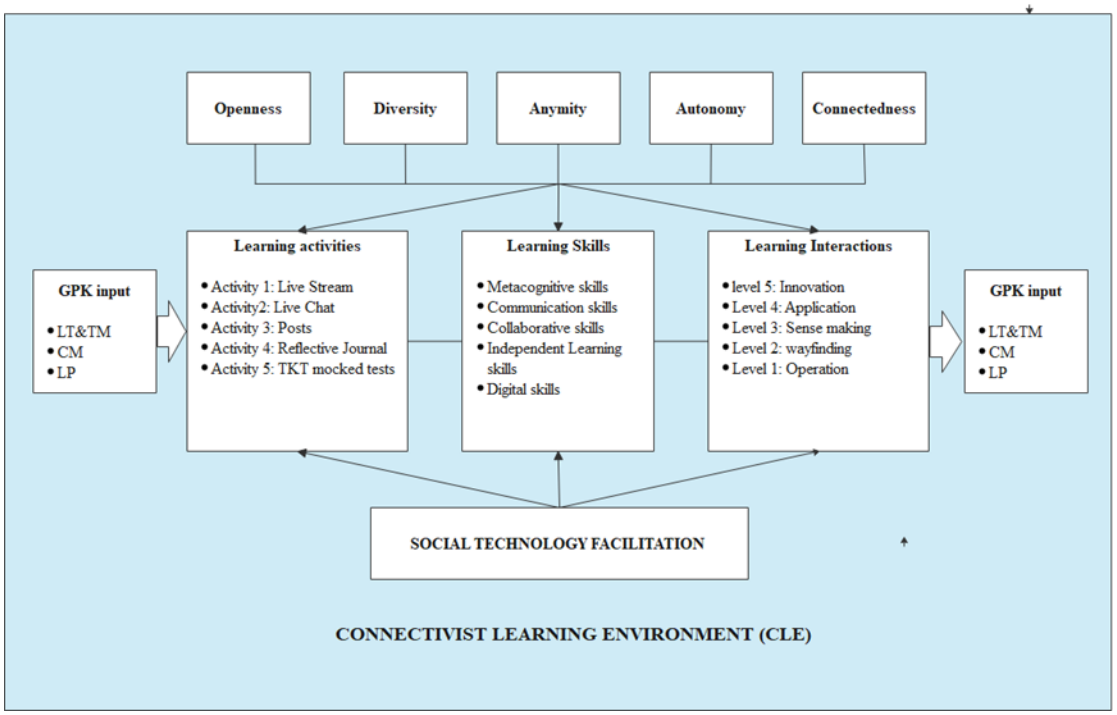

Figure 2.7 A Conceptual Framework for Enhancing PETs' GPK

2.8 Chapter Summary

This chapter has provided a comprehensive review of the literature concerning Connectivism, which serves as the theoretical background for the study. The chapter begins with the introduction of Connectivism, in which the definition, principles, characteristics, and connectivist learning model are meticulously discussed. An account of educational technology and ways of selecting the technology in education for this study is also provided. Following the definition and the explanation of GPK, the CLE is described in detail. Myriad factors influencing the e-learning or connectivist learning environment are subsequently elaborated before the theoretical gap is identified based on past related empirical studies. The chapter ends with the presentation of the conceptual framework of the CLE. The next chapter will provide deeper insight into the research methodology, research design, and implementation of the study.

CHAPTER 3
RESEARCH METHODOLOGY

This chapter, delineating the methodology utilized in this research, comprises four sections. It commences with the research design which presents and elaborates on the research setting, research participants and sampling methods, research instruments, data collection procedures, and data analysis methodologies. Additionally, it outlines the pilot study, its outcomes, and potential modifications for the main study. This chapter offers a recapitulation of its contents.

3.1 Research Design

According to Creswell (2014), mixed methods are utilized to neutralize the bias and weaknesses of each method and provide a comprehensible analysis of the research problem and possible interpretation of the data. A quasi-experimental mixed methods design was utilized to investigate the impact of the CLE on PETs' GPK and their perceptions. This approach integrates both quantitative and qualitative methodologies. A two-phased explanatory sequential design was adopted to establish causal relationships between various variables in the CLE and PETs' GPK. In the initial phase, quantitative data from pre-test 1, pre-test 2, post-test, and an online survey were collected and analyzed. Subsequently, the second phase involved gathering and analyzing qualitative data from online reflective journals and semi-structured interviews. The intention behind this design was to employ qualitative data to elucidate the findings derived from quantitative analysis. The belief was that while the quantitative analysis confirmed improvements in PETs' GPK, the qualitative analysis provided a deeper understanding of these findings. Additionally, the qualitative data would shed light on the perceptions of PETs regarding the CLE, offering nuanced insights into their experiences.

3.2 Research Setting

The research was conducted at Ton Duc Thang University (TDTU), where participants had prior experience with online courses and convenient access to the Internet across various campus locations, including the library, the classrooms, the study zones, the sports centers and the cafeterias during the first semester when the

participants of the study fully completed the required courses of the teacher education program and were preparing for their internships at high schools.

3.3 Research Participants

This research study involved 55 participants, including 40 pre-service English Teachers (PETS) in their fourth year at a university and 15 in-service EFL teachers from different provinces around Vietnam. The data regarding these participants' demographics and characteristics were summarized in Table 3.1 and Table 3.2 below.

Table 3.1 Demographics of Novice Participants (PETs)

Gender	M	08
	F	32
Number of years at the university	4	40
Pedagogical courses taken	1	40
	2	40
	3	40
Levels of English Proficiency (CEFR level)	B1	05
	B2	35

Table 3.2 Demographics of Experienced Participants (In-service English Teachers)

		In-service high school teachers (N=05)	In-service university teachers (N=05)	Researchers (N=05)	TOTAL
Age range	25-35	01	01	04	06
	36-45	04	04	01	09
Gender	M	03	02	02	07
	F	02	03	03	08
Years of teaching experience	06	01	00	01	02
	> 06	04	05	04	13
Nationality	Vietnamese	03	04	05	12
	Australian	00	01	00	01
	English	02	00	00	02

3.3.1 Pre-service English Teachers (PETs)

Out of 126 students who had completed requisite coursework in teaching methodology, learning theories, technology for language teaching, testing, and evaluation, 40 fourth-year students voluntarily participated in this study, as depicted in Figure 3.1. All 40 students who applied were included in the study. These

participants were at B1 and B2 proficiency levels according to the CEFR and were categorized as "novice" English teachers due to their lack of direct teaching experience. They chose to join the study to enhance their GPK. Selecting these participants began with retrieving a list of email addresses and telephone numbers from the target population sample. Then, each participant received an invitation email outlining the purpose and anticipated outcomes of the study, encouraging his or her voluntary involvement. Next, 40 PETs were selected for the study. Personal consent forms were subsequently retrieved and signed by these participants, who were notified that they could withdraw at any time. The procedure ended with the pre-test-based identification of the participants' levels of GPK.

3.3.2 Experienced English Teachers

This study also involved 15 in-service English teachers and researchers who voluntarily participated and were recognized for their expertise in the English teaching and learning domain (see Figure 3.1). These experienced participants were believed by Downes (2009) to set an example for the less experienced and provide emergent spaces supporting connectedness and interactivity, which Kop et al. (2011) said to be fundamental to successful CLE. All those experienced participants, irrespective of age, gender, and nationality, had at least five years of experience in English teaching or doing research relating to English Language Teaching (ELT). Multiple researchers have highlighted that experienced teachers typically have around five years or more of classroom experience (Gatbonton, 1999, 2008; Tsui, 2005; Martin et al., 2006). These experienced participants were selected based on convenience sampling. They comprised five in-service EFL teachers at five different high schools in different provinces of Vietnam, five in-service university EFL teachers who had experience in teaching PETs at different universities around Ho Chi Minh City and other provinces in Vietnam, and five students from five different countries who were participating in Master or Doctoral programs related to English teaching and learning in universities in Vietnam and other countries. It was believed that teachers of different levels of education were likely to offer different opinions and perspectives, which benefited PETs.

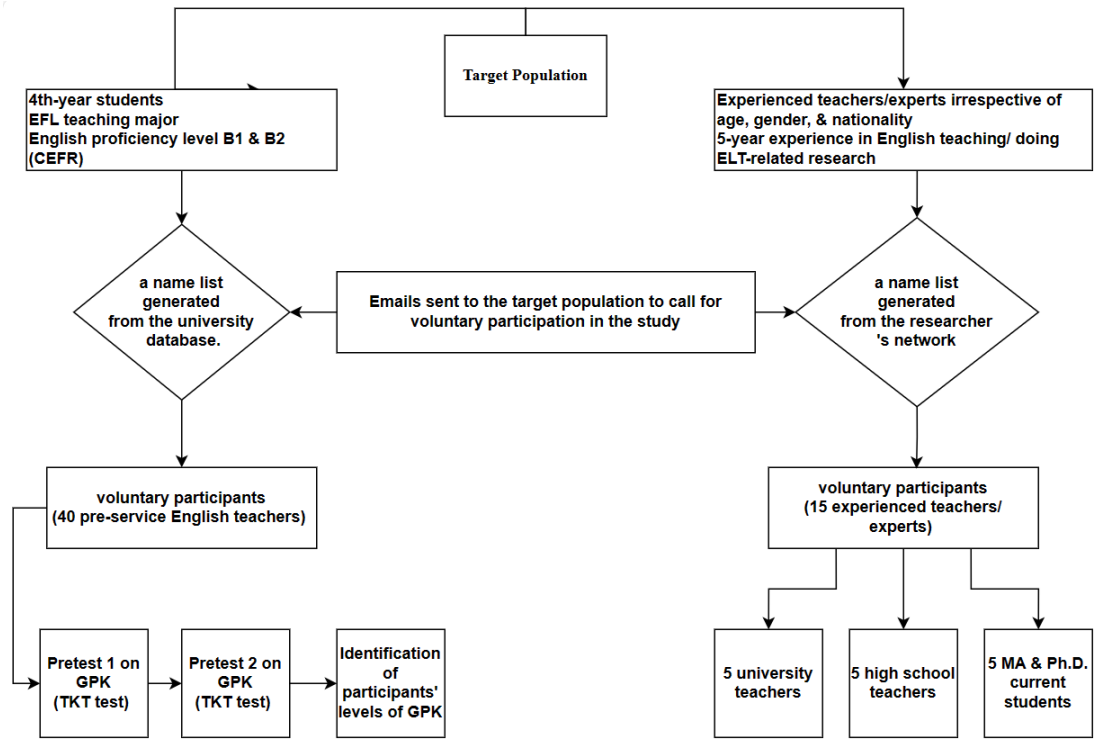

Figure 3.1 The Procedure of Selecting Participants for the Study

3.4 Research Instruments

3.4.1 Connectivist Learning Environment (CLE)

In this study, the CLE refers to the social networking platform known as 'ELT Nexus', facilitating user interaction and the exchange of current information. Like established Massive Open Online Courses (MOOCs) like Edmodo, Moodle, and Coursera, the CLE encourages participants to openly share expertise, insights, and opinions, fostering autonomy and self-directed learning. Participants are expected to create social and conceptual connections tailored to their needs (Tschofen & Mackness, 2012). Accessible through various devices such as PCs, laptops, iPads, and smartphones, learners can engage with the learning environment at their convenience, from anywhere and at any time. However, these MOOCs are conceptualized as online teaching platforms with few instructors or facilitators. They are open to anyone who wants to participate in learning a specific subject based on a specific curriculum and for a certain period.

In the CLE of this study, participants are not only PETs but also in-service high school and university English teachers whose interests and expertise are in ELT. CLE members are expected to manage their learning by participating in diverse activities like Livestream sessions, live chats or discussions, making posts, and engaging

in audio and video calls. They are equally valued and allowed to remain anonymous if they like. Learners' self-regulation and anonymity within the CLE have been considered to maximize their safety and confidence, which is believed to lead to their success in learning. Another feature of the CLE is that it provides space for the participant's data storage. Data of different formats like .doc, .ppt, .xls, .pdf, .mp3, .mp4, move, .jpeg, and .gif are permitted to be stored and shared. In contrast to other contemporary learning environments that prioritize the personal learning environment (technology network), the CLE places greater emphasis on fostering the creation of the PLN (human network) to support learners in their educational journey. It is noted that PETs can join this learning environment for good once they participate in the CLE.

3.4.1.1 The Construction of the CLE

The connectivist learning environment (CLE) was constructed through many steps (see Figure 3.2). Firstly, the review of the literature on Connectivism was conducted to identify the theoretical gap, and the teaching and learning context at the tertiary level of education in Vietnam, particularly in Ton Duc Thang University (TDTU), were also scrutinized to pinpoint the practical gap for this research study. The theoretical framework was developed based on identifying theoretical and practical gaps. Secondly, to move to the next step, which involved planning and designing the CLE, the Connectivism-based principles were meticulously established. Various kinds of technologies were also researched and subsequently selected. Thirdly, after the CLE was entirely designed with the support of a professional web designer, two experts in designing web-based learning environments evaluated the CLE. Fourthly, the CLE was carefully reviewed and then fully modified based on the suggestions and recommendations from the two experts. Before piloting this learning environment and research instruments, a social network was established, including fifteen experienced teachers, each with a minimum of five years of experience in English teaching or research in English language teaching and learning. Lastly, the CLE was piloted, adjusted, implemented, evaluated, and presented.

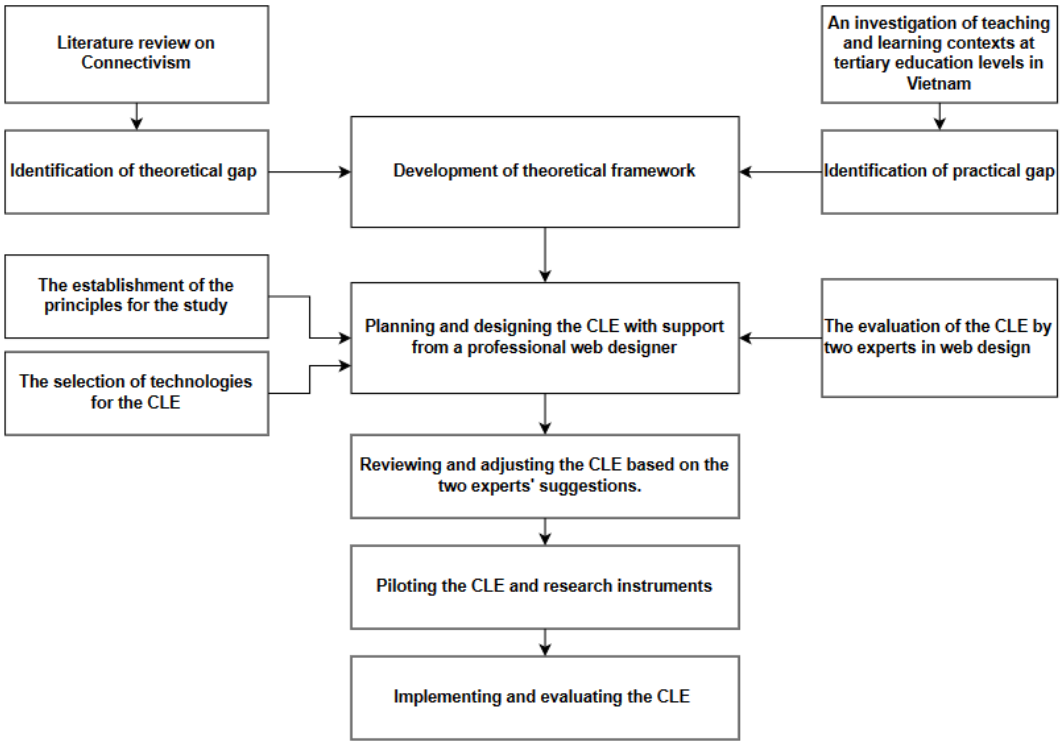

Figure 3.2 The Construction of the Connectivist Learning Environment (CLE) for this Study

3.4.1.2 Home page

This page (see Figure 3.3) allows users to upload what they would like to search for and share information regarding texts, images, audio, and videos after logging in with their private passwords. In other words, the users can make posts, comment on their posts and other users' posts, reply to other users' comments on their posts, follow other users, like, and bookmark other users' posts. The online status of other users whose posts are followed, bookmarked, liked, commented on, and contacted using voice and text messaging, audio, and video calling is also shown on the home page for each user to connect with if he or she wishes to.

This page also provides participants with the opportunity to take TKT mock tests, which aids in identifying areas of weakness in GPK, boosting confidence, and enhancing retention of information. It also offers live streams once a week and live chats twice a week to help participants exchange or share real teaching experiences. The filtering tool permits users to filter the information they would like to be shown, e.g., all, bookmarked, following, and most commented posts. The search function is available on this web page to offer users a way to find necessary information

on Google and Wikipedia and look up unknown words or phrases in an online dictionary when necessary.

