

# The Influence of Virtual Professional Learning Networks on Pre-service Teachers' Professional Learning and Growth

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## Abstract

This qualitative case study examines how pre-service teachers engage in virtual professional learning networks and how this engagement influences their professional learning and growth. The study used online surveys and group interviews to collect data from 41 participants, which were then analysed thematically. The results showed that pre-service teachers were able to successfully engage in virtual professional learning networks in various ways, using different social media platforms and establishing different online connections. The study also found that engagement in virtual professional learning networks supported the participants' professional learning and growth by helping them acquire new knowledge and skills, shaping their teacher identities, and transforming their perceptions and beliefs about teaching and learning. Additionally, the virtual professional learning networks provided a sense of security and support to the participants, creating a more comfortable and safe social space.

**Keywords:** Virtual professional learning networks, pre-service teachers, teacher identity, teacher professional development

## Sanal Mesleki Öğrenme Ağlarının Öğretmen Adaylarının Mesleki Öğrenme ve Gelişimi Üzerindeki Etkisi

### Öz

Bu araştırma öğretmen adaylarının sanal mesleki öğrenme ağlarına nasıl katıldıklarını ve bu ağların onların mesleki öğrenmelerini ve gelişimlerini nasıl etkilediğini incelemeyi amaçlamaktadır. Bu çalışmada nitel araştırma yöntemlerinden durum çalışması deseni kullanılmıştır. Türkiye'de eğitim fakültesinde öğrenim gören öğretmen adaylarından (n=41) toplanan çevrimiçi anket ve grup görüşmesi verileri tematik olarak analiz edilmiştir. Çalışmanın sonuçlarına göre öğretmen adaylarının çoklu sosyal medya alanlarında çeşitli çevrimiçi bağlantılar kurarak sanal mesleki öğrenme ağlarını farklı şekillerde oluşturdukları ve kullandıkları belirlenmiştir. Ayrıca, katılımcıların oluşturdukları sanal mesleki öğrenme ağlarının mesleki öğrenmelerini ve gelişimlerini çeşitli şekillerde desteklediği görülmüştür. Özellikle, katılımcı öğretmen adayları sanal mesleki öğrenme ağları sayesinde yeni pedagojik ve dijital bilgi ve beceriler edindiklerini, var olan ve gelecekte sahip olacakları öğretmen kimliklerini şekillendirdiklerini ve öğretme ve öğrenmeye ilişkin algılarını ve inançlarını yansıttıklarını ve dönüştürdüklerini belirtmişlerdir. Bunların yanında sanal mesleki öğrenme ağlarının öğretmen adaylarına rahat, güvenli ve destekleyici bir sosyal ortam sunmasının mesleki öğrenme ve gelişimlerine olumlu katkı sağladığı görülmüştür.

**Anahtar Sözcükler:** sanal mesleki öğrenme ağları, öğretmen adayları, öğretmen kimliği, öğretmen mesleki gelişimi

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## INTRODUCTION

It is crucial for pre-service teachers (PSTs) to participate in a professional development process through which they can adopt new student-centred instructional methods and acquire a wide range of skills, such as innovation, critical thinking, and collaboration. Although teacher education programs are primarily responsible for equipping PSTs with the fundamental knowledge and skills to succeed in the profession, even the most effective programs cannot guarantee that all PSTs will fully grasp every aspect of teaching and learning (Carpenter & Morrison, 2018). Most teacher education programs offer PSTs only a limited amount of practical experience, which often leads to a gap between what they learn in theory and what they encounter in practice (Flores, 2016). Since PSTs typically have only one teaching practicum, they often depend on the guidance of just one or two mentor teachers. However, this support may not be sufficient to address the multifaceted and unique requirements of each individual PST (Carpenter et al., 2017).

Given such limitations, it is increasingly recommended that PSTs should establish and develop a virtual professional learning network (V-PLN) to explore new informal learning opportunities in the digital realm through social media platforms (Carpenter et al., 2021). The creation of a V-PLN is considered crucial for the professional development of both pre-service and in-service teachers since it provides a new perspective on professional learning that is tailored to their individual needs, available anytime and everywhere, connectivist and collaborative (Trust et al., 2016). V-PLNs present a flexible online learning environment that motivates teachers to take ownership of their professional development (Tsiotakis & Jimoyiannis, 2016). Being collaborative in nature, V-PLNs provide teachers with the opportunity to share and explore professional ideas and resources, build collective knowledge around topics of interest, while also connecting and working with peers and experts from all over the world who share similar interests (Carpenter & Krutka, 2015). Furthermore, establishing and nurturing a V-PLN can provide PSTs with access to a virtual mentoring community, where experienced educators can guide and assist them in implementing theoretical knowledge and skills into real classroom situations, and help them smoothly transition to becoming full-time teachers (Luo et al., 2017).

