

Designing online professional learning network for developing researcherly dispositions of pre-service teachers

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Received date: 19 / 03 / 2019

Accepted date: 30 / 06 / 2019

Abstract

Researcherly disposition is a quality which is rarely studied with pre-service teachers. For developing researcherly disposition, online networks are brought to agenda now. This study aims to design an online professional learning network (PLN) and to investigate its effect on pre-service teachers' researcherly dispositions. Concurrent embedded experimental mixed design is used as a research method. Related Samples T-Tests, ANCOVA are used for analysis of quantitative data; and content analysis method is used for analysis of qualitative data. Findings indicate that online professional learning networks provide good opportunities of research. increase pre-service teachers' research-based decisions, their sharing of educational studies. Also, they help pre-service teachers to value research and update their instructional knowledge.

Keywords: Professional learning networks; social networks; researcher identity of teacher

1. Introduction

The emergence of the Internet since the middle of the 20th century and the development of social networks over time have led to essential changes in area of teachers' professional learning which is crucial as their teaching practice is to be critically informed and up-to-date. The spread of social media platforms, which are called Web 2.0 tools, has facilitated professional learning and development of individuals in the education sector. Trust, Krutka and Carpenter (2016) stress that educators have now begun to use digital environments to create and expand their networks for their personal and professional development. Emergence of these learning networks is closely related to spread of Web 2.0 tools. For the first time, Tobin (1998) coined the term personal learning network (PLN) and defined it as a network of people and resources that support ongoing learning. According to him, such a network is very important because it helps to "guide your learning, point you to learning opportunities, answer your questions, and give you the benefit of their own knowledge and experience". It is not compulsory to be from the same workplace or from the same sector as to be involved in those networks; any individual who is knowledgeable in the field and willing to share his experience and expertise may be a member of a personal learning network (Tobin, 1988). When literature is reviewed, it is seen that there are some terms used for PLN –such as personal learning network, professional learning network or online professional learning network; however, professional learning network or online professional learning network- is used more than personal learning network (Flanigan, 2011; Krutka, Carpenter & Trust, 2017; Trust, 2012). In this study, online professional learning network is preferred as a more appropriate term for three reasons:

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- Professional learnings take place mostly online.
- Learnings in these networks take place not for social purposes; but aiming at professional development.
- Professional learnings mostly occur with usage of Web 2.0 tools.

Ronkowitz (2016) expresses that users in online networks make connections with other educators by using blogs, Twitter, Facebook, LinkedIn and other platforms. Ronkowitz points at monthly NCTE Twitter talkings (#nctechat) as a good example of online professional learning network. He also specifies that collegeas create new accounts for growing their professional networks differentiating from their social accounts. The spread of Web 2.0 tools makes it possible to transform physical areas and time to virtual environments, to create different communities and facilitate social learning. Theoretically each individual interacted –whether friends from social networks, collegeas or content experts- is a potential member of professional learning network. Since professional learning now often occur online in the 21st century, teachers also tend to find and connect with other experts who have the same interests at the global level.

In the literature, there are various definitions of online professional learning networks which focus on the different dimensions of this concept. Professional learning network is basically defined as a system based on interpersonal connections and resources which support informal learning (Trust, 2012). Crowley (2014) defines professional learning network as “vibrant, ever-changing group[s] of connections” by stressing that actors and channels in these networks change continuously, while Flanigan (2011) emphasizes its teaching functionality by defining it as “online communities that allow the sharing of lesson plans, teaching strategies, and student work, as well as collaboration across grade levels and department”. Lautenbach and Batchelor (2015) describe this concept as a group of individuals or groups in interaction who share ideas, resources and expertise and interact. Similarly, McCorkle (2015) explain it as organized groups which can potentially interact and share useful resources that provide continuous learning about a preferred subject. Although these definitions are used in literature, it seems that there is a need for a more comprehensive definition. In this study, online professional learning network is defined as “virtual communities and network societies that provide a sustainable professional learning opportunity where a group of users included in a profession can connect with other colleagues to provide support, advice, feedback, cooperation and sharing.” The most important elements in a professional learning network are thought to be inter-personal connections, social interactions, sharing of resources & experiences and sustainable professional development. Online professional learning networks are more of a system to provide professional development rather than creating personal connections, and due to nature of these networks both the participants and the purposes in these networks are highly variable.