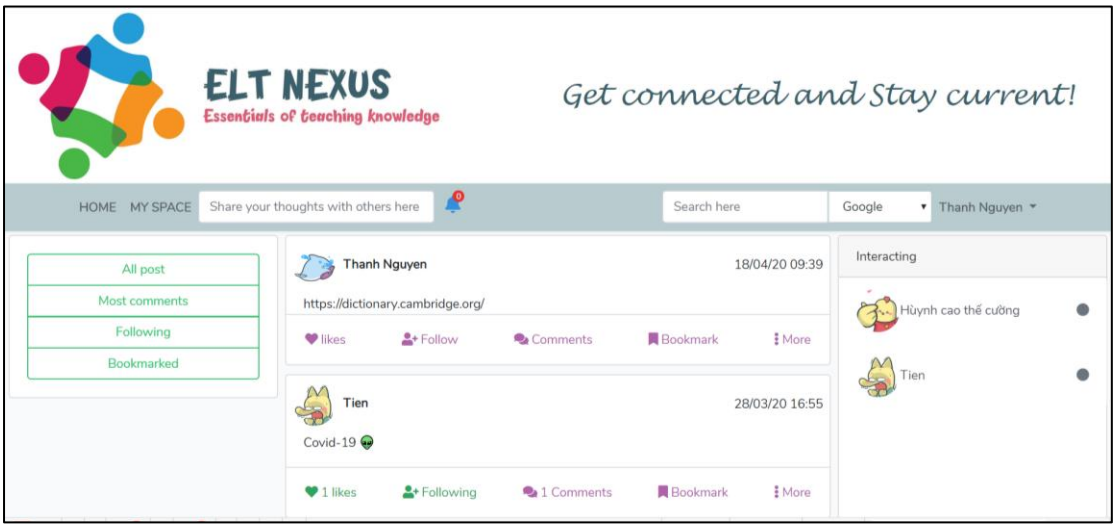

Figure 3.3 The Prototype (Homepage) of the CLE

3.4.1.3 Personal Page

This private page is exclusively designed for each user (see Figure 3.4). It includes three sections: 1) 'activity log', which presents each user's original and shared posts and his or her connections with other users, including his or her comments, likes, replies, text and voice messages, audio, and video calls. The filtering tool in this section offers each user options to show only his or her favorite information, such as his or her posts, his or her likes and comments to other user's posts, and his or her interactions with others, 2) 'My notes' where notes in the forms of texts, images, audio and video files are made and stored online by each user, and 3) 'My weekly journals' in which journals are required to be written weekly. In addition, the notification bell continuously and fully updates the user's activities chronologically. Whenever a user has a new notification, a blue bubble will appear with the number of new notifications a user received. If the user logs on to the website but is inactive for five minutes, a message box will appear to ask the user to choose whether to continue or end their activity. If the user is inactive for 10 minutes, the website will automatically log the user out and suggest that he or she log in again. Suppose the user does not log on to the website within 48 hours. In that case, notifications will be automatically sent by email to find out the reasons for his or her being inactive and to remind him or her of his or her participation again on the website.

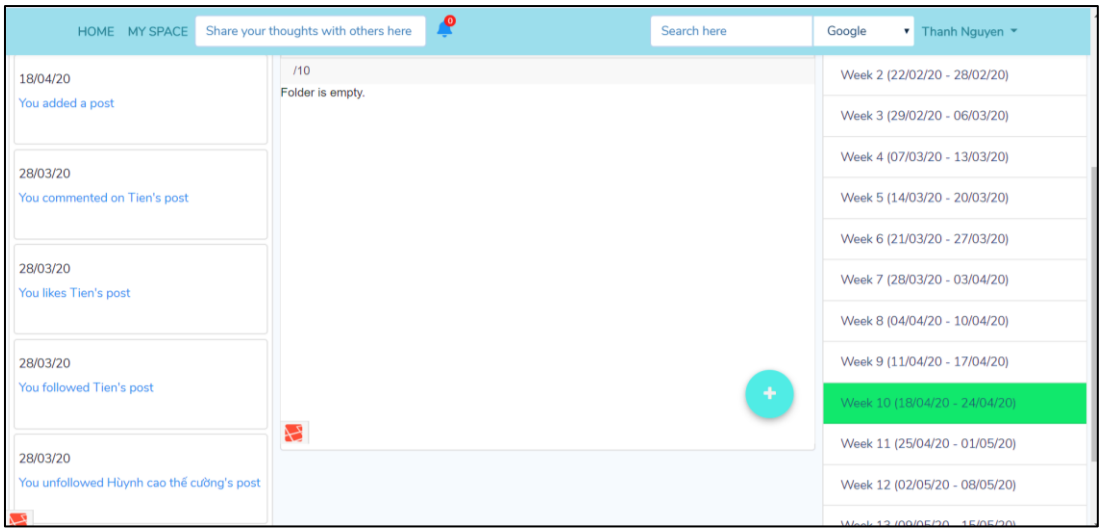

Figure 3.4 The Prototype (Personal Page) of the CLE

3.4.1.4 Experts' Checks on the CLE (a So-called ELT Nexus Website)

After the CLE was carefully planned and designed based on the established principles and selected technologies with support from a professional web designer, it was evaluated by two other experts in the field of web design. These evaluations of the CLE were conducted based on the form which employed the Likert scale and was adapted from Boklaschuk and Caisse (2001) (See Appendix B). The evaluation of the CLE focused on these experts' opinions and judgments on its aesthetic or visual appeal, navigation, and accessibility. The experts' check on the CLE was essential as it provided insight into building a better CLE. Based on the suggestions and recommendations regarding the use of graphics and colors, the overlook of the whole CLE was more professional.

3.4.2 Learning Modules

3.4.2.1 Learning Modules

The learning modules (the learning input) that included three different GPK aspects, namely learning theories and teaching methodologies (LT & TM), classroom management (CM), and lesson planning (LP) were carefully selected from different sources, including books, journals and newspaper articles, YouTube videos, and others to introduce to all participants of the CLE. Each of these GPK aspects (learning modules), which involved one dimension and several subdimensions of GPK in terms of images, texts, PPT slides, audio, and videos, was periodically introduced in each learning activity within three weeks (see Table 3.3). Through the connection and interaction among different members of the CLE, more dimensions of GPK were

expected to be discussed and shared among the learning community in each learning module.

Table 3.3 Learning Modules for the Connectivist Learning Environments (CLE)

Module	Duration	Dimension of GPK	Subdimensions of GPK
1	Week 1-3	Learning theories & Teaching methodologies	1- Teaching methods/ approaches 2- Introductory techniques 3- Classroom Activities 4- Teachers' Correction Methods
2	Week 4-6	Classroom management	1- CM key terms, problems & possible solutions 2- Teacher roles 3- Ways of grouping learners 4- Types of classroom interactions
3	Week 7-9	Lesson Planning	1- Stages and aims of a lesson 2- Lesson components 3- Strategies for effective lesson planning 4- Lesson plan checklist

3.4.2.2 Validation of Learning Modules

The learning modules played a vital role in this research study, so they were carefully checked for validity and reliability before being implemented. The validation of the learning modules involved two experts in the teacher educator program at two different universities in Vietnam and underwent a process of 3 different stages. In the first stage, the two experts separately evaluated the construct, content, and face validity of the three ready-made modules. Regarding the construct and face validity, the experts' opinions on the frequency, the length, the number of sub-dimensions of GPK, the presentation mode, and the visual design of each module were given. The content validity of the modules was also evaluated based on their relevance to the research purpose, which aimed to improve the PETs' GPK. Before these completed modules were given to PETs for further validation, they were rechecked by the two experts for construct, face, and content validity. In the second phase, the contents of the three learning modules were analyzed with 45 third-year PETs using a Likert Scale questionnaire. These participants were divided into nine groups of 5 students who were required to check the degree of understanding and the appearance of each sub-dimension of GPK in each module. To ensure the reliability of the contents of each sub-dimension of GPK in each module, the participants were required to analyze the identical modules at two different times. In the final phase, evaluations from two experts in the initial stage and data from the questionnaire in

the subsequent stage were synthesized and compared before the content of the learning modules was officially selected for the study.

3.4.3 Learning Activities

3.4.3.1 Description of Learning Activities

To enhance the GPK of PETs, an array of online and offline activities (refer to Table 3.4) accompanied by clearly outlined guidelines (see Appendix C) were meticulously developed. These activities were anticipated to allow PETs to interact, exchange ideas, and share authentic teaching experiences with experienced educators. This exposure aimed to provide them with engaging learning experiences and enhance their GPK.

Table 3.4 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 pm-9 pm)	60 minutes	All participants
			M2: Classroom management	Every Friday - week 5,6 (8 pm-9 pm)	60 minutes	
			M3: Lesson Planning	Every Friday - week 8,9 (8 pm-9 pm)	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 / 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 7-12:** Lesson Planning	Every Tuesday and Thursday (9 pm – 10 pm)	60 minutes	All participants
4	Posts	To share relevant teaching and learning resources related to each module. To give comments, replies, and reactions to posts	**Week 1-3:** Module 1 Learning theories & teaching methodology **Week 4-6:** Classroom management **Week 7-12:** Lesson Planning	Every day	any time	All participants

Table 3.4 A Summary of Learning Activities in the CLE (Cont.)

No	Activity	Purpose	Module	Time	Duration	People involved
5.	Reflective Journal Writing	To reflect how pedagogical knowledge is improved	**Week 1-3:** Module 1 Learning theories & teaching methodology **Week 4-6**: Classroom management **Week 7-12:** 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 7-12:** Lesson Planning	Every day	Any time	All participants

3.4.3.2 Validation of Learning Activities

The validation of the learning activities involved the same two experts in the teacher educator program at two different universities in Vietnam. They were provided with a questionnaire that required their evaluation on the level, i.e., meet the requirements (MR), partly meet the requirement (PMR), or do not meet the requirements (NMR)) at which each of the activities met the requirements of the study, i.e., facilitating the PETs' learning through connections and interactions, improving PETs' GPK, encouraging the employment of meta-cognitive skills/ learning strategies, providing opportunities to seek or share knowledge, being suitable for students' time and interests, being accessible at any time and any place, fostering PETs' autonomy (see appendix D). Based on the evaluation of the two experts, the learning activities that met the requirements of the study were employed.

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

3.4.4.1 Description of Pre-test 1, Pre-test 2 and Post-test

In this study, pre-test 1, pre-test 2, and post-test, which were parallel tests, were prepared by the researcher, who combined different sections of the TKT (Teaching Knowledge Test). TKT is a standardized test comprising three separate modules issued by Cambridge English to test people's knowledge in specific areas of English language teaching. General teachers can take one, two, or three modules to gain recognition for their teaching knowledge and skills. All these tests were utilized to see how the participants improved regarding GPK. Drawing from the official curriculums of over 12 universities in Vietnam offering EFL teacher education programs, the study concentrated on key dimensions of GPK. These dimensions encompass learning

theories and teaching methodology, classroom management, language testing and evaluation, material development and adaptation, lesson planning, and technology in language teaching.

Given that learning theories and teaching methodology, classroom management, and lesson planning were widely acknowledged as fundamental aspects for effective teaching in various newspaper articles, the pre-test 1, 2, and post-test of the study primarily focused on these three dimensions of pedagogical knowledge. In addition, it was highly recommended by Cambridge English that the English proficiency level of participants of TKT should be at least CEFR level B1, which was suitable for the participants of this study as they passed all IELTS exams to certify their levels of English proficiency at B2 level. Pre-test 1, pre-test 2, and post-test (see Appendix E) were combined from different TKT practice tests from 2012 to 2019. The construction of the tests was as follows:

1) The researcher randomly selected the whole sections (not individual items) from different TKT practice tests published from 2012 to 2019 by Cambridge English for pre-test 1, pretest 2, and post-test.
2) After the pre-test 1, pre-test 2, and post-test were combined, they were sent to the two experts in assessment for validity checking.
3) The researcher made necessary test adjustments Based on the two experts' advice and recommendations.
4) The complete pre-test 1, pretest 2, and post-test were tried out with 45 third-year students majoring in English-for-teaching at Ton Duc Thang University.
5) The data obtained from the pilot study were finally analyzed to assure internal reliability levels.

Pre-tests 1 and 2 were paper-based tests, each of which lasted 40 minutes and consisted of 40 multiple-choice and matching questions conducted with 40 PETs to identify their levels of GPK. Four weeks before the implementation of the actual study, these two parallel tests were administered by two professional examiners working for the authorized exam centers of Cambridge English in Vietnam (the third party) in the exam room to ensure their validity and reliability. The interval between the first and the second pre-test was four weeks. The two non-intervention pre-tests were conducted within four weeks to ensure that the PETs' levels of TKT were accurately identified and that their TKT knowledge was not improved or changed without any intervention before participating in the CLE. Based on the results of the

two non-intervention pre-tests, the PETs levels of GPK were identified. After nine weeks of learning in the CLE, the participants had to do the post-test to have their GPK checked. Similarly, the 40-item TKT post-test was conducted within 40 minutes with 40 participants in the exam room and by professional examiners from the authorized exam center of Cambridge English in Vietnam.

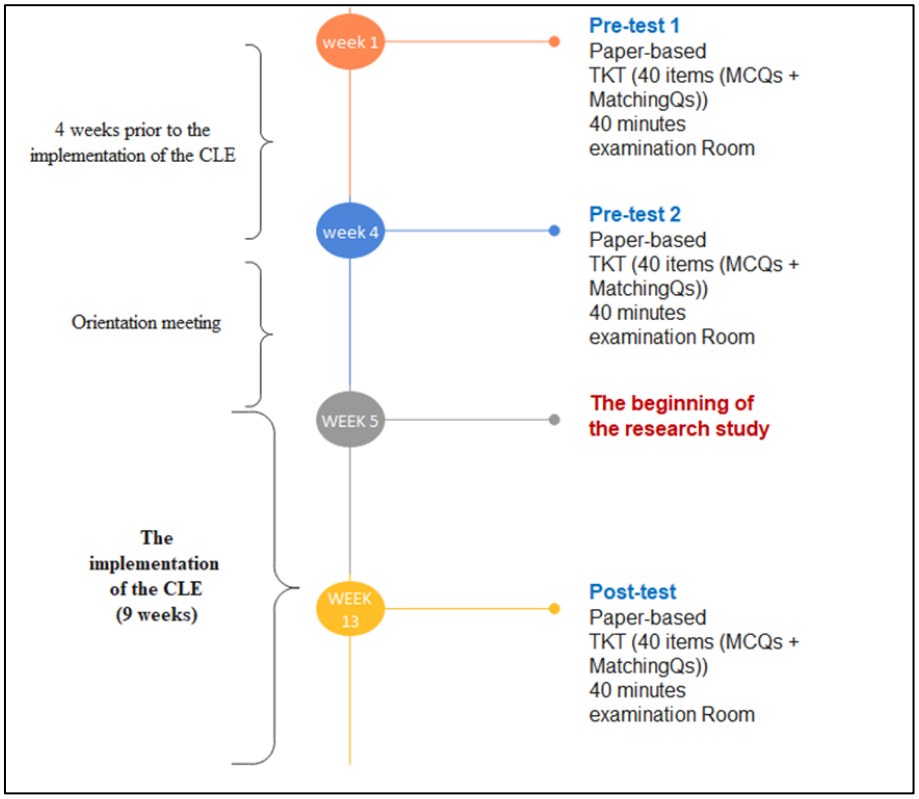

Figure 3.5 The Time for Conducting Pre-test 1, Pretest 2 & Post-test

3.4.4.2 Validation of Pre-test 1, Pre-test 2 and Post-test

The content of pre-test 1, pre-test 2, and post-test were taken from the standardized tests; however, they were also evaluated by the two experts to ensure the construct, content, and face validity and reliability. The two experts separately evaluated each test on its relevance of content to objectives, its length in terms of time and test items, its format, and the accuracy of language use. Based on the two experts' suggestions and advice, the revised pre-test 1, pre-test 2, and post-test were reconstructed. To test the reliability of these tests, the researcher tried them out with 45 third-year PETs divided into three groups of 15. Each group did each test at two different times. The average scores of each test at two different times were recorded and subsequently compared to ensure reliability. The pilot participants were also required to give their feedback and comments on the intelligibility of the test

content, the length of the test, the test format, and the accuracy of the language used in the test. All tests were finally revised and given to the two experts to check again before being employed for the main study.

3.4.5 Online Reflective Journal

3.4.5.1 Description of Online Reflective Journal

This study used online reflective journals to document PETs' diverse learning experiences in the CLE. As highlighted by Kerka (1996), journal writing enables participants to "articulate connections between new information and what they already know" (p. 2). This type of research instrument undoubtedly provided PETS with opportunities to reflect on their learning experience in the CLE. Connelly and Clandinin (1990) considered journals written by participants in practical settings as a valuable source for narrative research. Anderson (2012) also described them as pedagogical tools that motivate reflection, critique, and self-analysis. They also offered a way to triangulate data and a member check of one's thinking (Janesick, 1999). The online reflective journal consisted of two open-ended questions aimed at eliciting PETs' opinions on how and which dimensions of GPK were enhanced. For each preservice English teacher, clear guidelines and prompts for journal writing (refer to Appendix F) were provided online. Over nine weeks of learning on the CLE, participants were instructed to submit a weekly online reflective journal in either English or Vietnamese, providing qualitative evidence of their development in GPK. Therefore, Online journal writing is used in this study to triangulate data from pre-test 1, pre-test 2, and the post-test. To put it simply, the information about PETs' progress in GPK in their weekly reflective journal writing further explained the results found in pre-test 1, pre-test 2, and post-test.

3.4.5.2 Validation of Online Reflective Journal

The online reflective journal underwent validation by two experts in research methodology. They assessed whether 1) the wording was technically accurate and reasonable, 2) respondents universally understood all guidance questions, 3) the guidance questions aligned with the study objectives, and 4) the format or structure of the online reflective journal was appropriate. Following the evaluation by the two experts, a revised version of the online reflective journal in both English and Vietnamese was developed. Like other research instruments, the revised online reflective journal was tried out on the CLE with 20 participants, who were tasked with completing the journal and providing feedback to identify any issues with the guidance questions or technical difficulties. Based on the results of the pilot study, the

researcher further refined the online reflective journal, which was then re-evaluated by the two experts before its implementation in the actual study.

3.4.6 Online Survey

3.4.6.1 Description of Online Survey

There has been an increase in the popularity of online surveys employed in research as both the researcher and the respondent can handle them easily (Julien, 2008). Online surveys are like paper ones in the way the questionnaires are formulated. However, the online survey data were electronically collected from the respondents over the Internet (Bhaskaran & Leclaire, 2010). To conduct an online survey, participants were, therefore, required to get access to the Internet. An online survey was employed for this study for many reasons: 1) The survey aimed to gather the participants' viewpoints regarding the CLE. According to Bhaskaran and LeClaire (2010), an online survey was a successful method to collect opinions, reactions, and other feedback; 2) as the number of the participants were geographically dispersed and had easy access to the Internet, online surveys worked best for them. As explained by Ritter and Sue (2007), online surveys worked best for university students because of their potential access to the Internet and their geographical distribution; 3) online surveys were considered an effective way to gather information rapidly and inexpensively (Ritter & Sue, 2007). They were ultimately flexible and convenient for both the survey creator and the taker (Bhaskaran & LeClaire, 2010). Therefore, the participants could perform the survey on a private computer, a laptop, a smartphone, and so on at any time and place they would like to. Data analysis might be significantly easier because electronic responses might directly move to analysis software (Julien, 2008).