The significance of V-PLNs has sparked a growing interest among researchers to investigate its features and impact on teachers. Although, several studies have examined the experiences of in-service teachers in V-PLNs and provided evidence of its positive impact on professional development (e.g., Davis, 2015; Trust et al., 2016), scant attention has been paid to whether and how PSTs establish, engage in, and derive benefits from V-PLNs (Kearney & Maher, 2019). In addition, a search conducted in well-known databases (e.g., Scopus, Web of Science) and academic journals indicates that the majority of studies related to V-PLNs have been carried out in Western settings (e.g., Carpenter, 2015; Kearney & Maher, 2019; Luo et al., 2017). This article seeks to fill the gap in the research by reporting the results of a study that examined the attitudes and practices of Turkish PSTs in V-PLNs. Hopefully, this research will shed light on the role of V-PLNs in the professional development of PSTs and their potential to support their transition into full-time teaching roles.

### Literature Review

#### *V-PLNs for teacher professional development*

Learning how to create and utilize V-PLNs is increasingly considered as a 21st-century skill for all teachers. Krutka et al. (2017, p.247) present a typical definition of a professional learning network (PLN) as unique “systems of interactions made up of people, spaces, and tools that support learning and professional growth”. While the PLNs of teachers traditionally include a small number of face-to-face connections and resources, such as other teachers in their schools, former colleagues and university classmates, books, and local media (Curran & Wetherbee, 2014; Whitaker et al., 2015), with the proliferation of social media and Web 2.0 technologies, it is increasingly becoming popular for many teachers also to create and cultivate PLNs in virtual spaces. Being a complex and multifaceted system (Trust et al., 2016), which dynamically grows and evolves over time as a result of a collective effort (Whitaker et al., 2015), creating a V-PLN involves building online professional connections (e.g., Twitter followers, LinkedIn connections, Facebook friends) and utilizing a variety of virtual spaces (e.g., Twitter, Google+, LinkedIn) and digital resources and tools (e.g., online journals, curation tools) (Kelly & Antonio, 2016; Trust et al., 2016; Visser et al., 2014).

A V-PLN offers pre-service and in-service teachers a new, personalized, collaborative, global, and connectivist professional learning environment (Trust et al., 2016; Whitaker et al., 2015). By presenting a bottom-up approach to professional development (Xerri, 2017), it respects the professional agency of teachers and empowers the teaching profession conventionally characterized as lonely and isolated (Curran & Wetherbee, 2014). As it supports anytime, anywhere learning without temporal or spatial restrictions, teachers can take control

of their own professional learning (Tsiotakis & Jimoyiannis, 2016) and personalize learning experiences based on their unique individual interests, needs and expertise (Carpenter & Krutka, 2014). Its open, social and participatory nature allows pre-service and in-service teachers to connect and collaborate with a network of educators worldwide, who share similar interest, inspiration, passion and talent (Whitaker et al., 2015). By engaging in V-PLNs, teachers can find, share and exchange ideas, knowledge and digital resources globally (Carpenter & Krutka, 2015; Visser et al., 2014), reflect on teaching and learning (Macià & García, 2016; Trust et al., 2016), and feel emotionally and professionally supported by peers, academics and other educators around the globe (Carpenter & Krutka, 2014; Davis, 2015; Kelly & Antonio, 2016).

#### *Previous research on V-PLN of PSTs*

In recent years, while some studies have been conducted to investigate the characteristics and effects of V-PLNs on teachers' professional learning and growth, the previous research has mostly focused on in-service teachers (e.g., Carpenter & Krutka, 2015; Ekoç, 2022; Nochumson, 2020; Trust, 2017; Visser et al., 2014; Yildirim, 2019). There has been lack of research focusing on PSTs' use of V-PLNs apart from a few studies, the majority of which have only focused on PSTs' perceptions on and experiences of using Twitter as a PLN in the Western contexts. Carpenter (2015), for instance, examined PSTs' experiences and perceptions of the professional use of Twitter during and after taking a teacher education course in a private university in the United States (US). His findings suggested that the majority of PSTs maintained a positive perception of Twitter in terms of its educational potential, and indicated several benefits of using Twitter, including resource sharing, communication, and connecting with educators inside and outside of the class. In a recent comparative study, Tur, Marín, and Carpenter (2017) investigated PSTs' use and perceptions of Twitter from two universities in the US and Spain. Their findings indicated that most of the PSTs from both universities appreciated the educational benefits of Twitter. At the same time, there were differences in terms of the ways they utilized Twitter and perceived its educational value. For instance, the US participants pointed out Twitter's interactive and collaborative uses, whereas many Spanish PSTs considered Twitter valuable in finding and sharing information. In a study conducted at a Midwestern University in the US, Luo et al. (2017) examined PSTs' perceived benefits and challenges of participating in Twitter live chats, and the influence of prior experience with Twitter on their live chat experiences. Their analysis indicated that PSTs had no previous experience with an educational Twitter live chat. After participating, most of them held a positive perception towards these live chats, considering it enjoyable and rewarding, and indicated intentions to participate again in the future. In addition, in a recent study conducted in a university from the Mid-Atlantic region of the US, Colwell and Hutchison (2018) explored PSTs' perceptions regarding their experiences in participating in and cultivating a Twitter-based PLN about disciplinary literacy. Their findings suggested that while some PSTs held some negative perceptions of using Twitter, most of them reported positive experiences in participating in the PLN via Twitter, as they were encouraged to reflect on and consider the information and resources posted to Twitter and supported to build their knowledge on disciplinary literacy.