Research questions

Considering the literature, this research aims to investigate the effect of online professional learning networks on pre-service teachers’ researcherly dispositions. Specifically, this study aims to answer the following research questions:

- Do online professional learning networks have an effect on researcherly dispositions of pre-service teachers?

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- What do pre-service teachers think about the effectiveness of online professional learning networks?

2. Methodology

In this study, embedded experimental mixed design is used as a research model. The study is conducted with primary school pre-service teachers in the School Experience course and planned as 12 weeks in total. The experimental group takes 2 hours of theoretical and practical lessons each week where they make activities aiming at researcherly disposition by using PLNs. The same activities are carried out with control group in face-to-face lectures by using portfolio.

Participants

As this is a mixed research, there are two study groups. The first study group takes place in the quasi-experimental process (n=24). Quasi-experimental process includes junior pre-service teachers [the experimental group (n=12) and the control group (n=12)] who study in Primary Education Department in a state university and take the School Experience course. This first study group is chosen as two groups who meet the criteria of the equality of variances and no significant difference between the averages in terms of researcherly disposition scale. The second study group takes place in qualitative stage. This group includes experimental group (n=12) who experience online professional learning networks.

Instruments and measures

“Researcherly Disposition Scale” is used as quantitative data collection tool developed by the researcher as part of his PhD thesis (Yokus, 2018). Table 1 shows internal consistency and sub-scales of this scale.

Table 1. Internal consistency of researcherly disposition scale

Cronbach's Alpha	N of items	Standard Deviation
0,88	18	,352

The coefficient alpha of this scale is found to be .88 and it includes four factors including “valuing research, research competences, resistance to research and perceived usefulness”.

In the qualitative stage of this research, there is included Online Discussion Wall (ODW) which allows pre-service teachers to freely discuss the open-ended questions asked by author. ODW is used as data collection tool and their posts are then analyzed by content analysis. In ODW, open-ended questions are directed to users in various time periods which are developed with expert views including one expert in measurement and evaluation department and two experts in curriculum development and instruction department.

3. Findings

In this study, the effect of online professional learning networks on pre-service teachers' researcherly dispositions are analyzed. When pre and post-tests of experimental group are reviewed, it is observed that the mean score increased to 83.00 in the final test while it was 68.00 in the pre-test measurement. Table 2 shows the results of paired samples t test to see whether there is a significant difference between pretest and posttest scores of experimental groups.

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Table 2. Paired samples t-test results of experimental group related to researcherly disposition

	Paired Difference				t	df	Sig.
			Lower	Upper			
Pre-test- Post-test	-14,250	5,344	-17,64	-10,85	-9,23	11	,000

When findings in Table 2 are reviewed, it is seen that there is a significant difference between researcherly disposition pre-test and post-test scores of experimental group who use online professional learning networks $t(11)=-9,236$, $p<.05$; and this difference is in favor of post-test scores. Also, it is investigated to see whether there is a difference in terms of researcherly disposition subscales. Table 3 shows paired samples t-test results related to subscales of Research Competences and Resistance to Research. Table 4 shows Wilcoxon test results related to subscales of Valuing Research and Perceived Usefulness as nonparametric equivalence of t-test.

Table 3. Paired samples t-test results of experimental group related to research competences and resistance to research

Pretest – Posttest	Paired Difference					t	df	Sig.
				Lower	Upper			
Research Competences	-2,08	2,57	,74	-3,71	-,44	-2,80	11	,017
Resistance to Research	-2,16	3,24	,93	-4,22	-,10	-2,31	11	,041

When Table 3 is reviewed, it is seen that there is a significant difference in pretest- post test scores of experimental group in favor of posttest related to “Research Competences” $t(11)=2,803$, $p<.05$ and “Resistance to Research” $t(11)=2,315$, $p<.05$.