Based on the objectives of this present study, an online survey (see appendix G) was constructed by the researcher using one of the available templates provided by a survey software, namely QuestionPro, which was reported to be used by thousands of organizations worldwide and considered as a powerful instrument to make online research "engaging, streamlined and downright fun". With the support of this web-based service, QuestionPro, "meaningful surveys and actionable results" could be produced with little requirement of technical expertise and fewer errors" (Bhaskaran & LeClaire, 2010, pp. 1-4). The online survey's construction and validation involved eight steps (see Figure 3.6). It began with the literature review, followed by the construction of the questionnaire items, which were revised and edited by the researcher after the two experts in research methodology evaluated them. The next step was to pilot the online survey with pilot participants. The last step involved the

two experts' validation of the online survey once more before it was implemented in the actual study.

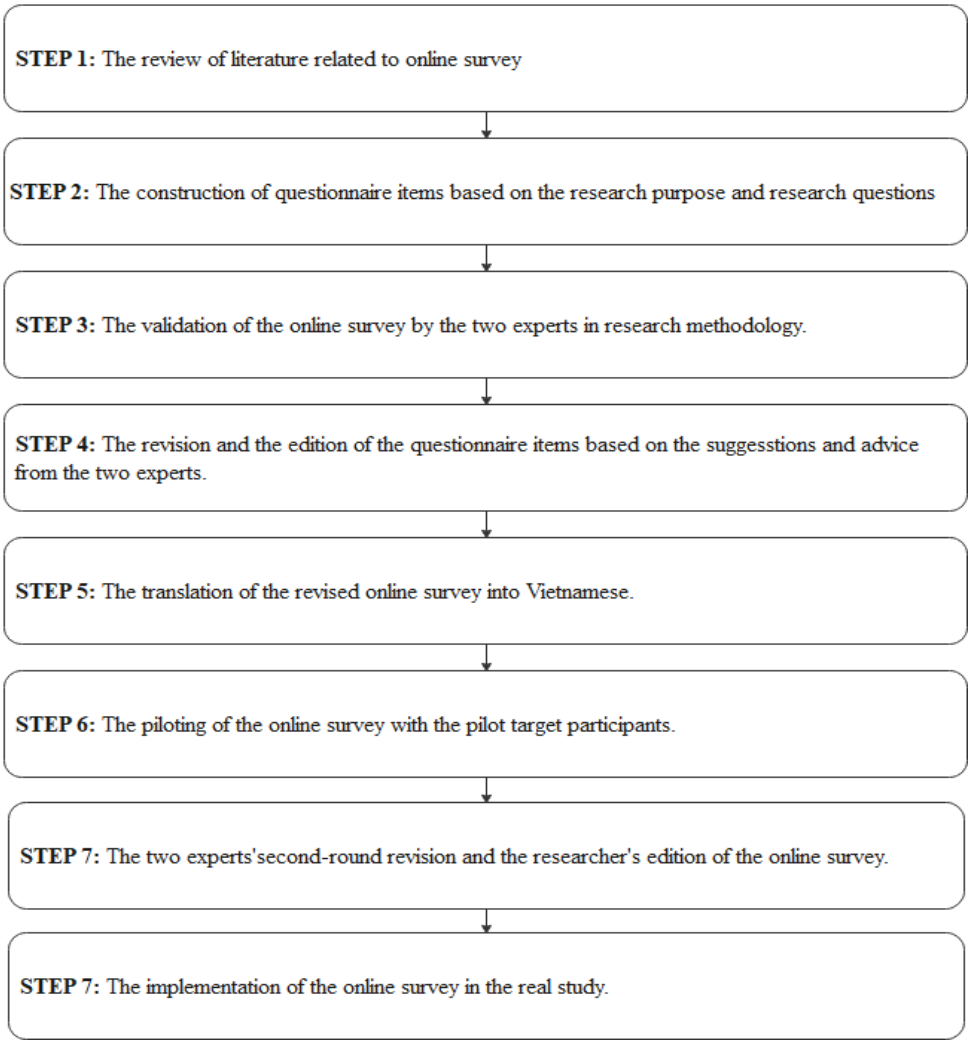

Figure 3.6 The Process of Constructing and Validating the Online Survey

The online survey consisted of open- and close-ended questions designed to gather insights into the participants' perceptions of the CLE. According to Ritter and Sue (2007), open-ended questions aimed to make an in-depth investigation of aspects of particular topics or problems (Bhaskaran & LeClaire, 2010) and might produce a "more diverse set of answers" (Reja et al., 2003, p. 159). On the contrary, close-ended questions provided many response options with which most respondents were familiar, and they were easy to answer and offered reliable measurement (Ritter & Sue, 2007). The formats of the close-ended questions used in this study included dichotomous, multiple choice, rankings, and rating scales. Before the survey's commencement in week 15, each participant received an email detailing the survey's

objectives, the methodology for its execution, and the utilization of collected data. This email served as an invitation for participants to partake in the online survey, which did not require them to provide email addresses and was claimed to ensure the anonymity and confidentiality of the participants. This made them feel safer and allowed them to answer the questions honestly (Ritter & Sue, 2007). To achieve a high response rate, a short instructional video provided instructions for the survey. All participants were also informed by email and in the instructional video in the CLE that their information was kept from the third parties and that each of them would get a coupon as an incentive after they finished the survey.

3.4.6.2 Validation of Online Survey

To validate the online survey questionnaire, 2 experts in research methodology were invited to evaluate whether 1) the wording was technically correct and reasonable, 2) all questions were understood in the same way by all respondents, 3) the questionnaire matched the objectives of the study; 4) the survey overall appealed; 5) the format or the structure of the online survey was appropriate. The survey guide was revised and edited based on the suggestions and advice from the two experts. It was subsequently translated into Vietnamese to avoid misunderstanding or misinterpretation of the questionnaires. Before implementing the online survey with the target participants of this study, the survey was tried out with 20 participants who were asked to complete the survey and give feedback to find out if the questions worked and if there were any technical problems. Based on the result of the pilot study, the researcher revised the online survey, which was subsequently sent to the two experts again for their examination and evaluation prior to their employment in the real study.

3.4.7 Semi-structured Interview

3.4.7.1 Description of Semi-structured Interview

Interviews are recognized as a valuable tool for generating information in research, particularly in capturing personal experiences and perspectives (Silverman, 2004). They are among the most powerful ways to better understand the participants (Punch, 2014). Furthermore, interviews can be used to triangulate the study's data as they can explore more profound information (Nunan, 2002; Wilkinson & Birmingham, 2003). In this study, semi-structured interviews (see Appendix H) were conducted utilizing an interview guide containing open- and close-ended questions. This approach aimed to gain a comprehensive insight into the participants' perspectives on the CLE. With semi-structured interviews, the interviewers asked follow-up questions that might naturally emerge during the interviews (Johnson & Christensen,

2014). As a semi-structured interview was used to triangulate the data found in the online survey, participants who were statistically found active in the CLE and whose responses were found noticeable (for open-ended questions) or extreme (for close-ended questions) were selected for the interview. Robson and McCartan (2016) highlighted that research design is expected to "adapt" as the research evolves. Hence, the number of interviewees for this study was likely to change to fewer or more depending on their actual responses, which showed the occurrence of data saturation.

A set of interview questions, comprising both open-ended and closed-ended queries, was developed in accordance with the research inquiries of the study. The interviews were conducted face-to-face with the participants and in self-learning rooms for readers in the TDTU library, where the informants were not distracted by the noise. Every interview spanned 10 to 15 minutes, and each informant's experience of the topic under investigation was audio-recorded.

Before the interview, the respondents were briefed that their participation was voluntary, their truthfulness in answering the questions was important, and their responses were assured of anonymity and confidentiality. Informed consent, participants' voluntary approval of their participation in the interview, was subsequently gained from all participants. After the interview, an email with the audio script was also sent to each of the informants for his or her accuracy checking. Another email was sent to show the researcher's gratitude for each participant's participation in the interview.

3.4.7.2 Validation of Semi-structured Interview

The following procedures were conducted to investigate whether the interview questions were appropriate for this study: First, the literature review about the interviews was done. Next, the two experts cross-checked the interview questions after they were constructed. Then, the interview questions were carefully revised based on the experts’ suggestions. To assure the validity and reliability of the interview guide, it was piloted at TDTU with ten 3rd-year PETs who were also the target population but did not participate in the study. Next, the interview guide was created and subsequently translated into Vietnamese for complete understanding. Finally, the interview guide was implemented in the actual study after it was revised by the two experts and edited by the researcher.

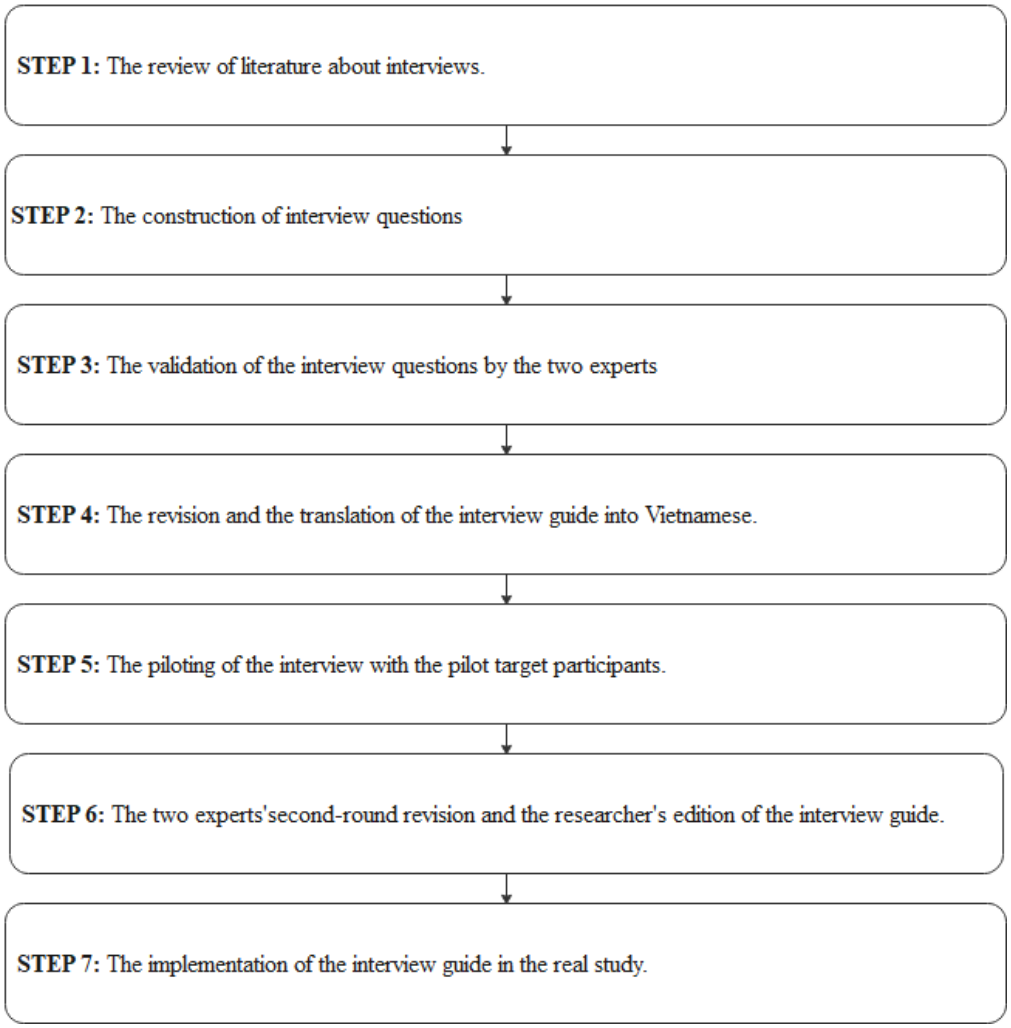

Figure 3.7 The Process of Constructing the Interview Guide for the Study

3.5 Data Collection Procedures

As presented in the above section, many instruments such as pre-tests, post-test, the journal writing format with guidelines, questionnaires for online survey and the interview, the instructional video for online survey, the guiding video for both novice and experienced participants, online etiquette and informed consent forms (see Appendices K & L) were made prior to the collection of the data. Also, written consent was granted from Ton Duc Thang University to conduct the study (see Appendix M). This research study utilized both quantitative and qualitative methods of data collection. The procedures for gathering these data were as follows:

Following the selection of participants for this study, the initial step in the data collection process involved administering pre-test 1 and pre-test 2 on GPK approximately one month before the commencement of the CLE implementation.

The interval between these two tests was four weeks. They were administered in the examination room and by the Creative Learning Center (CLC), one of the authorized exam centers of Cambridge English in Vietnam. The outcomes of these two pre-tests enabled the researcher to ascertain the participants' proficiency levels in GPK. The results from these two pre-tests assisted the researcher in determining the participants' levels of GPK. A face-to-face orientation on the CLE, learning skills and strategies, and online etiquette was organized in the university's computer lab, where all participants could easily access the Internet and the CLE. In this meeting, they were introduced to how to operate the CLE, use learning skills and strategies, and behave politely when working in this learning environment.

The next step incorporated each participant's online reflective journal writing. During nine weeks of learning in the CLE, each participant was required to write a weekly online journal based on ready-made guidelines using Vietnamese or English to reflect his or her progress in GPK. The participants' journals were kept in the CLE from the beginning until the completion of the research study, and the data gained from these online reflective journals were transferred to a computer for later analysis.

The third step entailed conducting an online survey consisting of open- and close-ended questions. Before administering this survey, participants were contacted via email to request participation. Every participant received a detailed explanation of the researcher's intentions and anticipated outcomes of the research process, along with assurances of anonymity and confidentiality regarding their responses. The survey was administered by the end of week 14. The participants were given a week to answer the questionnaires in the survey before the results were gathered for later data analysis.

The fourth step entailed the conduct of the post-test on GPK after nine weeks spent in the CLE. This test was identical to pre-test 1 and pre-test 2, both in format and content, and was administered in the exam room and by the same exam center (CLC) authorized by Cambridge English in Vietnam. The researcher of this study was subsequently provided with the results of the post-test by this exam center for later analysis.

The last step involved conducting semi-structured interviews with open- and close-ended questions. Sixteen participants were purposively selected for these interviews to gain deeper insights into their perceptions of the CLE. Each interview was conducted in person, with the interviewees speaking in their first language (Vietnamese) and lasted approximately 15 minutes. The interviews took place in the self-learning

room for readers at the library of TDTU to minimize distractions. Responses were audio recorded, and the data were stored on the computer for subsequent analysis.

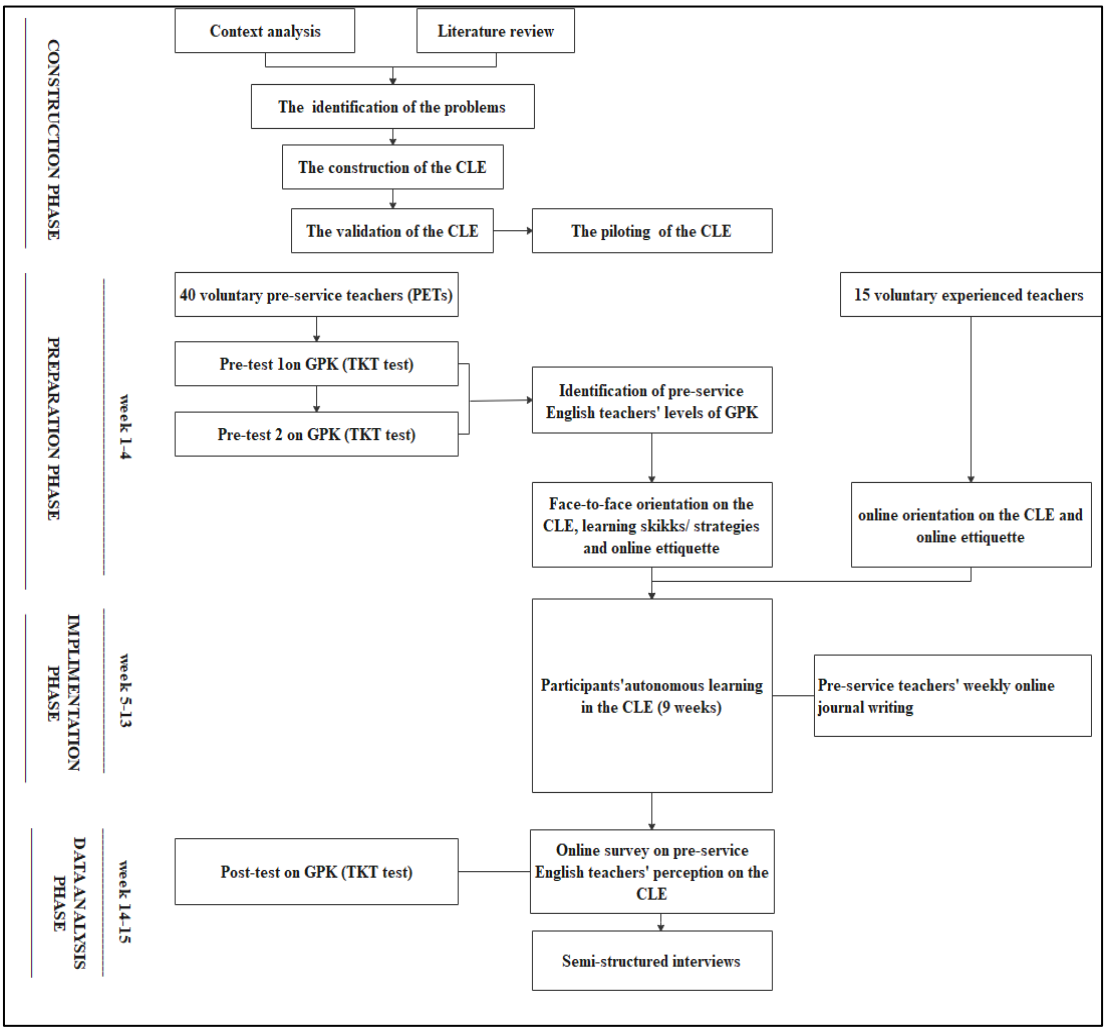

Figure 3.8 Flow Chart of 3-phase Data Collection Procedures

3.6 Data Analysis

This section delineates the methods employed for data analysis. Both quantitative and qualitative approaches to data analysis were comprehensively elucidated for each research question.