In addition to the studies that specifically focus on Twitter, Kearney and Maher (2019) recently examined final year Australian PSTs' experiences of using multiple social media platforms (e.g., Facebook, Twitter, Pinterest, LinkedIn) as a PLN. Their study indicated that most of PSTs enjoyed high levels of agency in engaging in ubiquitous personalised learning, participated in valuable collaborative learning conversations, and captured and shared multimodal resources, particularly during professional experience lessons, while some of the participants were also identified being reluctant to share and collaborate via their PLNs.

In summary, while most of the previous studies have focused on in-service teachers, there has been also several attempts to investigate PSTs' perceptions on and practices in V-PLNs, but mainly with a focus on only a microblogging platform, Twitter, as well as participants from the Western contexts, especially the US. Hence it appears that further research is needed to understand PSTs' V-PLN experiences across multiple social media platforms and tools as well as across different socio-cultural and educational contexts in order to have a more complete and comprehensive understanding of how PSTs develop, utilise and benefit from V-PLNs. In addressing this gap, this article sought to investigate Turkish PSTs' perceptions on and practices in V-PLNs. It specifically addresses the following questions:

1. How did PSTs participate and engage in V-PLNs?
2. How did PTSS perceive their V-PLN activities influence their learning and professional growth?

## METHOD

### Research Design

In this research, a qualitative case study research approach (Yin, 2011) was utilised, since the aim was to explore and understand in–depth participants' perceptions on and practices in their V-PLNs through using multiple sources of data (Uçan, 2019). The study design consisted of a group of second-year undergraduate students studying at the primary education department at a state university in Turkey as a case. They were enrolled in a compulsory course on educational technology in which they were first time introduced to the concept of V-PLN. The primary objective of this course was to familiarize PSTs with current trends and issues related to educational technology and to facilitate their acquisition of knowledge and competencies in employing digital technologies for educational purposes. From a class of 50 PSTs, 41 (aged 19 to 23) agreed to participate in the study. Among those, 31 PSTs (75.6%) were female and 10 (24.3%) were male.

At the first week of this course, as one of the course topics, the PSTs were encouraged to create and actively engage in a V-PLN to support and enhance their learning across all their teacher education courses. To get them familiarised with the creation and use of V-PLNs, firstly, the PSTs were provided with an overview of social media platforms (e.g., Twitter, Facebook, Instagram, Pinterest, Edmodo) and shown how influential educators utilise these platforms for professional purposes. Next, they were asked to set–up new social media accounts or professionally use existing ones to start connecting and interacting with peers and educators to further expand their knowledge and understanding of the topics they were learning in their teacher education. To facilitate this process, they were given a list of recommended educators, social media learning groups, hashtags (e.g., #egt, #edchat, #ilkokul) and blogs to follow. In addition, as an after–class activity, they were asked to read and reflect on two articles about the importance of using V-PLNs and their effective use by educators.

### Data Collection

An online survey was administered to the participants at the end of the term. The survey was designed with open-ended and closed-ended questions to gather information on the participants' perceptions of and practices in their V-PLN (see Appendix A). The participants were asked to describe their V-PLN, provide feedback on how it supported their professional development and growth, and explain the significance of creating and engaging in a V-PLN as a prospective teacher.

Following the survey completion, PSTs were invited to participate in a semi-structured group interview, and 16 volunteered to be interviewed in one of five groups. All the interviews were audio-recorded and subsequently transcribed in full. These interviews were designed to complement the online survey data by further exploring participants' perceptions of and experiences with their V-PLNs (see Appendix B).

The existing literature on V-PLNs (e.g., Carpenter, 2015; Trust et al., 2016) informed and facilitated the questions' design in the online survey and semi-structured group interview. These questions were also discussed and revised with two teacher educators actively using social media for professional purposes.