Table 4. Wilcoxon signed rank test results of experimental group related to valuing research and perceived usefulness

		n	Mean Rank	Sum of Ranks	Z	Asymp. Sig.
Valuing Research Posttest-Pretest	Negative Ranks	0 ^a	,00	,00	2,947	.003
	Positive Ranks	11 ^b	6,00	66,00		
	Ties	1 ^c				
	Total	12				
Perceived Usefulness Posttest-Pretest	Negative Ranks	0 ^d	,00	,00	2,943	.003
	Positive Ranks	11 ^e	6,00	66,00		
	Ties	1 ^f				
	Total	12				

When Table 4 is reviewed, Wilcoxon test results indicate that there is a significant difference in pretest- post test scores of experimental groups in favor of posttest related to “Valuing Research” and “Perceived Usefulness” (2,947, $p<.05$; $Z=2,943$, $p<.05$).

When it comes to control group, reviewing their pre-test and post-test results, it is observed that the mean score of control group increased to 72.41 in the final test while it was 67.50 in the pre-test measurement. Table 5 shows the results of paired samples t test to see whether there is a significant difference between pretest and posttest scores of control group.

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Table 5. Paired samples t-test results of control group related to researcherly disposition

	Paired Difference				t	df	Sig.
			Lower	Upper			
Pre test-Post test	-4,91	2,35	-6,41	-3,42	-7,23	11	,00

When findings in Table 5 are reviewed, it is seen that there is a significant difference between pre-test and post-test scores of control group who use portfolio $t(11) = -7,238$, $p < .05$; and this difference is in favor of post-test scores. Portfolio makes a significant contribution to total score of researcherly disposition. Also, it is investigated to see whether there is a difference in terms of researcherly disposition subscales. Table 6 shows paired samples t-test results related to subscales of Resistance to Research and Perceived Usefulness. Table 7 shows Wilcoxon test results related to subscales of Valuing Research and Research Competences as nonparametric equivalence of t-test.

Table 6. Paired samples t-test results of group related to resistance to research and perceived usefulness

Post Test- Pre Test	Paired Difference					t	df	Sig.
				Lower	Upper			
Resistance to Research	1,250	2,094	,604	-,080	2,580	2,068	11	,063
Perceived Usefulness	,750	1,602	,462	-,268	1,768	1,621	11	,133

Table 7. Wilcoxon signed rank test results of control group related to valuating research and research competences

Post test- Pre test	n	Mean Ranks	Sum of Ranks	z	Asymp. Sig.
Valuing Research	Negative Ranks	9 ^a	5,94	-1,815	.046
	Positive Ranks	2 ^b	6,25		
	Ties	1 ^c			
	Total	12			
Research Competences	Negative Ranks	6 ^d	6,08	-,923	.356
	Positive Ranks	4 ^e	4,63		
	Ties	2 ^f			
	Total	12			

When Table 6 and Table 7 results are reviewed, it is seen that there is a significant difference only in subscale of Valuing Research among researcherly disposition subscales ($Z = -1,815$, $p < .05$). In other words, portfolio is effective on valuing research subscale such as utilizing research for problem solving, improving instruction thanks to research; however, it seems ineffective in research competences, resistance to research and perceived usefulness.

As pre-service teachers' pre-test scores might affect their post-test scores as confounding variable, ANCOVA analysis has been used to correct the difference between mean scores of experimental and control groups. The effect of pre-test scores of the experimental and control groups have been checked and the post-test corrected mean scores have been calculated. Table 8 shows the corrected post test mean scores of the participants.

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Table 8. Corrected mean scores of researcherly disposition post test

Dependent Variable: *Researcherly Disposition (RD) Post Test Scores*

Group	Mean	Standar Error	95% Confidence Interval	
			Lower	Upper
Experimental	82,578 ^a	,958	80,586	84,570
Control	72,839 ^a	,958	70,847	74,831

a. Covariates appearing in the model are evaluated at the following values: RD = 68,1250.

When corrected post test mean scores are analyzed, it is observed that pre-service teachers who use online professional learning networks in experimental group have higher level of researcherly disposition ($\bar{X}=82.57$) compared to those who use portfolio in control group ($\bar{X}=72.83$). Table 9 presents the results of Covariance Analysis (ANCOVA) on whether the observed difference between researcherly disposition corrected post test scores of two groups is significant.