For Research Question 1, which aimed to find out the extent of the improvement that PETs made in terms of GPK, the scores from pre-test 1, pre-test 2, and post-test were subjected to quantitative analysis using descriptive statistics. Additionally, a repeated measures ANOVA, or within-subjects ANOVA, was conducted to determine if there were any changes or discrepancies in mean scores between pre-test 1 and pre-test 2, pre-test 1 and post-test, as well as pretest 2 and post-test. The repeated

measures ANOVA results helped confirm the participants' improvement in terms of GPK over a two-time period (Pre-test 1 and Pre-test 2; Pre-test 2 and Post-test).

For both research questions 2 and 3, the content analysis of the qualitative data was done. Content analysis is claimed by Lankshear and Knobel (2004) to be a great choice for analyzing written data because it is suitable for dealing with a great deal of data and comparing several texts of the same type over time. According to Taylor et al. (2016), content analysis is a method used to categorize verbal or behavioral data to classify, summarize, and tabulate. The analysis of the data from these two methods, therefore, comprises the coding and categorization of the data based on the six-phase framework for doing a thematic analysis provided by Braun and Clarke (2006): 1) becoming familiar with the data, which requires the numerous times of reading the transcripts; 2) generating initial codes, which involves coding or systematically and meaningfully organizing the data with the support of the computer to identify initial codes; 3) searching for themes, which means the examination of the initial codes and the organization of clearly-fitted codes into preliminary themes; 4) reviewing themes, which involves the revision, modification and development of preliminary themes identified in the third step; 5) defining themes, which is the final refinement of the themes; and 6) writing up the report.

In this study, Research Question 2, which investigated how PETs' GPK was improved, relied on the analysis of the data from the online reflective journal and the semi-structured interview. Likewise, these data were examined to determine the participants 'perceptions of the CLE.

Lincoln and Guba (1985) deposited that triangulation was used to address questions of validity. Data triangulation, which is the combination of data drawn from various data sources, at different times, in different locations, or from different people, is one of the four basic types of triangulation to enhance credibility in qualitative study (Ary et al., 2018). In this study, the data from the semi-structured interview were triangulated with those from the online journal writing, online questionnaire survey, and the pre-tests and the post-test.

To ensure the accuracy of the interview findings, the final products of analysis were sent to the interviewees for confirmation and accuracy checking (member checking) before the report was written. Peer reviewing or peer debriefing was another strategy or method of enhancing the credibility of this study. After being collected, the raw data from the online journal writing and the semi-structured interview were sent to two other researchers, together with the researcher's interpretation of these two data sources, for revision to see if these two reviewers agreed with the interpretation.

Table 3.5 A Summary of Methods of Data Collection and Analysis

Research Question	Data Collection Methods	Data Analysis Methods
1. To what extent is pre-service English teachers' general pedagogical knowledge (GPK) improved through connectivist learning environment (CLE)?	- Pre-test 1 & Pre-test 2 - Pre-test 1 & Post-test - Pre-test 2 & Post-test	Descriptive statistics A repeated measures ANOVA or within-subjects ANOVA
2. How is pre-service English teachers' general pedagogical knowledge improved?	- Online Reflective Journal writing - Semi-structured Interview - Text Analysis	- Content analysis - Content analysis - Content analysis
3. What are pre-service English teachers' perceptions of the usefulness of the Connectivist Learning Environment (CLE)?	- Online Survey - Semi-structured Interview	- Content analysis - Content analysis

3.7 Pilot Study

The pilot study took place over eight weeks, from May 4th to June 28th, 2020. Its main aim was to evaluate the efficiency of the CLE, the research instruments, and the data collection process in preparation for the actual study. The study cohort comprised 35 PETs in their third and fourth years at the university, gearing up for their high school apprenticeship. Moreover, 35 experienced teachers were involved, each with at least five years of teaching English as a foreign language. These participants included ten in-service high school teachers, ten in-service university teachers from different regions in Vietnam, 10 M.A. and Ph.D. students, and five researchers or Ph.D. holders from Thailand, England, and Vietnam.

3.7.1 Reflection and Modification

The results of the pilot study demonstrated that the instruments worked effectively, the expected data was obtained, and the research questions were addressed; however, the following things also needed to be modified:

3.7.1.1 Research Instruments

The CLE (The ELT Nexus Website)

Firstly, to avoid confusing statistical data, identical names were not allowed to be used. The system could notify the participants if their selected names had already been used.

Secondly, participants were not allowed to change their names by themselves. Limited changes of name were encouraged to keep good connections among the participants. An individual could contact the admin if he or she wishes to have his or her name altered.

Thirdly, the researcher's research email (eltnexus2019@gmail.com) and the website's management system had to be synchronized to better handle issues when needed. One of the problems identified in the pilot study was the admin's late approval of the participant's registration, which might result in their annoyance.

Fourthly, the color of the read message in the notification bell and the uncompleted journal should be changed from light to dark, making it easier for the participants to notice.

Fifthly, participants should be allowed to pre-view their messages (comments and posts) before sending them to the system and to search for keywords in the posts and comments they wish to see again.

Sixthly, a mobile app version should be constructed to facilitate the participants' use of the website.

The Pre-tests, and Post-test

Scheduling the pre-tests and post-test requires careful consideration due to time constraints. Before conducting these tests, it is essential to send reminder emails. A comprehensive plan or schedule, including specific dates and tasks, should be developed to ensure everything stays on track.

The Weekly Online Journal

The data from the weekly online journal showed that 4 out of 35 participants missed writing some of the weekly journals, which indicated a need for a pop-up message on the participant's private page, serving as a reminder to engage in journal writing. Additionally, incorporating a chat box feature would enable the CLE administrator to provide positive feedback or reactions to the content written in the journals.

The Semi-structured Interview

Examining the interview data and drawing on the researcher's experience in conducting the interviews, it was evident that the optimal number of interviewees should fall within the range of 5 to 6 individuals. This recommendation is based on the observed occurrence of data saturation during the interviews. Furthermore, it is advisable to dispatch reminder emails to the chosen participants,

seeking their confirmation, at least three days before the interviews to ensure their presence, as most participants were geographically dispersed. Another alternative solution was to conduct online interviews.

Online Survey

To minimize unnecessary contact between the researcher and participants and enhance the survey response rate, it is recommended that a more explicit and detailed set of instructions be provided during the orientation meeting. Additionally, it is crucial to email each participant a clear explanation of the survey's purpose and instructions for completing it. In the pilot study, a few respondents did not fulfill the survey expectations due to unaddressed technical issues, emphasizing the importance of comprehensive communication. Furthermore, while the online survey might only require a few minutes for participants to complete, it took researchers over one week to collect all the surveys from the participants.

Instructional Videos

As requested by most participants in the pilot study, instructional videos were made in both English and Vietnamese for them to select, as some technical terms might be too challenging for them to understand. Moreover, ways of resizing images for posting, steps for logging in when a password was forgotten, and ways of changing names if needed were also carefully instructed in the video.

3.7.1.2 Others

Orientation Meeting

One of the problems that needed to be addressed was to have a practical orientation meeting. The experience from the pilot study informed the researcher that there should be an additional online orientation meeting for those who missed the face-to-face orientation. This second meeting is also an opportunity for the participants who need help interacting in the CLE. More importantly, to familiarize the participants' interactions with the CLE, there should be a trial week when they introduce themselves, get to know other participants, and try using different functions in the CLE. Finally, as the orientation only lasts approximately 30 minutes, the pre-test on GPK should be conducted after the orientation meeting to save time for both the researcher and the participants.

The Selection of Participants

Reminder invitation emails should be rescheduled to get more participants for the study. According to the results of the invitation email sent to the participants in the pilot study, the reminder emails helped increase the 27% response rate. Additionally, this study aims to create a learning environment for the sake of pre-service and experienced English teachers; therefore, only those who are interested and voluntarily participate in this research should be selected.

Notes for Participants

Some of the following notes were drawn from the analysis of the posts and the comments on the website. Firstly, it is highly recommended that questions or posts should be made in the evening (from 8 pm. to 12 pm.) when all participants (pre-service and experienced English teachers) are available. There is a possibility that questions will be answered faster, and posts will get many more comments than at other times of the day. Secondly, only one problem or question should be raised each time to attract attention and to get different answers, ideas, or opinions from other participants. Lastly, for every question asked, the question raiser should first present his or her opinions, perspectives, or ideas to get more constructive comments from other participants.

3.8 Chapter Summary

This chapter restates the purpose of the present study and outlines the research questions. The selection of the participants is first presented. Then, instrumentation is meticulously described. Next, data collection is discussed. In addition, the validity and reliability of the instruments are presented. Finally, data analysis methods for each of the questions are presented. The following chapter will contain a presentation of the results of the data analysis.

CHAPTER 4
RESEARCH FINDINGS

This chapter unveils the outcomes of the investigation, aimed at scrutinizing the impact of the CLE on the GPK of Vietnamese PETs. It primarily investigated 1) the extent to which PETs improved in terms of GPK through the CLE, 2) how their GPK improved, and 3) their perceptions of the usefulness of the CLE.

4.1 PETs' Improvement of GPK

A paired samples t-test was initially conducted to address the initial inquiry regarding the improvement of PETs in terms of GPK. This test compared the mean scores of the pre-tests 1 and 2, administered at 4-week intervals. This statistical analysis aimed to evaluate whether a statistically significant difference existed between the mean scores of pre-tests 1 and 2. Additionally, it sought to establish the actual levels of GPK among PETs before they participated in the study.

Table 4.1 highlighted the mean scores of the PETs in pre-test 1 (M= 23.93, SD= 6.04, N= 40) and pre-test 2 (M=25.55, SD=5.52, N= 40) at a 4-week interval. In addition, the increase of mean scores of the two tests shown in Table 4.2 was 1.63, t(39) = 2.36, P >.005, with a 95% confidence interval of the difference ranging from -3.02 to -0.23. Based on Cohen's d (1988) convention, the effect size for comparing the mean scores of pre-tests 1 and 2 was relatively small (d = 0.37). Therefore, the conclusion drawn is that there was no statistically significant difference between pre-tests 1 and 2. In other words, the participants' GPK improvement was insignificant if there was no intervention.

Table 4.1 The Comparison of Pre-tests 1 and 2 at 4-week Interval

		Descriptive Statistics			
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pre-test1	**23.93**	40	6.04	.95501
	pre-test2	**25.55**	40	5.52	.87336

Table 4.2 The Results of the Pairs Sample T-test for Pre-tests 1 and 2

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	pre-test1 - pre-test2	**-1.62500**	4.35412	.68845	**-3.01751**	**-.23249**	**-2.360**	**39**	**.023**

A repeated measures ANOVA, also known as within-subjects ANOVA, was conducted using SPSS to determine if there were any statistically significant changes in the mean scores between pre-test 1 and post-test, as well as between pre-test 2 and post-test. The results showed that the participants' GPK significantly progressed over 9 weeks. As shown in Table 4.3, pre-test 1 had the lowest mean scores (M=23.93, SD =6.04, N= 40), and the post-test had the highest mean scores (M= 33.70, SD = 2.45, N = 40).

Table 4.3 Descriptive Statistics for Pre-tests 1, Pre-test 2 and Post-test

	Mean	Std. Deviation	N
Pre-test 1	**23.93**	**6.04**	**40**
Pre-test 2	**25.56**	**5.52**	**40**
Post-test	**33.70**	**2.45**	**40**

The pairwise comparisons examined each set of scores to determine whether they were statistically significantly different. The results, as shown in Table 4.4, indicated that the differences in mean scores between pre-test 1 and post-test (M = 9.775, SD = .530, $p < .005$) and between pre-test 2 and post-test (M = 8.150, SD = .411, $p < .005$) were significant. However, no significant difference was found between pre-tests 1 and 2 (M = 1.625, SD = .690, $p > .005$).

Table 4.4 Pairwise Comparisons among Pre-tests 1, 2 and Post-test

(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.

To summarize, the statistically significant differences in the mean scores of the three tests (pre-tests 1, 2, and the post-test) indicate a substantial increase in the GPK of PETs. Specifically, the mean increase after 9 weeks of participation in the CLE was 8.15 points, equivalent to a 31.90% improvement.

4.2 PETs' Possible Ways of GPK Improvement

Regarding research question 2, which investigated how PETs' GPK was improved, automatically recorded data from the database, data from online reflective journals, and the semi-structured interviews of the top five PETs who fully participated in the study and made the most progress in GPK after the intervention were analyzed. As presented in Table 4.5, the five PETs' post-test results were much higher than those of pre-tests 1 and 2, which showed their considerable progress in GPK. The results of their pretests and post-test scores were greatly different. All these five students could improve their GPK by 33% - 39%.

Table 4.5 The Top 5 Participants with the Most Progress in GPK

Participant/ Nickname	Pre-test 1 score	Pre-test 2 score	Average of Pre-tests 1 & 2 scores	Post-test score	The score difference between the average of Pre-tests 1 + 2 and post-test/percentage
1- Donald	20/40	21/40	20.5/40	36/40	15.5/38.75%
2- Tony	17/40	15/40	16.0/40	31/40	15.0/37.5%
3- Hanie	15/40	19/40	17.0/40	31/40	14.0 /35%
4- LeoBorn	22/40	24/40	23.0/40	37/40	14.0/35%
5- Kang	21/40	20/40	20.5/40	34/40	13.5/33.75%

4.2.1 PETs' Levels of Interaction

To see how PETs progressed in GPK, their levels of interaction or cognitive involvement were analyzed based on the learning interaction framework by Wang et al. (2015), which comprises four levels of interaction, namely operation, wayfinding, sensemaking, and innovation (See Figure 2.5).

4.2.1.1 At the Operation Level

At this level of interaction, PETs are expected to demonstrate their effort to use the learning technology provided in the CLE to create their PLN. According to Wang et al. (2015), this level of interaction serves as the foundation for learning on an online platform. The statistical data (Table 4.6) which compares the login times and interactive durations of the top 5 participants to the entire participant pool of the study (n=40), significant differences are evident. Over 9 weeks, the average login times

for all participants were 34.2, with an interactive duration of 149 hours. However, when focusing on the top 5 participants, their average login times increased to 54.63, along with a rise in interactive duration to 189.9 hours. This indicates that the top 5 participants were more actively engaged, spending notably more time interacting with the system compared to the overall average of participants in the study. That might be one reason why their learning was significantly improved.

Table 4.6 Top 5 Participants' Login Times and Interactive Duration Compared to the Whole Participants of the Study (n=40)

Participants	The average of			
	Login times		Interactive duration (hours)	
	9 weeks	1 week	9 weeks	1 week
N = 40	34.2	3.8	149	16.6
N = 5	54.63	6.07	189.9	21.1

Table 4.7 presents the participation of the five selected PETs in various learning activities on the CLE over nine weeks. The activities include Livestream sessions held every Friday of weeks 2,3,5,6,8 and 9, live chat sessions occurring every Tuesday and Thursday, journal writing sessions held every week, regular participation in TKT tests, and engagement with original posts (OP), post comments (PC), audio, and video calls (AVC). Compared to the entire participant pool (n=40), the five selected PETs exhibited higher participation rates across most activities. For instance, in livestream sessions, they achieved a perfect attendance rate (100%) compared to 90% for the larger group. Similarly, in live chat sessions, they maintained a high attendance rate of 97.8% compared to 68.3% for all participants.

Additionally, their engagement in journal writing was consistent at 100%, contrasting with the 95.6% participation rate for the cohort. Noticeably, despite their participation in the TKT tests being lower than the entire participant pool, their engagement with posts, including original posts and post comments, accounts for 46% and 21.4% of all posts and comments. The result also revealed that these five participants made no audio or video calls to connect with others in the CLE. It can be assumed that these participants might not like direct communication.

Table 4.7 The 5 Selected PETs' Participation in the Learning Activities on the CLE in a 9-week Time

Activity	livestream	Live chat	Journal writing	TKT tests	Posts		AVC
					OP	PC	
Time	Every Friday (Week 2,3,5,6,8,9)	Every Tuesday & Thursday	Every week	Any time (Once a week)	Any time	Any time	Any Time
Duration	60 min/ 1 time	60 min/ 1 time	15 min	80 mins			
Participant (n=40)	216 / 240 times (90%)	328 / 480 times (68.3%)	334/360 times (95.6%)	210/ 360 times (58.3%)	63	318	0
Participant (n=5)	30/30 times (100%)	88/90 times (97.8%)	45/45 times (100%)	16/45 times (35.6%)	**29/**63 (46%)	**68/**318 (21.4%)	0

* OP: Original posts PC: Post Comments AVC: Audio & video calls

4.2.1.2 At the Wayfinding Level

This level involved learner-content and learner-learner interactions. The analysis of learner-content and learner-learner interactions within the CLE over nine weeks revealed a high level of engagement among the participants. All five PETs actively searched for and shared information, predominantly through text-based posts, averaging four posts per nine weeks. Despite utilizing all provided searching tools, the dictionary was the most frequently used, averaging 35.4 times per nine weeks. They stored substantial information on MYSPACE pages, favoring text-based details and images. Additionally, they demonstrated social behaviors by following others and bookmarking their posts an average of 13.8 times and five times over nine weeks. Overall, these findings emphasize the participants' active involvement in collaborative learning processes, highlighting the importance of individual exploration and interaction within online learning environments.

Table 4.8 Top 5 Participants' Frequency of Interactions with Provided Learning Resources and Other Participants in a 9-week Duration

Behaviors	Participants				
	1	2	3	4	5
1. Sharing information by making posts in the form of					
- Texts (word, pdf)	03	05	04	04	04
- images			01	01	01
- Video/ audio files		01	01		
- Ppt slides	01				
- Links	01	01			01

Table 4.8 Top 5 Participants' Frequency of Interactions with Provided Learning Resources and Other Participants in a 9-week Duration (Cont.)

Behaviors	Participants				
	1	2	3	4	5
2. Searching information using					
- Wikipedia	09	06	03	08	02
- Dictionary	22	33	39	47	36
- Google	11	17	44	23	34
3. Storing information on the MY SPACE page					
- Texts (word/ pdf)	12	15	19	23	31
- images	05	03	09	11	16
- Video/ audio files	02	04	05	09	07
- Ppt slides	01	03	06	04	06
4. Following others	11	16	05	18	19
5. bookmark others' posts	06	07	03	06	02
6. communicating with others through					
- Video calls	00	00	00	00	00
- Audio calls	00	00	00	00	00
- Voice messages	02	00	01	00	00
- Text messages	37	44	27	52	38

4.2.1.3 At the Sense-making Level

The qualitative analysis of the collected data from posts and comments using Wang et al. 's (2014) framework showed that these five participants actively engaged in the learning process which included six stages, namely information seeking, information exchanges, discussion and negotiation, information synthesizing, information pattern recognizing and decision making (see Figure 5.1).