### Data Analysis

Online survey and semi–structured group interview data were analysed thematically via NVivo 12 software to identify and describe patterns and themes to explore the research questions. Following a six–phase procedure recommended by Braun and Clarke (2006), firstly, the participants' responses to the online survey questions and the interview transcripts were read and reread carefully to get familiar with their content. Initial codes were developed inductively for the participants' responses in the subsequent phase. A statement or statements of a participant represented the unit of coding during this phase. The next phase involved sorting these initial codes into the potential themes, which were subsequently discussed, reviewed, and refined iteratively with a teacher educator via both concerning the coded data extracts and the whole data set. After defining and naming each of the themes, the entire data set was comprehensively analysed and coded again in relation to the all themes (see Table 1 and 2 for the final coding schemes).

**Table 1.** Research Question 1 Coding Scheme

Themes	Description
Social media spaces	Respondent described a social media or digital tool he/she utilised as a part of his/her V-PLN.
Online connections	Respondent described the people or online communities or organisations he/she connected with in his/her V-PLN.
Participation types	Respondent described how he/she interacted with online connections or engaged in his/her V-PLN.

**Table 2.** Research Question 2 Coding Scheme

Themes	Description
New Professional Knowledge and Skills Acquisition	
Pedagogical knowledge	Respondent described acquiring knowledge about teaching and learning in his/her V-PLN.
Digital knowledge and skills	Respondent described acquiring knowledge and/or skills about digital technologies and tools in his/her V-PLN.
Increased Sense of Security	Respondent described that his/her V-PLN offered them a comforting, secured and/or supportive social space facilitating his/her online interactions.
Reflection on Teaching and Learning	Respondent described reflecting upon, questioning, reconsidering and/or changing his/her perceptions and beliefs about teaching and learning.
Professional Identity Formation	Respondent described shaping his/her current (actual) teacher identity and/or envisioning a future teacher identity.
Challenges	
Feeling not ready to share own ideas and perspectives	Respondent described that he/she was not willing to share own ideas and perspectives in his/her V-PLN.
Lack of English language skills	Respondent described his/her low level of English language skills as a challenge in his/her V-PLN participation.
Lack of digital skills	Respondent described his/her low level of digital skills as a challenge in his/her V-PLN participation.

Considering its interpretive, qualitative nature, in order to reduce the risk of bias, created by dependence on only one researcher, and enhance the reliability of the process of coding and analysis, an educational researcher was invited to code independently 20% of the data set by using the final coding scheme. A high level of inter-coding agreement (92%) was achieved between the coders and any remaining disagreements were resolved via discussion, which did not result from a need for adding or modifying any of the themes and codes. Both the discussions that took place during the review and refinement of the candidate themes as well as the inter-coding reliability process that the coding and analysis process was transparent, credible, and understandable for other researchers.

### Research Ethics

In line with the British Educational Research Association [BERA] Ethical Guidelines (2011), before the data collection process began, all participants were asked to sign a consent form for their participation and given comprehensive verbal and written information about the goals and procedures of this research. They were also provided assurances of confidentiality and anonymity.

## FINDINGS

This section first describes how the PSTs in this study engaged in their V-PLNs and then explicates their perceptions of how V-PLN activities influenced their learning and professional growth.

### How did PSTs engage in V-PLNs?

Concerning the first research question, the analysis indicated that the PSTs utilised several social media spaces in cultivating and engaging in their V-PLNs. As Table 3 illustrates, the were Twitter, Instagram, YouTube, Edmodo and Facebook. Other platforms, such as Google+, Snapchat, Pinterest, LinkedIn and Tumblr were less popular. Furthermore, the majority of the PSTs (98%) mentioned a variety of connections both from Turkey and abroad as part of their V-PLNs. The participants cited specific types of individuals (e.g., expert educators), in-service teachers, field experts, academics, peers within and outside their university and professional online groups (see Table 4), whom they decided to connect, network, and interact based on individuals' specific expertise and/or their own needs and interest. For example, one PST shared:

In Twitter, I primarily followed the people who could contribute to me professionally, share up-to-date information, are experts in the field of education and have high level of EdTech knowledge. For example, @yavuzsamur (digital game design), @devrimakgunduz (stem education), @borasinc (educational technology), and @yenilikiegitim (current educational news) are among the Twitter users I follow and benefit from. On Facebook, I am a member of a group which mainly consists of primary school teachers from Turkey and also have recently joined another group, called "Eğitimhane".