Table 9. ANCOVA results related to corrected post-test mean scores of both group

Dependent Variable: *Researcherly Disposition Post-test Scores*

Source	Type III Sum of Squares	sd	Mean Square	F	Sig.
Corrected Model	1298,480 ^a	2	649,24	59,15	,000
RD	626,438	1	626,43	57,07	,000
Group	565,239	1	565,23	51,50	,000
Total	146455,000	24			
Corrected Total	1528,958	23			

a. $R^2 = ,849$ (Corrected $R^2 = ,835$)

According to ANCOVA results in Table 9, the corrected post test mean scores of the pre-service teachers significantly differ depending on group type [F (1) = 51.502, $p < .01$]. Table 10 shows the pairwise comparison to find out in favor of which group is this differentiation:

Table 10. Pairwise comparisons related to corrected post test scores of groups

Independent Variable: *Researcherly Disposition Post Test Scores*

(I) group	(J) group	Mean Difference (I-J)	Sig.	Lower	Upper
Experimental	Control	9,739	,000	6,917	12,561

According to the results of the LSD test, the researcherly disposition levels ($\bar{x} = 82.57$) of pre-service teachers in the experimental group are significantly higher than the control group ($\bar{x} = 72.83$). In other words, pre-service teachers who have taken place in the experimental group and used online professional learning networks differ significantly from those in the control group in terms of researcherly disposition.

Qualitative findings

In order to determine the reliability of the qualitative analysis, Krippendorff's alpha coefficient, namely KALPHA, has been calculated to determine the agreement on the codings made by the three experts. The most important reason for rare use of Krippendorff's alpha (KALPHA) is the necessity to create a special syntax text in a statistical software (e.g SPSS) for calculating the

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matching index. Nili, Tate, and Barros (2017) state that it is more appropriate to use Krippendorff's alpha for both the flexibility it provides and for studies that require high level of sensitivity in content analysis.

Table 11. Kalpha values related to theme and codes about researcherly disposition

Themes	Codes	KALPHA	Units	Observers	Pairs	
Researcherly Disposition	increase research-based decisions (n=9)	Nominal	,97	4,00	3,00	12,00
	increase the share of educational research (n=9)					
	foster valuing research (n=7)					
	update instructional knowledge (n=5)					

Some examples of pre-service teachers' views about effectiveness of online professional learning networks on researcherly disposition are reported in the following lines:

"As a result of these activities, I realize that many of the decisions we make are not actually based on any research. In other words, we often act quickly according to our foresight or personal experience. After this, instead of doing this, I would prefer to read/do research when I encounter a problem"(K4) Increase research-based decisions

"I think there are very good studies conducted about learning and teaching. We can find effective things to practice in these studies. When I am involved in a network, I come across some research to improve my teaching. PLNs do really "work" in terms of sharing these good studies." (K7) Increase the share of educational research

"One of the benefits of these networks is that users see research as a more valuable effort. Providing the researcher the opportunity to make research more frequently, to learn where to find the appropriate information and fostering users in terms of being a researcher." (K2) Foster valuing research

" Teachers should always be open to innovation. We may not always be able to mix books, journals and so on, but by using online learning networks we can follow innovations and keep up-to-date on how to teach (K1)" Update instructional knowledge

As a result of the content analysis, it is seen that online professional learning networks increase the value given to the research, provide the share of educational research, increase research-based decisions and enable individuals to update themselves about how to teach.

4. Discussion

In this part of study, there is made a discussion using the findings obtained from this study analyzing the effect of PLNs on researcherly disposition and the other studies in the literature. In the 21st century, the teaching profession is associated with innovation, change in school but more importantly with researcherly disposition; therefore, it is very important for teachers to put value on research, to have basic research competencies and to develop positive perception of research. For instance, In Higher Education Qualifications Framework of Turkey, Teaching Profession Qualifications ask undergraduates to possess cognitive practical skills of "to interpret and

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evaluate, identify problems, analyze problems, develop solutions based on research and evidence" (Turkey Higher Qualifications Framework, 2018). Defining a research problem, data collection, analysis and developing solutions are the main steps of the research action. The American Association of Teacher Education (2017) and the 21st Century Competence Partnership (2016) stress that teachers should be knowledge, media and technology literate in order to successfully fulfill the national goals in the 21st century; they emphasize that they need to integrate these skills into class practices, and most importantly, use technology as a tool for conducting research and evaluating information. Considering Higher Education Qualifications and these reports published at global level, it becomes crucial that educational institutions responsible for training pre-service teachers should focus on researcherly dispositions of teachers and pre-service teachers.