To demonstrate cognitive engagement during the idea exchanges at this level, these posts and comments about Classroom Management were extracted from ELT NEXUS. The analysis aims to illustrate how learning is constructed through active interaction among its members. The focus is on the use of gifts as incentives in the classroom to motivate students. Members share their opinions, experiences, suggestions, and reflections, contributing to a collective understanding and improvement of teaching practices.

These extended excerpts illustrate how interaction fosters learning. Firstly, community members benefit from the collective expertise, gaining insights into various motivational techniques. Secondly, the shared diversity of perspectives and

personal experiences enriches the discussion and provides multiple solutions. Thirdly, members like Yumy experiment with suggested strategies and offer feedback, showcasing their learning process. Fourthly, the responses encourage reflection on practices and advice, promoting a deeper understanding and professional growth. Finally, supportive interactions motivate members to try new methods and accept constructive feedback.

YUMI *My teacher trainer always told me to offer younger students gifts in order to keep them focused or make them pay attention to the lesson. I am not against this, but you know students in my class always ask me for gifts every time they answer the questions or do the exercises correctly. Sometimes, I forget to bring gifts to the class. Guess what? My students seem to be very quiet or do not volunteer to raise their hands to answer my questions. Do you think that gifts are always good for students? What should I do to motivate my students if I forget to bring gifts to the class? Could you give me some insights into this issue? Thank you so much for your support.* 💗	**COGNITIVE ENGAGEMENT** Yumi raises a practical issue about the use of gifts to motivate students, seeking advice from the community. **[Stage 1 Information seeking: posting questions]**
A. **SOPHIE:** *I think incentives are good for young learners because they keep them motivated and focused. However, you should be careful when using them because you may form bad habits for your students. Personally, I think you should only give them "gifts" for certain kinds of exercises or tasks and for challenging tasks which require them to do a high level of critical thinking.*	This post serves as a call for help, initiating a collaborative process. Diverse perspectives and solutions are given. Collective knowledge-building emerges as displayed below. Sophie starts with the advantages and disadvantages of using gifts. She also suggests selective application for challenging tasks. **[Stage 2 Information exchange: sharing advice]**
REP: Xuha- *Hi, I agree with you , Sophie. Giving young learners gifts is often motivating for certain activities. You can use it as a tool to draw learners' attention or interest in the long run. I guess maybe you can invest more in designing activities which may meet their learning needs to some extent :)*	Xuha agrees with the ideas and advocates that gifts can be used to draw students' attention and suggests the activities that meet learning needs. **[Stage 3 Discussion and negotiation: suggesting alternatives and expressing agreement]**
REP: YUMY: *Thank you so much for your sharing . I will try this and see what happens*	Yumy plans to apply the new ideas right away. **[Stage 6 Decision making: stating intentions]**
REP: Xin Xin - *could you clarify a little bit about how incentives keep students focused?*	Xin Xin asks for more clarification **[Stage 1 Information seeking: asking for clarification]**

REP: SOPHIE- *It appears that incentives serve as motivators for students to stay engaged and focused on their tasks . By offering rewards such as prizes, praise, or privileges, students are more likely to feel motivated to participate actively in learning activities.* REP: *Xin. I got that. Thank you so much for your clear explanation.*	Sophie clarifies how gifts can motivate students to stay engaged. **[Stage 3 Discussion and negotiation: offering further explanation]** Xin Xin understands the point due to the clear explanation. **[stage 4 Information synthesizing: reflecting on information]**
B. **LUCAS:** *Gifts can be a great way to motivate students and show appreciation, but I don't think they are always necessary. Don't worry about forgetting to bring gifts to the class. I think acknowledgment and praise work well. Maybe you can highlight students' recent achievements or commend their efforts in front of the class.*	Lucas and Yumy propose using 'acknowledgment and praise instead of gifts. **[stage 3 discussion & negotiation: seeking agreements and suggest alternatives]**
REP: **YUMY:** *I absolutely agree with you, LUCAS. I also think that recognition can be just as powerful as physical gifts.*	YUMY agrees with LUCAS and adds her perspective Yumy's idea about using gifts to motivate students is confirmed and she also reflects by comparing similar things **[stage 5 Information pattern recognition]**
C. **MATHEW:** *Hi Yumy, I don't use gifts but I often have a student name list available. Whenever a student answers the question or does the task correctly, I offer him/her 1 plus which is equivalent to 1 point. I find this works very well with students in my class. Most of them are motivated and willing to contribute to the lesson.*	Mathew shares his technique of using extra points to motivate students. He thinks it is effective. **[stage 2 information exchange: sharing experience & presenting the outcomes]**
REP: YUMY: *I applied the technique you suggested this morning in most of my classes, and it works well with my students. Thank you so much for a very useful tip! I hope to get more knowledge from you, Mathew.* ***REP:*** **MATHEW:** *My pleasure YUME*	Yumy reports successful implementation of the new technique, demonstrating immediate application and learning. **[Stage 6 Decision making: reflecting on the past and setting a goal]**
D. NANCY: *I think offering gifts to students can be a great way to motivate them to learn better, so employing them in teaching is essential.*	Nancy offers her opinion about gift offering, recognizing the necessity of using gifts in teaching.
	[stage 2 Information Exchange: sharing opinions] More different viewpoints are offered. They are rich for active thinking and learning because participants need to be critical to compare and evaluate the different ideas.

REP: TONY: *"While I understand your intention, I'm concerned more about the potential drawbacks. Won't it create a culture of expecting rewards for every little task?"*	Tony expresses his understanding of Nancy's viewpoint and raises concerns about dependency. **[stage 3 Discussion and negotiation: discussing opinions and viewpoints]**
REP: JOSEPH: *"I see your point TONY but what if we use gifts strategically? Maybe for major achievements rather than everyday tasks?"*	Joseph expands the point, stating how to use gifts to balance motivation and prevent dependency. **[stage 3 Discussion and negotiation: offering concession and suggesting alternative]**
REP: YUMY: *"That sounds reasonable. It could serve as an extra incentive for students to excel in their studies or extracurricular activities."*	Yumy tends to agree with the point. **[stage 3 Discussion & negotiation: Offering further explanation]**
REP: **BELLA:** *"But what about the long-term effects? Will students become solely focused on the rewards rather than the intrinsic value of learning?"* REP: **CORAL:** *"I agree. We need to ensure that the emphasis remains on fostering a love for learning rather than just chasing rewards."* REP: **YUMY:** *I highly appreciate your concerns about what I am concerned about. Thank you very much for all ideas, suggestions and opinions which I find greatly useful and practical.*	Bella and Coral emphasize intrinsic motivation rather than external rewarding. New knowledge is collectively accumulated. Participants need to analyze the points and express their ideas. **[stage 4 Information synthesizing: Reflecting on information]**
E-ANGELA: *Dear Yumy, I think in case you forget to bring gifts as you wish, you may tell your students that you will give them gifts in the next class. Please don't forget to bring gifts to the next class. If you forget again, there might be a big problem.*	Angela goes back to the original question and suggests promising a gift if forgotten, while Anna advocates for using genuine compliments. **[stage 2 Information Exchange: sharing opinions and advice]**
REP: **YUMY:** *Thank you so much for your sharing. That's very good tip.] I did forget the gifts many times and my students felt disappointed. What if we explore the possibility of using compliments instead??*	Yumy acknowledges the possibility of using compliments as an alternative. But she still has some concerns.
REP: **ANNA:** *"I believe offering genuine compliments to students can be a powerful motivator. Recognizing their efforts and achievements can boost their confidence and encourage them to continue learning."*	Anna confirms the idea.

F- LAMIE: *Hi Yumy* *I think you can set levels for the award. For example, for easy tasks, they can have a plus for a time they volunteer, then 10 pluses can be equivalent to a surprising gift. For a difficult task, they can receive a small gift immediately (e.g. a candy). In that case, your students don't know when they will receive gifts, but they know gifts are always there.* *Hope it helps.* REP: **YUMY:** *I get your point. Thank you so much for your informative response. I love it much.* REP: **CHILI1308:** *You can also use another way to praise them. Maybe a star or something like that.* REP: **YUMMY:** *Dear CHILI1308, "I like that idea. By doing so, we can motivate the students to learn. My students are young learners, so I think this method works well with them. I will try it. Thank you very much for your suggestion.*	Lamie proposes a reward system – with different levels of difficulty. CHILI1308 recommends using stars to praise students. Yumy accepts the idea, expresses appreciation and plans to try these methods. **[Stage 6 Decision making: formulating a plan]**
G- NAT-*I think rewarding needs certain requirements, not every answer can get the gift, only exceptional ones. Or you can organise the bonus system, the individual or the team having the highest score shall get the reward. By doing so you can create a competitive yet still motivated environment. And even in the case you forget to bring the prize that day, you still can promise them that "I will give you in the next section." Because there's only one winner at the end of the lesson, the participation won't get compromised, they'll still engage in the lesson. If you keep rewarding too often every time they get a right (even an easy one), it could form a bad habit of craving for gifts and not thrive for the difficult tasks.* REP: **Harold**- *"I completely agree with your point about rewarding needing certain requirements. Not every correct answer should result in a reward; otherwise, students might expect prizes for every little thing they do right."* REP: **Angela:** *"Exactly! We need to set a standard for what constitutes exceptional performance. That way, students are motivated to strive for excellence rather than just aiming for the minimum requirement to receive a reward."*	Nat and Harold emphasize setting standards for rewards to avoid reward-dependent environment. **[stage 3 Discussion & negotiation: Discussing viewpoints]** Angela and Kang also support a bonus system to promote healthy competition.
REP:**Camila**- *It's clear that we all share a common interest in the way to motivate students in learning. Overall, I think it's crucial for a teacher to implement a selective and consistent reward system, combined with a balance of competition and collaboration, which can effectively motivate students to excel while fostering a positive learning environment.* **H- YUMY** *Thank you so much for all of your ideas, which I find very useful for me. I actually use the techniques that all of you share here. They are very effective for my class. I will continue to use them more in the future.*	Camilla advocates for a balanced and consistent reward system to motivate students effectively. Yumi admits that she has learned new techniques from the communities and has implemented them in her class and found them useful and practical. Her learning is not only at the theory but also practice **[stage 4 Information synthesizing: evaluating information]** **[Stage 6 Decision making: stating intentions]**

In conclusion, the nature of learning within the ELT NEXUS community is dynamic and emergent. The discourse within the ELT NEXUS community exemplifies how learning is built through active interactions, reflective practice, and collective problem-solving. The exchange of ideas and supportive feedback helps participants develop and refine their teaching strategies, ultimately enhancing their professional practice.

4.3 PETs' Perceptions of the Usefulness of Connectivist Learning Environment (CLE)

The third research question endeavors to delve into the perspectives of PETs on the usefulness of CLE. The data collected from online surveys and semi-structured interviews were analyzed based on the adapted frameworks for the evaluation of a website by Nievas-Soriano et al. (2021), Hughes et al. (2004), and Allison et al. (2019). The results indicated numerous positive characteristics or features of the ELT Nexus website called CLE, including usability, utility, functionality, confidentiality, trust, appearance, availability, interactivity, satisfaction, and fee (see Table 4.20).

Usability

The first feature of the website is its usability. According to two interviewees (interviewees 5 & 11), the website was easy for them to use and navigate because the website and its information were said to be easily accessible. Two interviewees mentioned the language used on the website, and three others mentioned mutual support on the website. The followings are what they said about these features:

> *"It is easy for me to locate the website and the information on the website."* (Interviewee # 9)
>
> *"I find the language used on this website familiar and easy to understand. I did not have as many problems with the language as I did when I participated in other websites."* (Interviewee # 5)
>
> *"The activities on the website encourage mutual support among its members. If you have any problems with your pedagogical knowledge, post them on the website and get help from experienced members."* (Interviewee # 2)

Utility

The next feature of the website is its utility. This website attribute was much referred to in many interviewees' answers. Expressly, they referred to the usefulness, the opportunities for interaction, the inspiration of user confidence, and the originality of the website.

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

“This website encourages interactions among the participants through interesting activities such as live streaming 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." (Interviewee # 5)

"I feel confident when I ask questions or discuss something with others because I do not have to use my real name. Nobody knows me, so I am not afraid of being an object of ridicule." (Interviewee # 9)

“This website is different from those I often browse because it contains much exceptional pedagogical knowledge that cannot be easily found on search engines such as Google and Microsoft Bing.” (Interviewee # 2)

Functionality

Functionality is another key website feature that garners significant attention from participants. Aspects such as online searching and filtering, online storage, website notifications and reminders, and website speed were taken into account.

“I found functions such as searching on Google and Wiki, looking new words up in Cambridge dictionary, and filtering website information beneficial for my learning." (Interviewee # 16)

"Many functions, namely editing, adding videos and links, sharing material, and learning resources, etc., for users to employ when posting something on the website. These are not allowed to do so on many other online platforms." (Participant #22)

“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 without fear that the information will be seen or stolen by others." (Participant # 29)

"Website reminders are handy for its users because they routinely remind them to go back to the website whenever they forget. This function motivates me a lot." (Interviewee # 14)

Confidentiality

Confidentiality was asserted by the majority of participants to be one of the standout features of the CLE. Two of the participants strongly emphasized the following:

“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 do not have to worry about disclosing our social identities." (Interviewee # 10)

"The website members' real names are not disclosed, which makes it safer and more comfortable for us to ask questions, give constructive feedback, express our viewpoints, and discuss or chat with others." (Participant # 2)

Trust

Trust was also characterized as a good quality of the website. The interviewee expressed confidence in the reliability of the information and learning resources available on the website, stating:

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

Appearance

The visual appearance of the website was considered "user-friendly" with a design described as "simple" and "good-looking":

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

Availability

The following features of the website to mention are available. The website can be accessed anytime when users are available and at any place with an Internet connection.

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

Interactivity

Slightly less than half of the participants, specifically 17 out of 40, noted that the ELT Nexus website offered opportunities for interaction. This aspect motivated them to engage regularly with the website. The learning problems were addressed rapidly, carefully, professionally, and timely. Three of the participants mainly shared their typical stance about this:

"I was impressed by the way questions are answered. I rapidly received useful, relevant, detailed feedback from other members for every question I asked, inspiring me to participate in this website routinely." (Participant # 18)

"As all users are anonymous, their interactions among other ELT Nexus members are so high. This is a place for pre-service and in-service English teachers to meet to discuss and contribute ideas to their real-life English teaching." (Participant # 24)

"The website has many features that allow optimal interaction and support from others in the community. In a short time, my question received lots of constructive feedback and comments, which motivated me and helped me improve my teaching knowledge." (Participant #35)

Satisfaction

Approximately 50% of the interviewees, specifically 9 out of 16 participants, held notably positive attitudes toward the website. They viewed it as a community where both inexperienced and experienced English teachers convene to exchange pedagogical knowledge. Two of the interviewees expressed their feelings:

"It seems that this is a community where you can meet different people who have the same interests and goals to exchange practical and useful knowledge." (Interviewee # 4)

"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." (Interviewee # 8)

Fee

6 out of 16 interviewees stated that they preferred the website due to its complementary nature. One interviewee provided insight into this viewpoint.

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

Qualifications of the Participants

Besides their perceptions of the website, they also provided some interesting facts about the characteristics of the website users. 32 out of 40 respondents to the online survey claimed that one of the website features was the characteristics of its members who were reported as "experienced," "enthusiastic," "supportive," "active," and "qualified" teachers. Two of the following extracts clearly illustrate the claim:

"I 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 timely, relevant, and practical" (participant # 8).

"As this website attracts many experienced teachers from different education levels, localities, and nationalities, the knowledge shared is reliable, professional, and useful for all website members." (Participant # 22).

Table 4.10 A Summary of PETs' Perceived Characteristics of ELT Nexus Website

	Attributes	**Description**
1	Usability	- Easy use & navigation - Mutual support - Easily understood language
2	Utility	- Usefulness - Opportunities for interaction - Inspiration of user confidence - Originality of the website
3	Functionality	- Storage space - Reminding functions - Searching & filtering tools - Anonymous function - Website speed
4	Trust	- Reliability of the information - Trust-worthy sources
5	Appearance	- User interface - Content arrangement
6	Availability	- The amount of time users get access to the website
7	Interactivity	- Sense of community - Ability to leave feedback and comments - Discussion/ chatting boards
8	Satisfaction	- Users' positive feelings about the website
9	Fee	- Free of charge
10	Website users' characteristics	- Experienced - Enthusiastic - Supportive - Active - Well-qualified

4.22 PETs' Perceptions of Online Learning Contents

In this study, learning contents refer to the learning materials or resources discussed or shared in the CLE. Data were gathered from both online surveys and semi-

structured interviews. The data from the online survey showed that all respondents (40/40) demonstrated their interest in the learning content provided on the ELT Nexus website. Plentiful explanations were given to prove why the learning contents are favored. As seen in Figure 4.1, the learning contents are said to be “situation-based," "well-selected," "well-organized," "interesting," "Downloadable," "relevant," "updated," "applicable," and "multifarious." The following are the typical extracts from different respondents:

> *“Most of the pedagogical knowledge is situation-based and updated, so it is interesting and applicable to our contexts.”* (Participant # 34)
>
> *“The contents in the ELT Nexus website are closely related to the knowledge I need for my future work. Moreover, its contents are multifarious and cannot be found in our coursebooks at the university.”* (Participant # 26)
>
> *"Unlike many websites I know, this website frequently offers new contents which are carefully selected for both online and offline teaching and learning and can be downloadable for free."* (Participant # 38).