**Table 3.** Social Media Platforms and Tools Utilised by PSTs

Platform	n	%
Twitter	41	100
Instagram	28	68
YouTube	27	66
Edmodo	27	66
Facebook	21	51
Blogs	13	32
WhatsApp	12	29
Prezi	6	15
Google+	4	10
Snapchat	2	5
Pinterest	1	2
LinkedIn	1	2
Tumblr	1	2

**Table 4.** Online Connections Established within PSTs' V-PLNs

Online connection	n	%
Expert educators	38	93
In-service teachers	36	88
Field experts	35	85
Academics	30	73
Professional online groups	30	73
PST peers	25	61
Authors	7	17
Friends / family	3	7

The respondents also stated diverse forms of participation and interactions in their V-PLN, as illustrated in Table 5. Like most of the PSTs, one participant, for instance, stated a variety of ways she participated in and benefited from her V-PLN:

To be aware of world-wide educational innovations, I look at #edchat and #comments4kids tags, tough not often. Locally, I check the #tags, such as #guncelegitim, #egitim and read the sharings made through these tags. Within the PLN I created, I can express myself freely, communicate with my target audience and get very quick feedbacks. Moreover, I learn the opinions of academics and field experts, and have the opportunity to have a dialogue with them.

**Table 5.** Types of Participation and Interactions within PSTs' V-PLNs

Participation	n	%
Accessing and/or sharing ideas and resources	32	78
Checking hashtags	28	68
Exploring ideas	19	46
Communication	14	34
Seeking, providing and/or receiving support	11	27
Asking and/or answering questions	9	22
Commenting	6	15
Personal growth	6	15
Collaboration	5	12
Communication with friends/family members	5	12
Entertainment	4	10
Socialising	4	10
Content curation	3	7

Overall, the analysis shows that the PSTs created and engaged in V-PLNs in diverse ways for many purposes via utilising multiple social media spaces as well as establishing a variety of online connections, which, as will be illustrated in the following section, influenced their learning and professional growth in several ways.

### **How do PSTs perceive their V-PLN activities influence their learning and professional growth?**

In addressing the second research question, this section explicates the PSTs' perceptions of how their V-PLN activities influence their learning and professional growth. Within the analysis of the dataset, five themes were identified: (1) new professional knowledge and skills acquisition, (2) professional identity formation, (3) reflection on teaching and learning, (4) increased sense of security, and (5) challenges. Each of these themes is elucidated below, along with illustrative examples.

#### ***New professional knowledge and skills acquisition***

Stating ubiquitous, personalised and social learning experiences, majority of the PSTs (93%) reported new knowledge and skills acquisition (i.e. pedagogical, digital) via accessing to a wide range of perspectives and resources as well as practices of successful educators within their V-PLN. 86% of the respondents stated an increase in their pedagogical knowledge as they learned about new emerging trends in education (e.g., STEM education, learn-to-code movement, virtual reality learning), contemporary instructional ideas (e.g., differentiated instruction, student-centered learning, personalised learning), strategies (e.g., flipped classroom, blended learning, gamification, inquiry learning) and various other topics, such as child psychology, classroom management strategies, educational systems, innovations, policies, curriculums and the teaching profession. One participant, for instance, shared, "one contribution of my PLN was learning about innovative technology-enhanced teaching methods. I can give 'flipped classroom' as an example. Learning these methods has helped me on my way to becoming a versatile and effectual teacher". Another respondent commented that her V-PLN helped her to "gain knowledge on many issues, such as children's psychological problems, specific types of behaviors that children exhibit at different ages, and how to best provide education to children considering their age." Similarly, one PST shared that:

Within my PLN, it is possible to follow the educational innovations not only in our country but also around the world. For example, in England, 3D VR (virtual reality) glasses are used in history lessons in order to ensure the permanence of learning. Students have the opportunity to observe historical events, wars or migrations via 3D VR glasses, as if they are presently living those events. Even if this kind of practice is not yet taking place in our country, I can access to this kind of information by means of my PLN.

More than a third of the respondents (37%) mentioned an increase in their digital knowledge and skills as they learned about using a variety of web 2.0 tools and apps, including game-based learning platforms (e.g., Kahoot, Zondle), interactive video creation tools (e.g., Adobe Acrobat, Playposit, Videoscribe, PowToon), presentation tools (e.g., Prezi, Padlet) and other innovative classroom tools (e.g., Classdojo, Blendspace, Voki). One PST, for example, stated, "one of the most useful things I have learned via my PLN is a website called 'PowToon' through which I was able to create my own video and share it with the world on YouTube."

### ***Professional identity formation***

More than two thirds of the participants (68%) reported shaping and/or projecting their professional identity as a result of their engagement with V-PLNs. Some participants identified their current roles and characteristics as teacher candidates in terms of who they are and who they are not, while most of them projected a future identity stating what kind of teacher they would like to be based on their own and/or other expectations. In their responses, they used several descriptions to explain their current and/or future roles and identity, such as “innovative”, “active”, “visionary”, “intellectual”, “creative”, “well equipped”, “open-minded”, “open to constant development and change”, “open to learning”, “facilitator”, “life-long learner”, “knowledgeable and skillful”, “21st-century educator”.