Being smart producers and consumers of knowledge in the digital age depends on the development of the researcher identity; therefore, it is desirable -as in most professions- for pre-service teachers to develop researcherly disposition. As a dimension of researcherly disposition, teachers should be able to identify ways of interacting with research, improve their practices based on the results of a large body of research and to read research while making instructional decisions. Teachers do not merely have the role of practitioner in the teaching and learning process; at the same time, they represent the role of being a researcher. In literature, there is an emphasis on researcher role of teachers which is analyzed as researcherly disposition in this study (Bala, 2014; Gould, 2008; Mills, 2006; Muirhead, 2005; Santa and Santa, 1995). There is a close relationship and several similarities between the research process and teaching profession due to the nature of this profession. Kotsopoulos, Mueller and Buzzza (2012) state that teachers' routine work and their decision-making process are similar to a typical research process.

Within the context of researcherly disposition, particular attention should be paid to both behavioral (to make research) and affective dimension (to value the research). Tack and Vanderline (2014) elaborate researcherly disposition by defining it as "the habit of mind to engage with research – both as consumers and producers – to improve their practice and contribute to the knowledge base". Kotsopoulos et al. (2012) emphasize that pre-service teachers' development of researcherly disposition is very important and it is one of the identities that should be the earliest to develop in the professional development of teachers. In this study, it has been investigated whether there is a development in the researcherly dispositions of pre-service teachers who use online professional learning networks. When Researcherly Disposition Scale (RDS) used in this study (Yokus, 2018) is analyzed, it is observed that the researcherly disposition consists of four subscales: "valuing research, research competences, resistance to research, perceived usefulness". Valuing research subscale measures behaviors such as reading research, using research results in problem solving, accepting the results proven by research. Research competences subscale measures behaviors such as, being able to distinguish between qualified and non-qualified research, to be able to understand the results of the statistics and reports, to have enough experience in research. Resistance to research subscale measures behaviors such as seeing research as a waste of time, thinking that research has no practical value, acting considering the suggestions of others instead of research. Perceived usefulness subscale includes behaviors such as research increasing interest and motivation for the profession, enhancing professional development and making individuals feel as a member of the profession.

When the findings obtained from this experimental study are examined, there is observed an increase in the researcherly dispositions of experimental group using online professional learning

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networks (PLNs). Also, there is a relatively lower increase in researcherly dispositions of control group using the method of portfolio. Despite the effectiveness of both method; however, it is seen that there is a significant difference between two methods in terms of the level of increase. There is more increase in pre-service teachers' researcherly dispositions who use PLNs than those of pre-service teachers who use portfolio. In terms of subscales, pre-teachers using PLNs developed in all subscales of researcherly disposition, namely valuing research, research competences, resistance to research, perceived usefulness; however, it is seen that the preservice teachers who use the portfolio method only show increase in valuing research. Based on the qualitative findings, it appears that experimental group pre-service teachers make various research through PLNs, share this research among themselves, give more value to research and keep in mind the research results while making decisions rather than making arbitrary decisions.