The results obtained from the interviews with 16 interviewees showed some more distinctive features of learning contents of the website, which are also regarded as "comprehensible," "essential," "succinct," and "exclusive." The following typical responses can clearly illustrate these features:

> *"The learning contents on the website are essential and relevant to all pre-service English teachers. They are close to reality so that they can be applied immediately in teaching."* (Interviewee # 16)
>
> *“The learning contents are well-structured, succinct, so they are easy to understand. I almost had no difficulty understanding pedagogy-related knowledge on the website.”* (Interviewee # 3)
>
> *“The contents are continually updated and suit our needs. They are “clean” because they focus only on English teaching. No “toxic” information and advertisements are found on the website. Whenever I log in, I always find new and useful information.”* (Interviewee # 2)
>
> *“The learning contents on this website are contributed by those who are experienced and enthusiastic about English teaching, so they are reliable, and much of them cannot be found elsewhere."* (Interviewee 8)

In response to the question about the usefulness of learning contents to their teaching practicum, all participants agreed that the learning contents are helpful for their teaching practicum, and they further explained their opinions as follows:

"Learning contents are practical, useful, and essential for my teaching practicum. I am now well-prepared for my upcoming practicum thanks to my participation in different activities on this website." (Participant # 35)

"Personally, the three learning contents on the ELT Nexus website, e.g., teaching methods and learning theories, classroom management, and lesson planning, are all fundamental pedagogical knowledge that every student teacher like me must master before their teaching practicum." (Participant # 36)

"Through different learning activities on the website, much crucial pedagogical knowledge has been discussed and shared, which helps me build a background teaching knowledge and prepare for my teaching practicum next month." (Participant # 8)

Well-selected	Logically structured	Interesting	Downloadable	Relevant	Updated / Current	Practical/ Applicable	Multifarious	Situation-based	Reliable	Essential	Succinct	Comprehensible	Exclusive
Data from an online survey													
Data from semi-structured interview													

Figure 4.1 PETs' Perceptions of Learning Contents

Regarding their favorite learning contents, figure 4.2 below shows that more than half (52.5%) of PETs preferred learning contents involving classroom management to those of lesson planning (30%) and teaching methods and learning theories (17.5%).

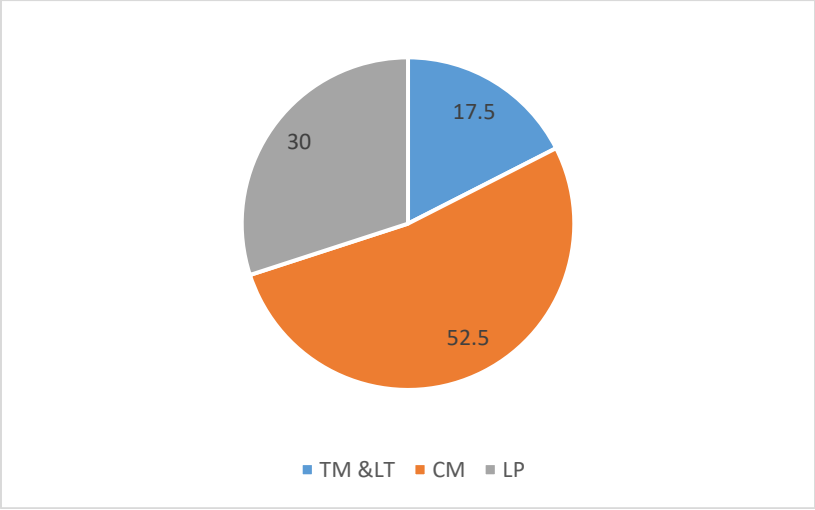

Figure 4.2 PETs' Most Favorite Learning Contents

Classroom management attracted special attention and interest from PETs as it was considered a new, practical, and crucial aspect of GPK. Three of the participants confided:

> *"Classroom management is knowledge I do not know much about, so I find it interesting and useful. Most of the discussion related to classroom management is very informative and practical. It provides an insight into different ways of managing activities for learning in and out of the classroom."* (Participant # 33)
>
> *"I prefer the classroom management aspect to others because it provides many practical situations and inspirational stories in classroom contexts about which I have little knowledge. Through discussions with others about classroom management, I learned many classroom management-related tips that I have never thought of."* (Participant # 14)
>
> *"I think classroom management is one of the essential aspects of pedagogical knowledge teachers should know as they cannot teach well without good classroom management knowledge or skill. I collected a lot of classroom management tips and strategies from this website and applied them to my tutoring classes. They worked very well with my students."* (Participant #37)

Those interested in lesson planning emphasized its importance in the teaching process. They loved this aspect of pedagogical knowledge as it was updated with new formats and ideas. The following extracts could illustrate what they said:

> *"I was updated with the new format of a lesson plan that I have never known or been instructed by my teacher before. This is essential for my upcoming teaching practicum."* (Participant # 11)
>
> *"Lesson planning is one of the most important knowledge areas every teacher should know. As a member of the website, I was provided with new ideas to create interactive and interesting lesson plans for online and offline classes."* (Participant #17)
>
> *"I have many opportunities to update my ideas for designing interesting lesson plans. I was particularly updated with the new format of a lesson plan proposed by the Ministry of Education 2021."* (Participant # 36)

Although teaching methods and learning theories should be paid more attention to the other aspects of pedagogical knowledge, they are considered essential and valuable for English teachers. Seven participants revealed they needed to learn more about learning theories as they were not clearly explained or fully instructed in

their conventional classes. One participant showed her interest in this aspect of pedagogical knowledge:

> *"There are many posts about teaching methods and learning theories, some of which are quite new to me. I have not been taught much about learning theories in the study program at the university."* (Participant # 37)

4.2.3 PETs' Perceptions of Online Learning Activities

Numerous characteristics are disclosed concerning the perception of the learning activities, which were also gained from online surveys and semi-structured interviews (see Figure 4.3). According to the data from the online survey, all participants (40/40) acknowledged the usefulness of the learning activities, which were characterized as "well-scheduled," "interactive," "interrelated," "convenient," engaging," and "practical." Each of these characteristics is clearly described in the following extracts from participants.

Firstly, 9 out of 40 participants mentioned the website schedule, which was said to be chronologically arranged and quickly followed. One participant remarked:

> *"Most of the activities are arranged according to a fixed schedule, so it is easy for participants to follow if they want to."* (Participant # 2)

Secondly, 12 out of 40 participants asserted that the ELT Nexus website offered interactive learning activities. They create opportunities to meet with experienced others to exchange essential pedagogical knowledge. One participant highlighted:

> *"Learning activities encourage interactions and connections among website members. They help us connect to share knowledge or experience and to update knowledge that we have not known yet."* (Participant # 6)

Thirdly, 5 out of 40 participants discovered that all learning activities had strong connections, making the learning contents quickly remembered and understood. One participant commented:

> *"All activities are varied but strongly connected. Similar topics are included in different learning activities, which helps me understand better and remember knowledge longer."* (Participant # 21)

Fourthly, 29 out of 40 participants found the learning activities on the website interesting because these activities included relevant and new knowledge. One typical opinion was recorded as follows:

> *"The contents embedded in each learning activity are not easily found in books and our course materials, so I collect much new knowledge every week. Furthermore, all the activities purely focus on indispensable pedagogical knowledge, so they attract much attention from me."* (Participant # 17)

Fifthly, convenience is another characteristic of the learning activities to arouse the interest of pPETs. Almost three-quarters of participants (29 out of 40) found the learning activities favorable to them in terms of space and time, which is commented on by one of the participants:

> *"We can update our pedagogical knowledge anytime and anywhere we want. Through different activities such as live stream, live chat, and posts, we can ask questions and discuss anything related to ELT without worrying that our personal information would be disclosed."* (Participant # 12)

Finally, 13 out of 40 participants favored the practicality of the learning activities. The activities were said to enable them to seek support or to provide practical solutions to their problems. One among these participants stated:

> *"Most of the learning activities are practical. They help us get connected to those who have intensive pedagogical knowledge to get our problems solved."* (Participant # 25)

The results from the semi-structured interview also revealed many interesting facts about the learning activities. Besides the characteristics mentioned above of the learning activities, others, such as relevance, personalization, and security, were meticulously described. The following extracts are typical illustrations for each of these characteristics of the learning activities on the website:

> *"Website activities benefit participants because they help them solve various profession-related* problems *and share practical teaching and learning experiences through direct or indirect discussions with other website members."* (Interviewee # 6)
>
> *"One of my favorite characteristics of this website is that it offers different learning activities for its members to choose from. In addition, these theme-based activities have strong connections with each other, which makes the learning process more focused. This is an online course for pre-service English teachers."* (Interviewee # 14)

"It is more comfortable and secure for website users to share or discuss professional knowledge. We were not required to disclose any personal information in any activity we took part in." (Interviewee #10)

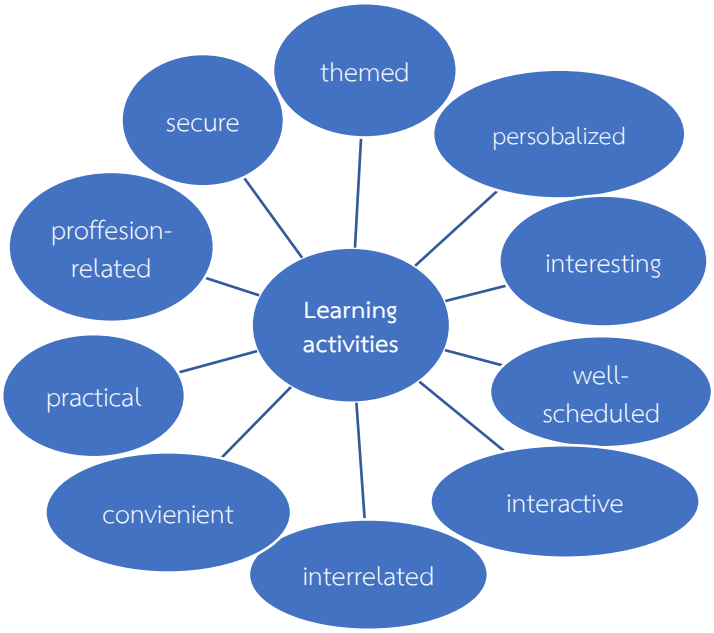

Figure 4.3 PETs' Perceptions of Learning Activities

Interestingly, the data in Figure 4.4 revealed that PETs' three favorite learning activities were a live stream, posts, and live chat activities.

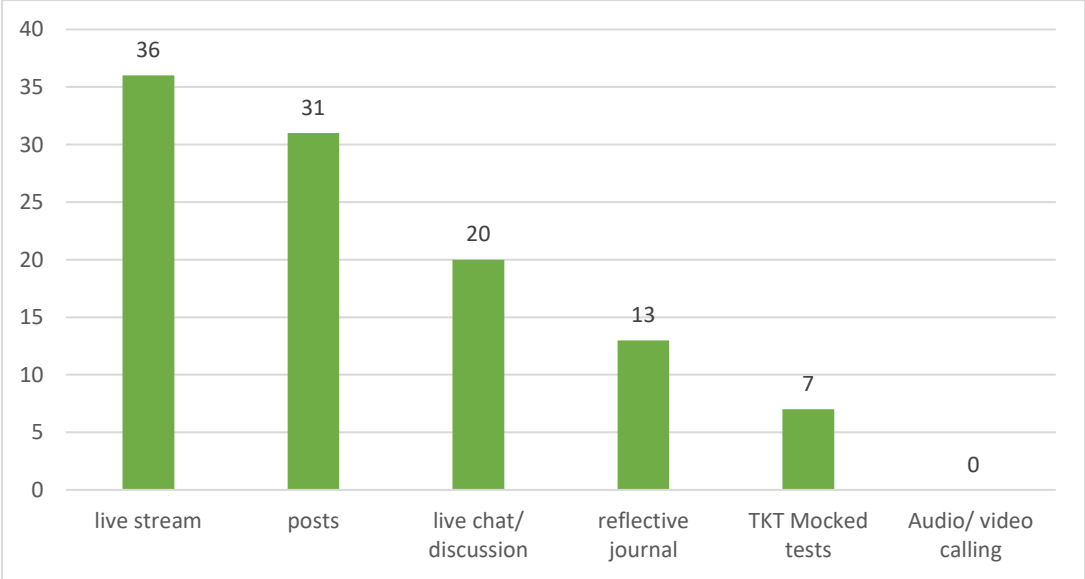

Figure 4.4 PETs' Most Favorite Learning Activities

Firstly, several explanations were given by the participants to clarify their interest in the livestream activity. According to most of them, live stream activity created opportunities for them to interact or discuss with experienced teachers who were well-selected for such activity. Below are some of the extracts that represent many other participants' opinions:

> *"I have a chance to meet different experienced EFL teachers, all of whom are carefully chosen, active, and helpful. I learned much practical pedagogical knowledge from participating in live stream activity."* (Participant # 23)
>
> *"All presenters in livestream activity are deliberately selected, so they enthusiastically share pedagogical knowledge which is practical and useful for us and willingly answer any questions from the listeners."* (Participant # 40)
>
> Livestream activity was also reported to help them gather more practical and current information faster than others.
>
> *"I was fascinated by practical and useful pedagogical knowledge from qualified teachers. This activity provided us with updating knowledge rapidly and helped us understand the knowledge deeply through question-and-answer sessions."* (Participant # 6)

Additionally, livestream activities are favored more because it was appropriately scheduled.

> *"The length of each live stream is reasonable (not too short or too long), which keeps the listeners focused more on the live stream contents."* (Participant # 8)

Next, notwithstanding the second rank, posting activity was believed to provide lots of interesting, practical, and updated content, facilitate knowledge sharing through discussion among website members, and allow anonymity. The following extracts perfectly exemplify what they thought about the posting activity:

> *"I think that this activity is interesting because it contains a lot of new and relevant knowledge which is suitable for our current teaching in Vietnam. Like Facebook, the posts are easy to follow."* (Participant # 3)
>
> "*What I fear is to receive no comment on my posts. However, whenever I posted a question on the website, I always received a lot of satisfactory answers and practical suggestions or advice from other members. I was genuinely motivated a lot by this."* (Participant # 11)
>
> *"Because I am afraid of communicating directly and in person with others, anonymous communication with others through posts and comments is the most suitable for me."* (Participant # 7)

PETs' third favorite activity is the live chat activity. Like live stream activity, live chat activity created considerable opportunities for website members to exchange useful and practical pedagogical knowledge. One of the participants said:

> *"Live chat helps everyone instantly and easily interact with each other to exchange knowledge which is practical and useful for their teaching."* (Participant #16)

Similarly, when being asked about three activities on the website that they most joined in and three other ones that they rarely joined in PETs demonstrated that they most participated in such learning activities as livestream, posting, and live chat (see figure 4.5), They were least engaged in learning activities such as audio/video calls, TKT mock tests, and online reflective journals. (see figure 4.6).

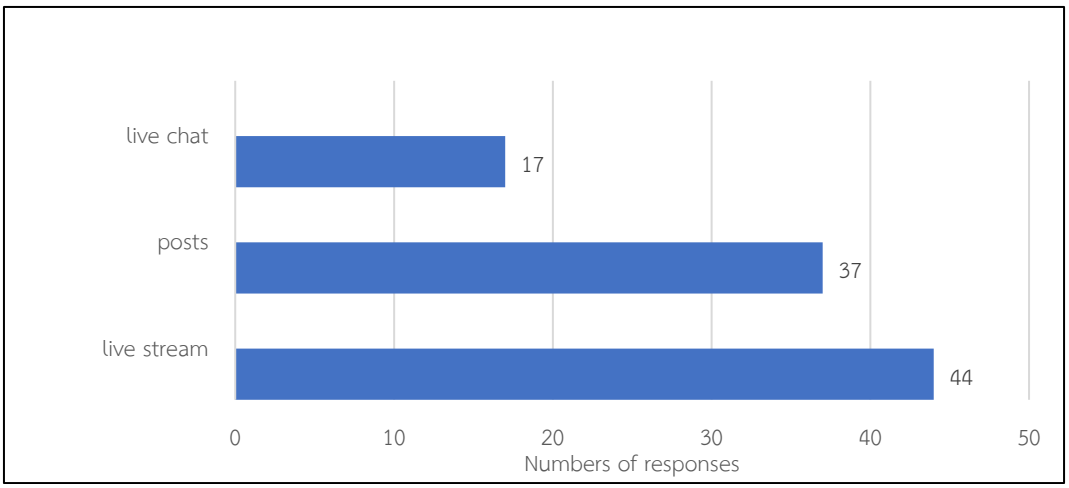

Figure 4.5 PETs' Three Most Frequently Joined Learning Activities

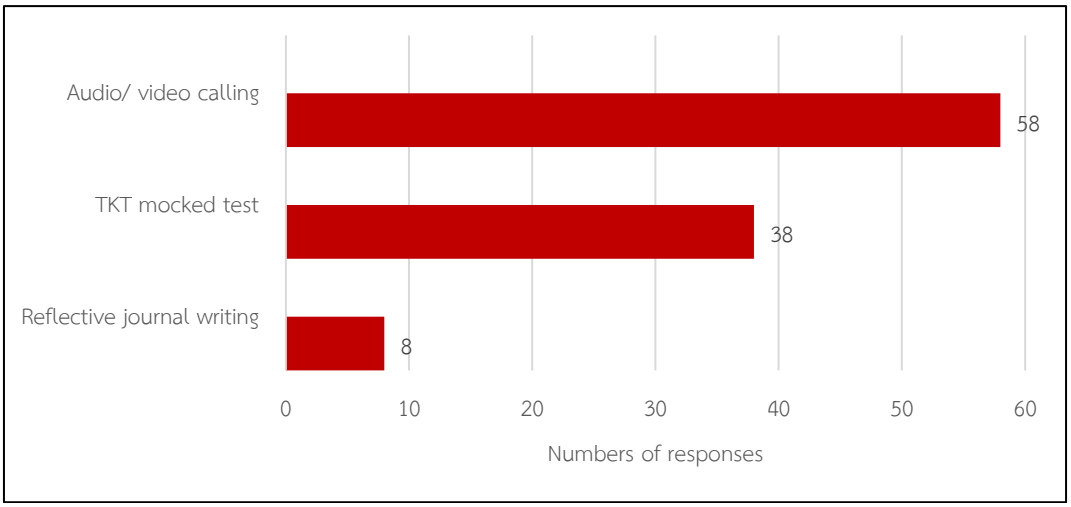

Figure 4.6 PETs' Three Rarely Joined Activities

For each activity, different reasons were given to explain their low frequency of participation. It is easily seen from Figure 4.10 that no participants joined the audio and video calling activity. However, it is a necessary and helpful activity for their learning process. 7 out of 40 participants said they needed to be more confident about their English proficiency and professional knowledge to have direct discussions with others they regarded as experienced experts. One participant disclosed her perspective:

> *"I am not confident enough to make audio or video calls with others because I do not think my English is good enough to make myself understood. Moreover, my pedagogical knowledge is still limited."* (Participant # 35)

8 out of 40 participants said they were not good at communicating with strangers and did not want their identity to be disclosed. One of the participants shared his opinions:

> *"I am scared of talking to other people about whom I do not know much. I did not call others for help because I feared they knew who I was. I join this website because my personality is always kept secret."* (Participant # 6)

Additionally, 7 out of 40 participants mentioned that they did not join this activity as it did not suit their time and personality and did not have any urgent need to make audio or video calls to ask for instant support. Two participants shared their viewpoints:

> *"Because other website members' online availability is different from mine, it is tough for me to find time to interact with them by using audio or video calls."* (Participant # 3)
>
> *"I am an introverted person, so I think this activity is not suitable for me."* (Participant # 19)
>
> *"I have not completed my learning at the university yet, and my teaching practicum will begin next month, so I have no urgent need* to *ask for instant help by audio or video calling others."* (Participant #2)

Although most participants admitted that TKT mocked tests benefit their major, they only did them occasionally due to time constraints and their feeling of being tested. The followings are two of the explanations from the respondents:

> *"I was so busy that I could not do all of the TKT mock tests. However, I think they are beneficial for me, so I downloaded all of them for later practice and use."* (Participant # 34)

> *"I do not like tests much. When I did TKT mocked tests, I always had a feeling of being tested. Therefore, I did not do them very often."* (Participant #12)

Unlike the other two learning activities, i.e., audio/ video calling and TKT mocked tests that attracted the fewest participants, online reflective journal writing had many more participants. 6 out of 40 participants admitted that they sometimes forgot to write reflective journals because they were busy with their learning plans and other personal stuff.