In terms of shaping current identity, one PST, for instance, mentioned how her V-PLN helped her “achieve a teacher candidate profile that is well equipped, more active and continuously self-improving”, while another participant shared, “my PLN has reminded me that I need to be constantly open to development and improvements as a teacher candidate.”

Furthermore, many of these respondents used future-oriented discourse, envisioning a future identity that they wanted to attain with the help of their V-PLNs. In their responses, these PSTs considered their own goals and expectations, the changing and evolving educational landscape, societal expectations, and the needs and characteristics of their future students. For example, one respondent described what kind of teacher she wanted to be based on her own goals and expectations, saying:

The reason why I am using my PLN now and will use it in the future is that I want to be a teacher who goes beyond the ordinary, is different and informed of current knowledge. I will use my PLN for a long time because I want to be a productive and knowledgeable teacher instead of being someone who just adopts a traditional view of education.

Considering the evolving nature of education, another PST mentioned, “I am using my PLN to create a teacher profile who keeps up with the changing times and has knowledge and skills required by the changing and developing educational systems”, while one participant described her aim of using her PLN as “becoming a more helpful, innovative and different teacher of the next generation children.”

### ***Reflection on teaching and learning***

42% of the PSTs stated that as a result of their V-PLN engagement, they reflected upon, questioned, reconsidered and most of the time changed and transformed their perceptions and beliefs about teaching and learning. One respondent, for instance, mentioned:

I began to think that teaching can no longer happen only in a class with traditional methods. In the future, I will try to utilise innovative approaches and allow my students learn by hearing, seeing, feeling and applying. I think about turning my future class into a place where students feel good about themselves, and right now, there is a platform (her V-PLN) where I can get an idea of how to do it.

Another PST commented that due to her learning within her PLN, “I realised that we must adopt modern methods in teaching rather than traditional ones, and teaching needs to be done considering the characteristics of new generation students.” Similar to these respondents, one PST shared how learning about instructional strategies, such as blended learning and flipped classroom, within his PLN changed how he thinks about the role of teachers and students, saying, “I started to think that students should be as active as teachers, and teachers must share control and responsibility with students in the class.”

Overall, their participation in V-PLNs helped the respondents to recognise the value and importance of student-centred, innovative instructional approaches for their teaching in the future, mentioned the changing role of teachers and students, and as a result, extend their understanding of teaching and learning processes in new ways.

### ***Increased sense of security***

Almost one third of the PSTs (29%) described their V-PLNs as providing them a sense of security by presenting a more comforting, secured, and supportive social space, increasing their interactions with their online connections. In their responses, these participants indicated feeling more confident and safer in terms of asking questions, receiving feedback, seeking help, thinking or expressing own opinions freely. For example, one PST stated, “sometimes, I ask questions in my PLN which I cannot even ask the lecturers, as I feel more comfortable there and find a chance to express myself more easily. We, teacher candidates, feel more free within PLNs.” Another respondent commented, “one thing my PLN contributed to me is that I can express myself more



comfortably and have my voice heard by many people”, while another PST used “family” as a metaphor for describing her V-PLN, saying:

You don't fear it, you do not think you make it feel bored, you just feel comfortable with it and you can ask any question anytime you want. It will not leave you unanswered. In real life, it is not possible to ask any question to every teacher, but through V-PLNs, we can communicate with educators who are miles away.

### **Challenges**

Apart from pointing out multiple benefits of their V-PLN, more than a fourth of the PSTs (27%) reported several challenges, which appeared to diminish their effective use of V-PLNs. 22% of the PSTs stated that they felt not ready to share their own ideas and perspectives as they perceived that they had a lack of deepened knowledge, expertise and/or insight concerning their profession. For instance, one PST shared that “If I will share something, I believe I should do it properly. But I don't find myself so knowledgeable or well enough to share. So, If I come across something I like, I just retweet it”, while another one mentioned, “I think that my thoughts are still immature. I don't think that I'm at a level to be able to share. So, I must still develop myself.”

Moreover, a few participants (7%) considered that their lack of English language skills impeded fully benefiting from their V-PLNs, while some of them also tried to overcome this challenge by using online translation tools. One participant, for example, explained that “sometimes, I check sharings of my connections with a hope that I can utilise them in some way. Unfortunately, if they are in English, it makes it hard for me to understand them”. Lastly, only one PST mentioned lack of her digital skills hindering the contributions of her V-PLN, saying:

Because I don't get along well with technology, at this stage, I cannot say that my PLN has made a lot of contributions. At the moment, I am facing the fact that I need to reduce the wall between myself and technology or destroy it completely. This can actually be the biggest contribution of my PLN.