PLNs provide users with opportunities such as connectivity, access to rich resources (libraries, journals etc) and experts to engage in research. Online learning communities and network societies are different from other social media communities because they are a network of experts and beginning teachers, where users are willing to participate voluntarily. In the 21st century called the digital age, social media tools and social networks have been adopted as new community areas for professional development. Within the scope of this study, pre-service teachers using PLNs state that these networks give the opportunity to the members of a profession to make meaningful conversations and discussions among themselves. In study of Trust, Krutka, and Carpenter (2016) on how online learning networks are perceived, it comes out that these networks support teachers in terms of emotional, social, cognitive, and identity development, where nearly every participant has changed the teaching practice as a result of a professional learning networks which influentially change their minds. It is web 2.0 technologies which lie in roots of PLNs. These technologies include social networks (Facebook, Pinterest, Youtube), microblogs (Twitter), job profiles (LinkedIn), information sites (wiki), blogs (Blogger), RSS readers (Google Reader) and webinars (Classroom 2.0, EdTechTalk Live). Almost there is unlimited number of media and platforms included in each category listed above. This situation gives teachers the opportunity to communicate among colleagues, to provide access to experts and to share teaching activities in the way they prefer. PLNs allow a teacher in a network of experienced educators and high-quality resources to pursue a professional development of his own way through social networks of his or her choice.

In this study, pre-service teachers in PLNs are able to easily discuss the subjects that attract their interest and position themselves as "thought leaders". On the other hand, they realize their shortcomings after asking questions directly or following silently the indirect discussions in the subjects that. This situation allows pre-service teachers to start a research on a subject, to value research and to benefit from the results of shared research. In this way, they have the opportunity to update their current knowledge about how to teach. Pre-service teachers claim that the most preferred social networks used in PLNs are Facebook (TeachingIdeas), Twitter (Edchat) and Pinterest (Edutopia) because pre-service teachers find it very useful for their keyword search option, they can easily find the individuals they want to communicate with, they are in constant communication with interest groups, and they are informed about the agenda items thanks to features such as hashtag. Also, they easily share the materials they find related to a course and also offer various links, experts, videos, dashboards that they find useful in terms of teaching.

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With regard to the researcherly dispositions, Loughran (2014) -pointing at teacher educators- states that educators should have the competence to conduct research on their own practices. According to him, teacher educators need to be aware of the necessity of research for their profession, to value the research, to be “smart consumers” in the research field (to use the existing research and to evaluate them critically). In the definition by Tack and Vanderline (2014), the researcherly disposition is explained by indicators such as improving practices, increasing the level of knowledge, and the mental habit of doing research. Researcherly disposition has affective, cognitive and behavioral dimensions. Affective dimension is related to tendency of an individual to be educator-researcher, to value this role and see research as indispensable for his/her profession; the cognitive dimension relates to competencies to be a educator-researcher, being familiar with research as both consumer and producer, having enough knowledge and competencies in the action plan; the behavioral dimension is about the sensitivity of the individual to be a teacher-educator, reading and using the existing research in order to direct his / her practices; and also producing research.

Lingard and Gale (2010) stated that policy makers, education leaders and also teachers are responsible for developing researcherly dispositions. They emphasize that all these actors should be open to enlightenment and understanding of research findings and critical reading of educational research. In this regard, the Dutch government’s decisions such as supporting teacher educators to obtain a master's or doctoral degree, and supporting teacher training institutions in order to improve their research capacity can be shown as examples. As a result of these developments, it is seen that teacher educators are more involved in academic research practices in information centers. The researcherly disposition is seen as a sub-identity under the identity of the teacher educators, naming it academic teacher identity (Swennen, Geerdink and Volman, 2017). Lingard and Renshaw (2010) consider teachers to have a lower responsibility for research compared to teacher-educators and acknowledge that teachers are only interpreters or practitioners of educational research conducted by others, as well as passive recipients of research. In terms of researcherly disposition, the teachers should not be only assumed to have the role who apply the results of the research conducted by others. In this study, the researcherly dispositions of the pre-service teachers are not kept narrow and it is argued that the individuals who will conduct the teaching profession should be effective investigators and establish a close relationship with the research in a “complete and integrated” way. The scale used in this study stand for idea that not only “valuing research” but also “research competencies” are basic constituents of researcherly disposition. Flake, Kuhs, Donnelly & Ebert (1995) stress that the basic idea that influences many teacher training programs is that teachers are also researchers and they are expected to develop theories that will guide teaching practices; however, research done by teachers should not be a copy of university research. According to them, teachers' research should arise from routine life and related practices at schools, and compared to the studies conducted in higher education, the research questions should be chosen more appropriately in terms of their practicality in the school, the investigations should be more natural and the findings more reliable. For instance, in the Instruction MA Program at South Carolina University, various strategies have been adopted and followed by university to support teachers’ professional development in order to fulfill these new researcher roles (Flake et al., 1995).