4.2.4 The Contribution of CLE to PETs' Future Profession

When asked about the contribution of the ELT Nexus website to their future career, all PETs (N=40) admitted that it significantly contributed to their future careers for several main reasons, the first of which was the marked characteristics and the regular presence of the "well-selected" and "experienced" participants who were "professional" and "helpful" knowledge providers. One of the participants highly appreciated the support from the experienced teachers by saying:

> *"This website creates opportunities for me to meet with many participants who are enthusiastic and helpful experts in the field. They helped me a lot, so my pedagogical knowledge was much improved. If I continue to participate in this website in the future, my pedagogical knowledge will be improved much more."* (Participant # 5)

It is easily seen from the data that most of the participants believed that at a certain time in the future, novice English teachers would need professional support, and the website is a good place for them to do so because of the regular online presence of the experienced members on the website. One of the participants said:

> *"This website is very helpful as it offers a variety of learning activities that create opportunities for us to connect or interact with others who are highly professional and are always available online to provide timely professional support."* (Participant # 16)

The second main reason to mention was content shared and discussed on the website. These contents were said to be "reliable," "relevant," "practical," "diverse," "practical," and "current," and essential for their future career. Two of the participants shared their opinions regarding the contents of the website.

> *"The website offers a lot of updated and practical content, which will help me a lot in my teaching job in the future. Before my participation on the website, I did not know much about classroom management and learning theories; however, after 9-week participation*

on the website, I now know a lot about how to manage my students effectively." (Participant # 27)

"I think I learned a lot of new and practical pedagogical knowledge that I cannot find in the book and the teaching and learning content of the program that I am currently following at the university. I believe this website can help me update my knowledge more if I continue to join it because I will need to learn and update my pedagogical knowledge in my future career." (Participant # 19)

"I joined many educational websites for teachers such as Edmodo and Khan Academy, and I do believe that ELT Nexus website is among few websites that share practical and updated pedagogical knowledge with its members." (Participant # 38)

The ultimate primary factor demonstrating the website's contribution to the advancement of PETs' future careers was its learning activities, which fostered interactions among members and the generation of new knowledge. One participant said,

"The website has many interesting and useful activities such as live streaming, live chat, posting, etc., encouraging participant interaction and knowledge sharing. These activities are continuously updated with new pedagogical knowledge, which is essential for my teaching job in the future." (Participant # 32)

4.2.5 PETs' Recommendations for Improvement of the CLE

Despite the above-presented positive and strong points about the ELT Nexus website, a few weak ones that needed to be improved to serve the participants' learning needs were also mentioned. Based on the respondents' recommendations, the following aspects of the websites should be improved to make them better and to serve their members' needs.

Learning Activities

Activities like live streaming and live chat should be held more frequently to create more opportunities for participants to interact with and exchange professional knowledge. One participant suggested:

"Chatting rooms should be opened daily to create more opportunities for everyone who urgently needs professional support to have direct interaction with others to exchange for knowledge." (Participant # 31)

Website Functions

Many participants raised the same problems they confronted while participating in live stream activity. The problems involved the online chatting and

PowerPoint slides sharing functions. They said they had difficulty chatting while watching the live stream as this function did not work properly. One of the participants expressed his concern*:*

> *"In my opinion, what needs to be improved is the chat box in live stream activity. While you are typing and other participants enter their messages, all the content you have typed in the chat box disappears."* (Participant # 36)
>
> *"I think there should be a screen sharing function for the live stream activity, so the live streamers can show their PowerPoint slides and make their presentation easier to follow."* (Participant # 37)

Besides, more functions are also suggested to be included on the website to serve its members' needs better. One of the additional functions of the website is the mobile version for the website. One participant proposed:

> *"There should be a smartphone version for the website as it does not appear as user-friendly as it is seen on the laptop"* (participant17) because "*the participants may access the website more frequently if there is a mobile app which provides timely automatic notifications of the new posts, comments, and so on."* (Participant # 29)

Another function to be added is a collocation dictionary and grammar check tools. As a participant expressed:

> *"The website should make a collocation dictionary and grammar check function available to support the website members in writing or understanding posts better."* (Participant # 16)

To summarize, this chapter presented the study results collected from multiple research instruments, namely online weekly reflective journals, online surveys, semi-structured interviews, and database-generating data. The qualitative and quantitative analysis of the collected data revealed positive results, potentially furnishing satisfactory responses to the three research inquiries posed in Chapter 1. The findings will be meticulously discussed in the next chapter of this study.

CHAPTER 5
DISCUSSION & CONCLUSIONS

This research study aims to examine the effectiveness of the CLE in enhancing PETs' GPK and their perceptions of its usefulness. The employed methods include pre-test 1, pre-test 2, and post-test, online reflective journal writing, semi-structured interviews, and text analysis. The collected data underwent quantitative analysis through descriptive statistics and qualitative analysis utilizing content analysis. The findings showed that PETs substantially increased in GPK after nine weeks of participating in the CLE, thanks to their high levels of interaction and cognitive engagement with others in the community. PETs perceived the ELT Nexus website, the so-called CLE, as a beneficial learning platform for GPK improvement. Not only the CLE's features but also its learning content and learning activities were found to be of PETs' interest.

5.1 PETs' Improvement of GPK

The findings of the descriptive statistical analysis of pre-test 1, pre-test 2, and post-test demonstrate a significant enhancement in PETs' GPK after nine weeks of participation in the CLE. This increase in the test scores proved the effectiveness of the CLE (a social networking website), the framework of which comprises GPK input, learning activities, learning skills, and learning interactions with the facilitation of 5 learning conditions, namely diversity, openness, connectedness, autonomy and anonymity and social technology. It can be seen that the carefully selected GPK aspects or input, namely learning theories and teaching methodology (LT & TM), classroom management (CM), and Lesson Planning (LP), integrated closely into learning activities, including live streaming, live chatting, posting, audio and video calling and reflective journal writing could cater to PETs' learning needs, which potentially enhanced their learning autonomy, interaction levels, cognitive engagement and application of learning skills and subsequently improved their GPK. Additionally, the anonymity feature within the CLE allowed for uninhibited participation in activities like live streaming, live chatting, and posting, fostering a sense of security regarding personal information. This aspect likely encouraged active contributions of information or knowledge within the learning community, which could bring positive learning outcomes.

5.2 Aspects of the CLE

The findings from the qualitative analysis of automatically-recorded data from the database, online reflective journal, and from the semi-structured interview related to the 5 participants who fully participated in all learning activities and had the most progress in pedagogical general knowledge after spending nine weeks participating in the study and the information gathered from online surveys and semi-structured interviews revealed the distinctive and positive aspects of the CLE including its characteristics, learning conditions, online learning resources, online learning activities, learning skills, and learning interactions.

5.2.1 CLE's Distinctive Features

Like numerous other social networking platforms, the CLE was highly regarded by PETs as a robust educational platform, lauded for its various positive attributes such as its visual appeal, accessibility, user-friendliness, functionality, and cost-effectiveness. Nevertheless, the CLE possesses distinctive features that are believed to be pivotal in fostering active engagement in learning activities and ensuring participant retention within its framework. Firstly, the credibility of information and learning resources within the CLE was enhanced because they are predominantly selected and shared by experienced English teachers, drawing from their wealth of teaching expertise. Secondly, the CLE was noted for its high level of interactivity, evidenced by the dynamic discussions among participants across various learning activities. This indicates that the platform facilitated both synchronous and asynchronous interactions through features such as live streaming, chat functions, postings, and audio/video calls.Moreover, the study enlisted the participation of 15 experienced English teachers, enabling prompt responses and the exchange of professional insights and practical teaching experiences. Finally, the CLE was perceived as a secure environment for confidential information exchange and experience sharing, with participants afforded anonymity during learning activities. This inclusivity fostered knowledge acquisition and academic support-seeking among less experienced participants while allowing experienced members to offer guidance and expertise to those with similar interests.

5.2.2 Learning Conditions

The enhancement of PETs' GPK, as observed in this study, reaffirmed the notion that the academic success of online learners can primarily stem from four key learning conditions: learner autonomy, connectedness, diversity, and openness (Downes, 2006, 2010, 2012). Additionally, anonymity, highly valued by PETs, is an equally crucial supplementary condition for their effectiveness within the CLE.

5.2.2.1 Learner Autonomy

Like many other online websites, the design of the CLE aimed to maximize PETs' ability to learn autonomously in the CLE. Firstly, the carefully scheduled learning modules introduced at the beginning of the research study helped PETs clearly define learning objectives, understand what was expected of them, and set their personal goals. This clarity provided direction and motivation, guiding their efforts toward specific outcomes. Secondly, a clean and user-friendly interface of the CLE allowed PETs to easily navigate the platform, access the learning resources, and find relevant information without unnecessary complexity. Thirdly, the CLE provided not only information searching and filtering tools, which made it easier for PETs to locate the information they needed, but also reflective ones (reflective journals), which enabled them to articulate their thoughts, document their learning journey, and take ownership of their learning process on the CLE.

Fourthly, the learning activities were designed to facilitate communication and collaboration among participants through discussions, posts, forums (chat), video/ audio calls, and live streams. Whenever PETs had concerns or problems related to English teaching and learning or sought needed information, they could participate in such learning activities.

Fifthly, different from many social networking sites, this study involved many more experts (15 experienced English teachers) whose responsibility was to share updated knowledge and practical experience and to provide professional support to others when necessary. As there were more experienced English teachers on the CLE, their contributions to knowledge development were more remarkable, their online on the CLE was more regular, and their ability to provide instant answers to questions and instant solutions to problems was likely to be more rapid than others. These experts' online presence on the CLE enabled them to meet PETs' demands of real-time interactions.

Last but not least, participants in this study were allowed to customize their learning experiences. They could independently select whatever contents they needed to learn and discuss, whichever activities they wanted to participate in, whenever they wanted to join the CLE, and whomever they would like to communicate or interact with, which is referred to as "learner choice" by Mackness et al. (2010) or "learner autonomy" by Downes (2010, 2012). This helped cater to their individual needs and preferences and allowed them to process the learning content at their own pace and accommodate different learning speeds and styles, promoting autonomy. Consequently, PETs could govern and direct their learning according to

their learning objectives (Abhari, 2017; Downes, 2010) despite the absence of instructors within the CLE.

5.2.2.2 Connectedness

The participants' connections and interactions with others and the CLE in exchange for the needed information through their intense discussions in such learning activities as live streaming, live chat, posting, and commenting are likely to be particularly strong, potentially leading to favorable learning outcomes. This could be explained by the fact that participants could anonymously communicate and exchange with anyone in the CLE without being worried about private information being disclosed. Stone and Springer (2019) also proved that teacher presence could increase connectedness. As there were many experienced English teachers in the CLE, their presence was more frequent, and there were more connections and interactions among participants. These findings align with the propositions of Abhari (2017), suggesting that active engagement in learning activities fosters positive learning outcomes through meaningful connections with others.

5.2.2.3 Diversity

The results from the qualitative analysis of the participants' posts demonstrated that for each question or problem raised in such activities as live streaming, live chat, and posting, a wide range of ideas and opinions are provided by other participants, which is considered as an integral part of the learning process and which also enriches participants' aspects of knowledge. This aligns with Downes' (2012) findings, which suggest that an effective learning environment ought to cultivate diverse perspectives among its participants. As this study employed 15 experienced in-service teachers whose levels of education, age, and expertise differ, their contributions are also varied in terms of ideas, opinions, and knowledge. Practical and authentic teaching and learning experiences can be gained from in-service EFL high school and university teachers and innovative ideas from experts and researchers in the field. In such a dynamic learning environment, the variation in the selection of experienced participants can bring about variety, which benefits all members. Every participant has a role to play. Those who are good at technology may contribute their technological knowledge; those who gained much experience in teaching may share professional knowledge; those who prefer highly and directly interactive activities may have discussions via such activities as live stream and live chat; and those who are interested in less interactive forms of interactions may choose to post and to comment.

5.2.2.4 Openness

In the context of the CLE, openness entails facilitating open communication via networks to acquire knowledge, exchange learning materials, ideas, and expertise, and generate novel insights and information (Firdausiah & Yusof, 2013). The findings from the analysis of participants' behaviours through different activities show that they were open to anonymously communicating with each other through discussing, sharing, and commenting on different ideas and perspectives. This indicates that open communication through networks will be significantly facilitated if participants are anonymous.

5.2.2.5 Anonymity

Although anonymity was not mentioned in the findings by most researchers as a learning condition, it played a crucial role in making learning in the CLE happen. Through the quantitative analysis of the interactions and the qualitative analysis of the participants' perceptions of the CLE, anonymity was perceived as a must-have condition for the online learning environment where knowledge was confidentially and freely shared, and anonymous written communication among participants was greatly facilitated. The results obtained from the semi-structured interviews, online surveys, and online reflective journals indicated that maintaining anonymity during activities within the CLE promoted participant involvement and engagement. This finding is consistent with the research conducted by Chen (2019), which explored the perceptions of 154 international EFL university students regarding the utilization of anonymity in online peer interactions. The findings revealed that anonymity was perceived as influential in their interactions with peers. Therefore, the more confidential the online learning environment is, the more interactive the online learners are, and the more positive the outcomes they get.

5.2.3 Comprehensive Online Learning Resources

It is generally agreed that online learning resources that are made available online are categorized into learning contents and learning tools that may be tailored to support the learning process (Lebenicnik et al., 2015); however, they should also include human beings, e.g., teachers who directly or indirectly contribute their professional knowledge and experience to the learning process (Jeong & Hmelo-silver, 2010). In this study, learning tools, learning contents, and native and non-native English teachers are all considered learning resources that significantly contribute to learning success. Keengwe, Diteeyont, and Lawson-Body (2012) assert that online learning resources must be appropriate and beneficial for supporting learning. Hmelo-Silver

(2004) suggests that learning resources are effectively employed if learner self-direction and learner agency are encouraged.

The first online type of resource, online learning tools, refers to any program or application in the CLE that can be accessed via the Internet to facilitate learning by connecting PETs with others and enhancing their ability to perform learning activities. Similar to the study conducted by Keengwe, Diteeyont, & Lawson-Body (2012), who wanted to search for appropriate online learning tools that responded to learner and instructor satisfaction within an online course, the online learning tools in the CLE are found to be convenient in terms of accessibility and usability. It can be observed from the CLE that learning tools in this platform can meet learners' needs when searching for technical support and professional knowledge. If participants, for example, have any problems or inquiries related to technology when interacting on the CLE, they may utilize a variety of communication modalities, including chat functions and audio/video calling features, as well as posting queries or dispatching instant messages to the CLE administrator. Additionally, avenues for correspondence with the CLE designer via email are provided. Regarding supporting learning activities, the CLE provides different supportive tools tailored to facilitate information retrieval and data curation, thereby enhancing participants' ability to access and sift through requisite information.

The second online resource to mention is the learning content which refers to the learning materials or resources being discussed or shared through different activities in the CLE (Salmon, 2013). A significant amount of relevant knowledge is generated through participants' interactions with learning activities in the CLE. It is worth noting that the more relevant, current, and practical knowledge is shared in the CLE, the more active interaction is paid, the more related knowledge is generated, and the more knowledge is gained.

The third online resource is native and non-native EFL teachers considered experts and professionals in the field. The online survey and semi-structured interview findings demonstrate that native and non-native English teachers in the CLE are perceived as well-selected knowledge providers who are always active and helpful. They are highly appreciated for their regular online presence, active participation in learning activities, and their eagerness to share professional knowledge and experience with the learning community in the CLE. They made 166 posts, shared 17 links, and commented 527 times on other participants' posts. They also provided a lot of feedback and guidance, which was highly regarded by participants (Bates, 1995).

In summary, learning resources in the CLE, including learning tools, online learning resources, and experienced native and non-native EFL teachers, play a pivotal

role in fostering a learner's construction of a rich understanding of knowledge. It can be concluded that online learning is probably remarkably successful in a resource-rich learning environment.

5.2.4 Diverse Online Learning Activities

It is seen from the findings that the levels of PETs' engagement in most of the learning activities, namely live stream, live chat, TKT mocked tests, posts, and reflective journals in the CLE, are high because these activities are believed to provide them opportunities to exchange and share authentic teaching and learning experiences with other experienced teachers in the CLE and bring about their positive learning outcomes. These confirm that learning activities are crucial to their success (Nguyen, 2017). The more actively the learners engaged in the learning activities, the higher their achievement in the learning outcomes they received (Surjono. Muhtadi, and Trilisiana, 2019). As perceived by most participants, learning activities in CLE are organized according to a fixed schedule focusing on specific aspects of pedagogical knowledge. They can participate according to their availability and interests. Each activity offers PETs different learning experiences that are believed to benefit them and their future teaching careers.