## **DISCUSSION & CONCLUSION**

This current study provides insight into Turkish PSTs' use of V-PLNs and elicits their perceptions concerning the influences of V-PLN activities on their professional learning and growth. Considering the important role of V-PLNs in supporting teacher learning (Trust et al., 2016; Visser et al., 2014) and the possible cultural influences on PSTs' use of V-PLNs across different contexts (Tur et al., 2017), this study makes a timely and important contribution to the literature by increasing our understanding of how Turkish PSTs construct, engage in and benefit from V-PLNs.

This study showed that the PSTs successfully cultivated and participated in V-PLNs in diverse ways, although, only a one-time instruction about the creation and use of V-PLNs was presented to them. The analysis showed that they used various social media platforms and digital tools to connect with a range of people and communities both locally and globally online and to engage in a variety of interactions, including exploring and exchanging ideas, asking and responding to questions, and seeking and offering support. These results support earlier study that described teachers' PLNs as a distinctive system of interactions made up of people, places, and tools (Krutka et al., 2017; Trust et al., 2016).

This study also revealed that PSTs understood the value and numerous advantages of V-PLNs for their professional development. First, the majority of the participants reported that their involvement in V-PLNs had improved their pedagogical and digital knowledge and skills. The PSTs mentioned engaging in informal learning about a range of topics, such as recent instructional ideas, strategies, educational systems, innovations, policies, and web 2.0 tools and apps, most of which were also included in the syllabus of their courses, especially the educational technology course. This finding points out the crucial role V-PLNs can play in supporting and enriching learning of PSTs across their teacher education courses, as both forms of their learning seems to be interconnected, going hand-in-hand. It also supports and builds on the previous studies that have showed that teachers mostly utilise virtual professional networks and communities to explore, share and construct professional knowledge and skills (Macia & García, 2016; Trust et al., 2016; Visser et al., 2014; Xerri, 2017).

Secondly, the results indicated that engaging in V-PLNs offered PSTs valuable chances to both discover and build their teacher identities. The participants shared that they shaped and communicated their professional identities by defining their strengths and weaknesses as teacher candidates, expressing their desired teaching style, taking into account their own goals and expectations, anticipating the needs of their future students, considering societal expectations, and adapting to the ever-changing educational environment. This finding supports and extends Trust et al.'s (2016, p.31) study that identified PLNs allowing in-service teachers to acquire “new conceptions of their professional identities”. It also supports the existing literature on teacher identity that suggests

that teacher can have multiple sub-identities which can co-exist simultaneously and be related to both their actual (or existing) and future (or expected) selves (Beauchamp & Thomas, 2009). Given this finding, the current study highlights the key role V-PLNs can play in contributing to PSTs' formation of current and future professional identities, which is often considered as a complex and multi-dimensional process (Livingston, 2016; Ó Gallchóir et al., 2018).

Thirdly, akin to the previous studies that identified online communities and networks stimulating teacher reflection (Davis, 2015; Trust et al., 2016), this study also identified that V-PLNs serve as a precious space for participants to analyse, probe, re-evaluate, alter, and transform their understandings and beliefs about teaching and learning. Participation in their V-PLNs helped PSTs recognise the value and importance of student-centred, innovative approaches for their future teaching, the changing role of teachers and students, and develop new mind-sets concerning teaching and learning processes. This finding may suggest that V-PLNs activities can offer opportunities for PSTs to become critically reflective teachers, who can easily address and adapt to constant changes in educational landscape during their teacher education years and throughout their future careers.

Moreover, this study indicated that V-PLNs created a comforting, secured and supportive social space for PSTs, which facilitated their online interactions. A number of the participants stated that compared to face-to-face settings, they felt more confident and safer in terms of asking questions, seeking help, receiving feedback and expressing their own opinions freely. This finding aligns with Carpenter et al. (2017, p.56) who identified "PSTs who were typically reticent to participate in traditional large-group, face-to-face classroom discussions, but willingly share their opinions and analyses via Twitter." This finding suggests that V-PLNs can be a supporting space for the professional growth of PSTs who lack confidence in interacting with others in face-to-face settings. It also supports and extends the previous research that has presented evidence concerning the affective benefits of V-PLNs, such as reducing feelings of isolation (Carpenter and Krutka, 2015) and increasing teacher confidence (Trust et al., 2016).

Lastly, the analysis identified several challenges impeding PSTs from fully participating in their V-PLNs. Although, this study found V-PLNs creating a comforting, secure, and supportive social space which facilitated PSTs' online interactions, several PSTs also felt not ready to share their ideas and perspectives with their online connections, as they perceived that they had a lack of deepened knowledge, expertise and insight concerning teaching profession. This finding is consistent with the recent case study by Kearney and Maher (2019), which identified some of the (master level) PSTs from an Australian university being reluctant to share and collaborate in their PLNs as they were feeling pressured to be perfect or scared of being judged by others. Moreover, in the current study, a few PSTs saw their low level of English language skills as a barrier for benefiting from their V-PLNs, which some of them attempted to overcome by utilising online translation tools.