In spite of the increasing emphasis on the relationship of the research with teaching practices in the classroom, it is stated that the teachers are reluctant to be involved in research and to take

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part as a participant or collaborator in the research (Smith and Sela, 2005) because research is not considered as part of the professional development of teaching. For example, in the study of Wyatt (2011b), it has been found that research experience has allowed a teacher to develop practical knowledge about material design, to develop autonomous study, self-confidence and a professional identity related to teaching. Goodnough (2011) seeks to understand how teachers deconstruct and reconstruct their own identities when they are involved in teacher-centered action research; and as a result of this study, it comes out that the participant teachers become the producer of information via research and their educational qualifications improve. Coryell, Wagner, Clark and Stuess (2013) examine the researcherly dispositions of doctoral students and claim that the participants describe research and development of their researcher identity as an ambiguous and risky experience. Nevertheless, their resistance level against research has been eliminated by up to 90 percent and they have succeeded in finding the appropriate research question, collecting data, analyzing the data, reporting the research and making it ready for presentation. Thanks to research experience, their doubts have turned into self-esteem, and research experience has led them to seek answers - in other words to do research- about their roles, behaviors, knowledge production or interpretation of test results.

Kotsopoulos et al. (2012) emphasize the importance of making research by pre-service teachers in order to make a meaningful connection between research and practice and affirm that the researcherly disposition of teachers are difficult and complicated to develop. As a result of their research, it comes out that the studies conducted by pre-service teachers before profession are promising as an early culturing method and it is very important for the school administrators to take their leadership role into account in school-based research. A change in school culture related to research is one of the steps to be taken in this direction. It is also observed that researcherly disposition develops when the link between research and teaching practice become an important part of professional practice through active participation in research. In other words, by linking research and teaching, pre-service teachers have become producers rather than just consumers of research. Their findings are in parallel with results in this study because it is seen that the pre-service teachers who use PLNs benefit from the results of studies in literature, they put more value on research and they attempt to make decision based on research. Furthermore, there is an increase in pre-service teachers' resistance to research which was at a moderate level before experiment. Before using online professional learning networks, pre-service teachers think of research to be a loss of time and research results to have no practical value in the classroom. Making instructional decisions in the classroom and the quality of the decisions taken become so crucial in teaching profession; therefore, decisions should be based on research such as student interviews, group discussions and systematic observations. Similarly, Kotsopoulos et al. (2012) put forward that teachers' decisions should not be based on ungrounded and arbitrary assumptions; it is important teachers' decisions to be based on evidence and observations, and that this is the purpose of developing a researcherly disposition.

When it comes online professional learning networks, there is a number of variables which support developing researcherly dispositions of teachers; because PLNs are more flexible, customized and experience-oriented when compared to traditional professional development models with time and space constraints. Users experiencing PLNs decide for themselves which networks to join, who to contact, how much time they will spend, and what kind of discussion activities to do. For example, a pre-service teacher interested in differentiated learning can read a blog post

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about it, follow the #differentiatedlearning hashtag on twitter, and join the Special Education Teachers group through Edmodo. The types and number of these networks are so to say unlimited. According to Trust (2012), these platforms are also environments where teachers can find professional support from broader communities of educators for purpose of collectivist knowledge production and sharing. Holmes and O'loughlin (2012) stresses the necessity of effective professional learning for teachers and examines the effectiveness of Twitter as a medium for professional learning and finds out that it works well for accessing new and relevant educational resources on the internet and also serving social support for like-minded educators. Trust (2012) stresses that many teachers have taken the initiative to continue their professional learning by developing online networks in social media. According to her, teachers that participate in PLNs demonstrate what the National Research Council (2000) calls “adaptive expertise” (p. 48). Teachers with adaptive expertise act flexibly and grow with the changes they face because they “use metacognitive strategies to examine their knowledge and continually seek to improve their expertise” (Trust, 2012). At this point, PLNs encourage teachers to perform self-assessments for self-improvement and help them to find information and connect with others who will help them. Trust conclude that PLNs include a cyclical learning process where teachers both receive help and provide advice – in other words getting expertise while also offering their own expertise to help other members. However, there is a point to note that it is not meant socially oriented personal accounts when we speak of online professional learning networks; because PLNs are created for a specific purpose which let professional support, instant access to information and most importantly connections to a broad community of experts. As stressed by Briscoe, Pollock, Campbell and Carr-Harris (2015), it is demanding to build a successful network and they use sweet spot as a metaphor. They recommend networks that use strategies to align structures and processes.