The findings show that PETs participate most actively in livestream activities. In total, 90 percent (216/240 times) of PETs participated in this activity with an average of 11 interactive questions. PETs' high levels of participation demonstrate their most significant interest in livestream activity, which can create favorable opportunities for them to exchange real teaching experiences and current knowledge rapidly and directly with experts and professionals in the field. English teaching experts offer free access to a diverse range of practical, relevant, and up-to-date knowledge and exclusive teaching and learning experiences related to classroom management and lesson planning. These resources surpass traditional books and other learning materials in their comprehensiveness and applicability.

Posting is the second most favorite learning activity, but PETs' participation and interaction in this activity are remarkable. During nine weeks of participation, 63 original posts and 318 comments on posts were made. They are highly evaluated because of their relevancy, currency, and practicality. Remarkably, most posts are commonly followed by many participant comments, replies, and positive reactions. In addition, a wide range of teaching and learning resources are shared and discussed throughout the posts, which benefit the participants' learning process.

Regarding live chat activity, PETs' participation is comparatively high (68.3%). Like livestream activity, participants are provided with considerable opportunities to

have instant exchange through chatting with others for updated and relevant information that they need. As this study is conducted when PETs are about to go for an internship at high schools, their urgent need to ask for pedagogical knowledge is not critical. This may influence the frequency of their participation and the amount of information exchanged during this activity.

Although online reflective journals are not among the top 3 favorite learning activities, they are completed by most participants (95.6%). In line with findings from Vuong and Le's (2021) study, participants in the CLE find online reflective journals instrumental as they provide them an opportunity to reflect on their progress in their learning. By writing online journals, individuals consistently review and critically reflect upon what they have acquired through their interactions with others in most learning activities. This process significantly aids in improving and retaining knowledge for future application.

It may become apparent that TKT tests are regarded as essential for their major, but only a few participants complete them all. TKT tests are, by nature, theoretical and long and offer little chance for interaction with others; therefore, participants are not motivated to do them. Moreover, some participants may not be interested in doing the tests due to time constraints and their feelings about being tested. This activity fails to stimulate learning, build participants' confidence, and prepare them for standardized TKT tests.

The last activity to consider is audio and video calling, which offer flexible chances to communicate instantly among online members for essential pedagogical knowledge. Surprisingly, the data retrieved from the database show that no PETs participated in this learning activity. It is understood that participants in this learning environment are not required to use their real names in all activities they participate in. However, unlike other learning activities, audio and video calling allow others to hear their voices and see their faces. This may prevent them from engaging in this activity as some participants may feel inferior to others regarding professional knowledge and English proficiency. Like live chat activity, audio and video calling motivate instant contact or communication with others to ask for essential and urgent information. As PETs do not need knowledge urgently, they do not make audio or video calls to get instant help from others. A learning activity may not attract participants' attention and participation if their identity is potentially disclosed. To summarize, interactive activities, namely live streaming, live chatting, and posting in which anonymity is allowed, attract more attention and interactions from participants. Thus, more knowledge is exchanged and learned.

5.2.5 Learning skills

The findings from the analysis of data from the weekly reflective journal writing show that participants in the CLE employed various metacognitive skills which are believed to be essential for learners to succeed in a connectivist learning environment and which are beneficial for their learning process (Kennie & Morrison, 2013; Siemens, 2005). Using metacognitive skills helped them regulate and control their learning processes, which led to positive outcomes (Veeman et al., 2014).

5.2.6 Learning Interactions

Banihashem and Aliabadi (2017) asserted that learning needs connection and interactions. The analysis of comments and posts of the top 5 participants who progressed the most in general pedagogical knowledge proves that they reached four levels of interaction and cognitive engagement, significantly contributing to their improvement. The finding of this study is similar to that of Downes (2012), who proved that the stronger the interactions among participants were, the more and the deeper the knowledge or the learning contents were shared. Additionally, the discourse analysis of CLE participants' information exchanges of 3 groups of posts (posts with the most information exchanges, posts with average information exchanges, and posts with the fewest information exchanges) reveals a learning process of 6 stages, including information seeking, information exchange, discussion and negotiation, information synthesizing, information pattern recognizing and decision making (see Figure 5.1). Participants employed various cognitive strategies throughout these stages to accomplish their learning objectives. This study's findings confirmed Wang et al. (2014) 's claim that interactions and cognitive engagement are indispensable parts of learning in a connective learning environment. The higher the interaction level, the deeper the cognitive engagement and the higher levels of learning skills are involved.

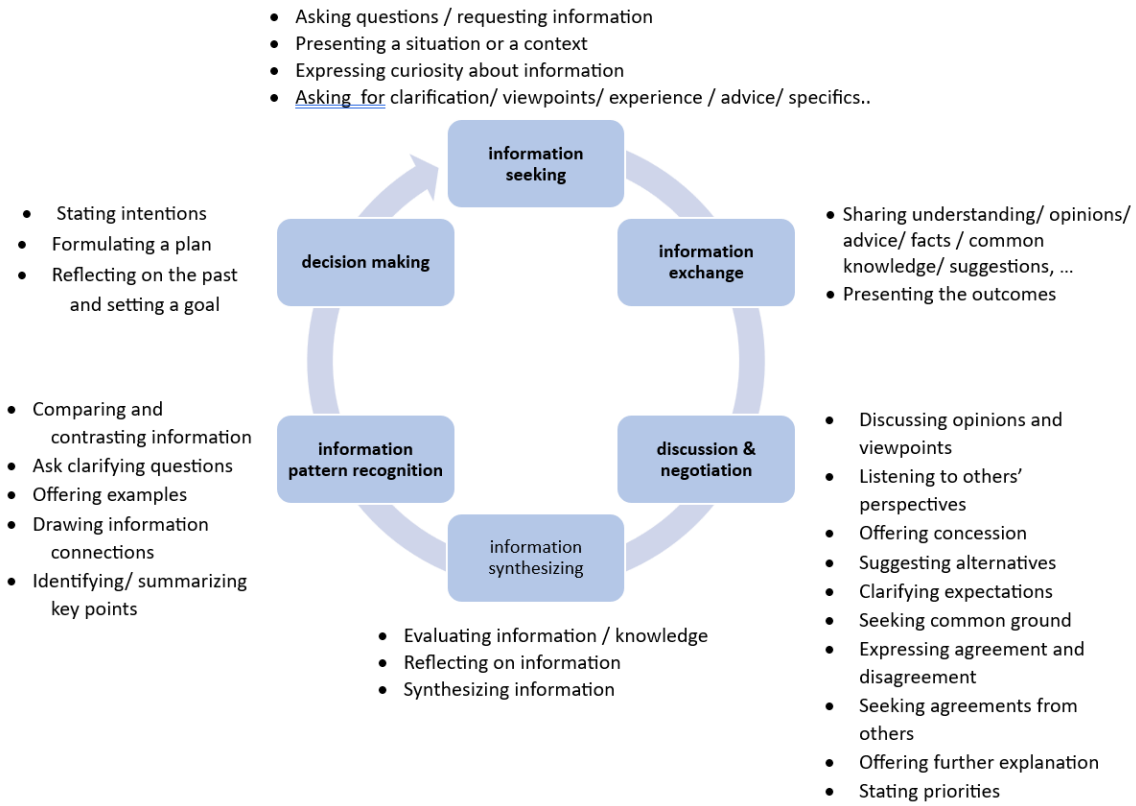

Figure 5.1 Cognitive Engagement in a 6-stage Learning Process

5.3 Implications of the study

5.3.1 The Creation of an Online Learning Environment (CLE)

Regarding the factors conducive to GPK development, the results of the PETs' perceptions displayed numerous positive features of the CLE. Most of these findings are consistent with the theories of online platform construction and findings from studies conducted by Nievas-Soriano et al. (2021), Allison et al. (2019), and Cinganotto & Cuccurullo (2016). However, in this study, four marked characteristics of the CLE, which are found to be pivotal factors leading to its success, are discussed as follows.

First, the PLN provided students with a distinct networked environment in this investigation, incorporating a more comprehensive range of experienced English teachers. Consequently, this facilitated more dynamic connections tailored to the specific needs and interests of the PETs.

The study's data suggested that the quality and quantity of experts, chosen purposefully, play a crucial role in driving participant engagement and stimulating involvement within the CLE. For instance, among the 15 experienced teachers within the CLE, comprising both native and non-native in-service teachers, representing

different levels of experience, including high school teachers, university instructors, and Master's and PhD students, diversity contributed to extensive responses, knowledge, perspectives, and experiences for PETs. High school teachers brought invaluable real-life experiences and practical insights about high school teaching, while university instructors focused more on relevant learning theories and teaching methods. Graduate students offered relatively new and challenging ideas to PETs, possibly due to their ongoing learning or research in innovative aspects of the field. Perceiving these experts as reliable, knowledgeable, and practical, participants valued their comments. Favorable characteristics mentioned by PETs included being experienced, enthusiastic, supportive, and well-qualified, which fostered a safe and constructive learning community.

Furthermore, the presence of a sufficient number of experts in the CLE ensured regular access to the website, enabling them to offer timely responses to PETs' inquiries. This consistent availability of experts directly influenced participants' frequent engagement, collaboration, and prolonged discussions within the CLE. Notably, by the end of the study, there were no dropouts among the participants, which contradicts Smith's (2010) research findings, indicating dropout rates ranging from 40% to 80% in online classes.

The second factor pertains to participants' anonymity. In this research, all participants were obliged to register under a pseudonym from the beginning, ensuring their identities remained undisclosed throughout the study. The results from the three instruments unequivocally confirmed that maintaining anonymity during any online activity within the CLE significantly enhanced participants' engagement. This aligns with Chen's (2019) research, which indicated that adopting pseudonyms and remaining anonymous positively influenced active involvement in learning activities. Additionally, these findings suggested that when experienced instructors or experts maintained equal roles within an online learning setting and their identities remained confidential, students felt safer and more at ease participating in the CLE. Anonymity could alleviate worries about status, educational background, English proficiency, and pedagogical knowledge, empowering participants to contribute openly. They felt confident in posing questions, sharing ideas, providing feedback, and discussing unclear points without hesitation or apprehension. As a result, their knowledge markedly improved. To corroborate this, the data also revealed that participants in this CLE consistently refrained from utilizing audio and video calling features despite their availability and ability to offer instant responses. They expressed concerns that using these tools might compromise their anonymity, thereby emphasizing that maintaining anonymity within

the CLE enhances the freedom of interaction and facilitates the creation of a personal learning environment (PLE). This environment fosters not only interactions among students but also with teachers and experts, facilitating knowledge acquisition.

Thirdly, this aspect involves the content shared and the online learning activities conducted within this networked environment. Various online activities, including live streams, live chats and discussions, posts, audio/video calling, TKT mocked tests, and reflective journal writing, were thoughtfully chosen and developed based on recommendations from prior research (Al Dahdouh, 2018; Banihashen & Aliabadi, 2017; Torres et al., 2015; Trna & Trnova, 2012). These activities were deliberately incorporated to cater to various learning styles and proficiency levels while offering opportunities for interactions and connections. Furthermore, the topics covered in discussions and presentations by guest speakers underscored three key areas of GPK that are essential and beneficial for teaching practicum. The findings also highlighted the significance of each activity design phase, beginning with the conceptual planning stage, including topic selection for talks, guest speaker selection, scheduling considerations, and the choice of appropriate activity formats. Additionally, these activities were arranged in the evening, a time that accommodated the schedules of most participants. Consequently, attendance for each activity was consistently high. Every participant in the online survey appreciated the practicality of the content, the well-suited schedule, and the diverse range of learning activities.

Finally, this aspect concerns the design of the website and the integration of certain technological features within the CLE. Participants noted that the website was user-friendly, featuring straightforward navigation, simple language, and a professional design. As a result, the overall appearance and ease of use of the website had a positive impact on the participants' perception. Furthermore, participants highlighted several online features, including instant notifications, activity bookmarking, a follow function, storage space, automatic reminders to join activities, and online dictionaries, which set this CLE apart from other LMS systems. These features facilitated the smooth flow of knowledge, aligning with the findings of Smidt et al.'s (2017) study. The well-equipped and convenient nature of the platform facilitated participants' learning processes, knowledge exchange, and acquisition.

To summarize, the study's findings regarding participants' perceptions of the CLE offer insight into creating an effective online learning environment. It is strongly recommended to consider these four major factors alongside other relevant elements to establish a highly interactive and engaging social learning environment that

effectively enhances learning opportunities. Together, they optimize the openness, connectedness, autonomy, and diversity of the CLE.

5.3.2 The Integration of Technology in Training PETs

Technology plays a prominent role in the e-learning environment, especially for PETs who need connections with knowledgeable others to exchange and gain GPK; therefore, selecting technology for the e-learning website should be carefully considered. Like many other e-learning websites, namely Moodle, Coursera, and Edmodo, the CLE, a so-called ELT Nexus website, is a social networking platform where PETs can input their data and get expected knowledge through their engagement in learning activities and social interactions with others. However, it has more features similar to Facebook, which integrates various social networking tools to facilitate its members' communication, collaboration, and information sharing with the availability of the Internet.

To build an effective e-learning environment for the learners, the structures and contents of the website should be carefully planned by the researcher before it is professionally designed and constructed with the integration of various social networking tools by a web designer. Regarding the structure, this website was divided into home and personal pages, allowing PETs to switch quickly and easily from one page to another. Like many other websites, the homepage is public territory, whereas the personal page is private and offers personal experiences. However, one distinctive difference of this website is that it provides each member with more than 1GB of data storage space for storing essential information or knowledge gained from others on the website. Besides, social networking tools can offer numerous functions to facilitate the PETs' connection and communication with others and their learning processes. The PETs can be anonymous in any learning activities they want to participate in. By using different social networking tools, PETs can perform a plethora of actions to serve their needs.

To summarize, the CLE or the ELT Nexus website is a social networking site that facilitates social connections among PETs to exchange GPK. To create an interactive learning environment for PETs, it is crucial to have the website constructed with the integration of various social networking tools so that they can perform different functions during their learning processes.

5.4 Limitations

Like many other online learning environments, the CLE faces some limitations regarding the research instruments and research design. As this study was conducted

during the critical period of social distancing during the COVID-19 pandemic when everything went online, the internet connection was sometimes slow and interrupted, inevitably affecting the quality of interactive learning activities such as live streaming and live chat. In addition, the schedule and the mode of the semi-structured interview had to be changed from face-to-face to online, which might influence the interviewees. Another limitation is that the number of participants involved in this study needs to be more significant. It examined only 40 PETs in a single university, which strictly limits the generalizability of the findings to other contexts.

5.5 Recommendations for Future Study

Drawing from the outcomes and constraints of this investigation, some of the recommendations are made for future research:

Firstly, experienced teachers of three levels of education employed in this study significantly contributed to the achievement of the CLE in general and to the PETs' learning process in particular; however, data involving these experienced participants were not widely collected and analyzed as they are not the focus of this study. It might be comprehensive if their perceptions of the CLE, their levels of interactions with others, and their contributions to the CLE are also explored in future studies. As experienced teachers are different in nationality, age, gender, and expertise, it will be interesting if future studies investigate whether these variables influence their online interactions, online presence, and knowledge contributions in the CLE.

Secondly, this study was conducted with only PETs whose major is English teaching, so the results of the present study might inspire other researchers to explore further whether the framework of CLE with a focus on the PLNs works well with students and teachers of other courses and disciplines which has the exact nature and which can really be done on-site but can still be done online.

Thirdly, even though PETs made significant progress in their learning in the CLE, it will be complete if a longitudinal study is conducted by following their actual teaching practice and obtaining their reflections regarding applying the knowledge gained from the CLE.

5.6 Conclusion and Final Remarks

The results of this study build upon the groundwork laid by previous researchers in the realm of online learning environments. They contribute to a deeper comprehension of the CLE, wherein PETs are afforded opportunities to interact with experienced individuals, facilitating the exchange of current GPK. They assist in

enhancing comprehension of the CLE, wherein PETs have opportunities to connect with knowledgeable others to exchange GPK and teaching experiences.

The results offer comprehensive and conclusive responses to the three research questions raised at the beginning of this study. Firstly, the investigation reveals that participants made marked improvements in GPK after their 9-week participation in the CLE. Secondly, the results from the analysis of the top five active participants' interaction levels show that they spent significant time interacting with others on the CLE, and they reached almost four levels of interaction in the learning interaction framework proposed by Wang et al. (2014). This can help explain how they progressed in GPK during and after their participation in the study. Thirdly, regarding the participants' views on its effectiveness, the CLE includes numerous positive characteristics or features, namely usability, utility, functionality, confidentiality, trust, appearance, availability, interactivity, satisfaction, and fee, and the three most preferred aspects of the contents such as classroom management, lesson planning, teaching methods, and learning theories. In addition, the learning activities help create opportunities for direct interaction and discussion with knowledgeable others anonymously based on a predictable schedule. Finally, the CLE is perceived as a learning platform that is beneficial for their life-long learning and future careers.

Based on the Connectivism learning theory, this research study confirms that in the CLE, PLEs and PLNs are essential to learning achievement. However, the focus on developing learners' PLNs, which offer different opportunities to connect and interact with knowledgeable others to share and exchange knowledge, can bring about positive learning. It is also drawn from the findings that the successful CLE should optimize the learning conditions, including openness, diversity, autonomy, connectedness, and anonymity, to make learning happen and improve knowledge. It should be an online learning platform where learners are highly motivated and cognitively engaged in interactive and practical learning activities. Regarding curriculum design, this research study's findings suggest that classroom management is one of the core dimensions of GPK that PETs must master to be well-prepared for their future careers. This research proves advantageous for aspiring PETs who wish to enhance their GPK and experience to be well-prepared for their teaching practices at high schools and future teaching careers. It is also beneficial for trainers of PETs who may struggle to offer additional professional support to their trainees due to time constraints, demanding schedules, and large class sizes. CLE emerges as a fitting tool to address these challenges and provide the necessary support.