Overall, this current study presents researchers and teacher educators new understanding of how V-PLNs provide PSTs with vital opportunities to support various aspects of their professional growth. As this study evidences, active engagement in V-PLNs offer valuable opportunities for personalised professional learning, identity development, critical reflection, networking, and staying current with advancements in education. In particular, by connecting with experienced teachers, mentors and peers over their V-PLNs, PSTs can gain exposure to different educational contexts and perspectives, foster a global outlook on teaching and learning, as well as develop a supportive community that extends beyond their immediate teacher education program. Considering these benefits, this study points out the importance of integrating V-PLNs into teacher education programs to enhance the professional development of PSTs. This implies that starting from the beginning of their teaching education programme, PSTs should be encouraged and provided with opportunities to create and cultivate their own V-PLN. Given that the creating and maintaining V-PLNs can be a challenging process (see Carpenter et al., 2021; Krutka et al. 2017), it is also important to offer PSTs ongoing support, feedback and encouragement to develop essential skills for establishing and nurturing their V-PLNs. In this respect, teacher education programs should look for the effective and innovative ways of integrating V-PLNs into their curriculum and assessment process, which can better prepare PSTs for the complexities of the classroom.

#### **Limitations of the study and future research**

One limitation of the present study is that it was conducted with the sample of second-year undergraduate PSTs who were all studying to be primary school teachers in a Turkish state university, and hence the results may not be generalised to other PSTs in Turkey or beyond. Nonetheless, this study can allow naturalistic generalisation where the relevance of the research findings can be assessed to new circumstances or analytic generalisation in which the findings can inform and support the theoretical concepts under consideration in this research (Yin 2011). Considering this, the future research should focus on PSTs from other subject areas (e.g., Maths, Science, Visual

Arts) in order to explore if similar findings can be identified or different patterns of behaviour may exist specific to other PSTs.

Furthermore, this study is limited by reliance on self-report online survey and group interview data. The actual V-PLN activities of the participants were not subject to in-depth analyses and was beyond the scope and focus of this study. Thus, future studies that collect and analyse PSTs' actual V-PLN interactions can be fruitful in revealing more details concerning the effects of V-PLNs on their professional learning and growth.

Moreover, since the participants of this study had not started their teaching practicum yet at the time of this study, this study was unable to reveal how PSTs' learning via V-PLNs could help bridging the gap between theory and practice in their teaching practices or have an influence on their students' learning outcomes. Hence further research should be undertaken that specifically examines how V-PLN engagement can enrich and contribute to PSTs' teaching practicum experiences and students' learning.

In addition, this study focused on PSTs' V-PLN participation only during one academic term. Since the creation of V-PLNs is viewed as a process that constantly expands and evolves over time (Whitaker et al., 2015), future studies that involves longitudinal data collection over a longer time period should be undertaken, such as during teacher education and beyond. This type of research can provide a valuable insight into changes PSTs' V-PLNs undergo over time, as well as the types and levels of support that they may need both during teacher education courses and after their transition to full-time teaching.

#### **Statements of Publication Ethics**

BERA Ethical Guidelines (2011) were followed in every stage of this study. The ethical approval was also obtained from İstanbul Medeniyet University Humanities and Social Sciences Research and Publication Ethics Committee. All sources used in this article were cited in accordance with APA standards.

#### **Conflict of Interest**

No potential conflict of interest was reported by the author.

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## APPENDIX

### Appendix A

#### Online survey

- 1) Could you please describe your V-PLN?
- 2) Which social media platforms do you use and how do they contribute to your professional learning?
- 3) Could you please describe two to three things you have learnt via your V-PLN?
- 4) Did what you have learnt via your V-PLN have an influence on your professional growth as a teacher candidate?
  - a) If yes, what effect or changes do you think has taken place?
  - b) If no, why did not it happen?
- 5) Why do you think it is important for you to create and engage in a V-PLN as a teacher candidate?
- 6) Will you use your V-PLN in the future? If so, for what purposes will you use it?

### Appendix B

#### Semi-structured group interview protocol

- 1) What do you do within the V-PLN you have created?
- 2) Does what you learn within your V-PLN have an influence on your professional growth as a teacher candidate?
  - a) If yes, what effect or changes do you think is taking place?
  - b) If no, why does not it happen?
- 3) Do you think that pre-service teachers should create and engage in a V-PLN?
  - a) Why and how?