In 21st century, there is an emphasis on adapting teaching styles, teacher productivity, teaching quality and social networking. In Lautenbach and Batchelor’s study (2015), pre-service teachers get familiar with “online learning in a systematic way that enable them harness the power of partnerships through communication with expert teachers, for example, enabling their transition to becoming education professionals.” They claim that thanks to online networks which smooth professional learning, pre-service teachers more often connect with teachers and content specialists all around the world and these networks give a rich experience related to pedagogical practices including opportunities to “share resources, collaborate, strengthen pedagogies and practices, allow for self-reflection and peer validation in the future – as long as the relationships are maintained”. In study of Trust, Carpenter and Krutka (2018), PK-12 educators remark that their PLNs have shaped their values, dispositions, practice related to profession; and there is a wide range of opportunities in “digitally enhanced PLNs” for connecting and interacting with knowledge producers and users. – in a sense connecting educational researchers together. The ongoing continuous flow of information in these networks makes these networks even more valuable; but for those users who are yet inexperienced and do not know where to start, there is developed a framework in this study for creating and enriching online professional learning network.

Veletsianos and Navarrete (2012) find out that students need administrative support in finding valid and accurate information on social networks and how to assure effective participation. Likewise, Lautenbach and Batchhelor (2015) emphasize that students need support to create professional learning networks despite their obvious motivation about social networks. It is good to re-emphasize that online professional learning networks are not just any connections that are used

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randomly, so guiding models should be introduced for inexperienced users of PLNs. In this study, Online Professional Learning Network User Guide is developed to guide the users and this PLN User Guide has common practices with framework of Krutka, Carpenter and Trust (2017). This framework has a flexible and regeneratable structure. Table 12 gives detailed information about PLN User Guide:

Table 12. User guide for using online professional learning network

Take Action	<i>Identifying actors</i> (global actors, prominent educational leaders, active educators etc)	<i>Setting up goals and objectives</i> (specific goals and objectives for each network)	<i>Making research about networks of good quality</i>
Extend	<i>Expanding the network with prominent actors recommended by other users and newly joined actors</i>	<i>Managing active involvement in networks</i> (share, participate, like, comment etc)	<i>Investigating and expanding his/her network with newly emerging networks of best ideas, resources and content</i>
Update	<i>Updating the network by identifying which actors contribute to professional development and which do not.</i>	<i>Regularly checking whether the objectives are met related to professional development</i> (ideally 4-6 months)	<i>Updating the network by identifying which channels are effective and which are not in terms of professional development.</i>

Each variable that is incorporated and excluded in online professional learning networks affects the professional learning of the individual. Individuals within online professional learning networks provide a variety of services to each other. A user who acts as an expert for others can also receive consultancy from others. The key point in online professional learning networks is the interactive exchange of best experiences, ideas and practices that will sustain professional development; therefore, it is important for the user to participate regularly and to engage in these networks to develop new values and dispositions, such as researcherly disposition which includes valuing research and benefiting from research results. A research-oriented culture –especially in PLNs- should be established in order to enable pre-service teachers to establish a link between teaching practices and research. For this purpose, the institutions responsible for teacher training can implement activities –for instance related to academic writing standards and ethics- by connecting experienced experts from the globe. This makes it easier for pre-service teachers to place more emphasis on research and to develop researcherly disposition via PLNs. It is also necessary to establish connections between online communities of educators and educational research, and work to organize research-oriented workshops in PLNs.

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