Pre-Service Teachers' Perceptions of ICT Integration in Teacher Education in Turkey

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ABSTRACT
Information and Communication Technology (ICT) integration in teacher education and teaching practices of teachers is a complicated and challenging issue. As far as pre-service teachers are concerned, this becomes critical because they need to be equipped with the competencies for their future teaching practices. The objective of this study is to identify pre-service teachers' perceptions of ICT integration in teacher education and its association with their teaching practices. A stratified two-stage probability sampling design was used. Firstly, three Turkish state universities with the highest and lowest number of the pre-service teachers were chosen. Secondly, pre-service teachers from the subject domains of Turkish language, social sciences, elementary education mathematics and science were selected. A qualitative method was used in this study. Data were collected from 782 pre-service teachers from open ended questions in a survey and interviews were conducted with 15 participants. Qualitative data were analyzed with thematic coding. The results identified the specific conditions of ICT integration in teacher education and pre-service teachers' perceptions of ICT integration and the associations with their teaching practices.

Keywords: pre-service teachers, ICT integration, ICT competency.

INTRODUCTION
Information and Communication Technology (ICT) appear to be not only the backbone of the Information Society, but also a crucial catalyst and tool to bring about educational reforms which enable our students to be productive knowledge workers (Pelgrum, 2001). In this context, ICT seems to be an important tool to support new ways of teaching and learning (Drent & Melissen, 2008). The integration of ICT into education remains a crucial issue for both teachers and students to perform effectively. Therefore, teachers are required to be competent in the use of ICT (Voogt & Roblin, 2012; Pineida, 2011).

An important factor for teachers to integrate technology into instruction is being trained in how to integrate technology into education (Pamuk & Peker, 2009). In this regard, teacher education programs play a significant role in training pre-service teachers to integrate ICT into education. The programs should enable them to gain technology rich experiences throughout all aspects of training (UNESCO, 2008). What is more, pre-service teachers should acquire the skills and knowledge essential for ICT use in their pre-service learning process and apply them in their pre-service education period and in their professional life (Yapıcı & Hevedanlı, 2012). So, pre-service teachers' perceptions of ICT integration in teacher education are highly important to investigate whether the programs for teacher education are sufficient to prepare pre-service teachers to acquire and integrate ICT competence in their pre-service education and in their prospective life.

THEORETICAL BACKGROUND
ICT integration in teacher education and teaching practices of teachers is a complex and challenging issue. In this regard, Gülbahar and Güven (2008) claim that just equipping schools with the essential ICT tools does not improve the quality of instruction and does not create more effective learning environments. Nevertheless, schools should reconsider the current teaching programs, practices and resources by grasping a broader vision and philosophy. It is not simple to integrate technology successfully since it relies on interlinking variables (Akbaba-Altun, 2006). In this study, the interlinking variables, namely variables related to ICT integration in education, are examined focusing on three categories related to pre-service teachers' ICT integration into teaching practices. These categories are conditions for ICT integration in education, pre-service teachers' perceptions of ICT integration and the perceived impact of pre-service teachers' perceptions on their practices of ICT integration in education.

Conditions for ICT integration in education

Infrastructure is one of the crucial variables to integrate ICT into education. It is indicated in many studies (Akbaba-Altun, 2006; Akbulut, Odabaşı & Kuzu, 2011; Göktaş, Yıldırım & Yıldırım, 2008; Pelgrum, 2001; Voogt, Knezek, Cox, Knezek & Ten Brummelhuis, 2011) that infrastructure is highly important to integrate ICT in education successfully. In this regard, Akbulut, Odabaşı and Kuzu (2011) claim that strong infrastructure should be ensured in addition to providing equal access for all, taking precautions to facilitate ease of use and employing technical staff to help users. The development of ICT integration infrastructure is understood to be one of the domains to integrate ICT into education.

In the context with the ICT courses in teacher education, pre-service teachers are trained with Computer I and II, Instructional Technology and Material Development (ITMD) courses in Turkey. The general objectives of the "Computer I" course are to enable pre-service teachers to learn ICT, the basic concepts in regards to hardware and software, operating systems in general, word processor, spreadsheet, presentation program, usage of Internet in education. The course consists of four hours per a week, namely two hours for theory and two hours for practice. In addition to the "Computer I" course, the general objectives of the "Computer II" course are to enable pre-service teachers to be knowledgeable about basic concepts, elements, theoretical basis, advantages, limitations and application methods with regard to computer assisted education. The course consists of four hours per a week, namely two hours for theory and two hours for practice. It is understood from the objectives of Computer I and II courses that pre-service teachers are expected to be literate in technology. The main objectives of the ITMD course are to learn the usage of instructional technologies in education, to plan and apply instructional technologies in education, to develop two and three dimensional materials using instructional technologies, to examine educational software and to assess a variety of instructional technologies. The ITMD course consists of four hours per a week, namely two hours for theory and two hours for practice (HEC, 2006). Pre-service teachers are required to acquire the competency to use the existing technology in teaching-learning process through the ITMD course (Gündüz & Odabaşı, 2004).

Factors related to ICT integration (as perceived by pre-service teachers)

The pre-service teachers' perceptions regarding ICT integration are examined in terms of staff issue and teacher related variables. According to Pelgrum (2001), insufficient supervision staff, and lack of technical assistance are among the most common obstacles for ICT implementation. Therefore, the pre-service teachers' views concerning staff issue in respect to ICT integration are examined in this study. As a result of the literature review, it appears that teacher related variables are also important predictors for technology integration. According to Becker (2000), teachers' limited skill and expertise in using computers is an obstacle for more teachers to utilize computers frequently with their students. Besides, teachers' attitude to technology affects computer supported education to a large extent (Celik & Yesilyurt, 2013). According to Pamuk and Peker (2009), computer anxiety will also prevent those teachers who suffer from computer anxiety from using educational technology effectively. Moreover, Aslan and Zhu (2014) found out that pre-service teachers' pedagogical knowledge, their gains from ICT related courses in their teaching program and their perceived ICT competence significantly predict their ICT integration into teaching practice. In addition, more experience also brings about a more positive attitude towards computers (Beckers & Schmidt, 2003). Therefore, teacher related variables concerning ICT integration in education were investigated further in this study.

The association between pre-service teachers' perceptions of ICT integration and their teaching practices (as perceived by pre-service teachers)

In many studies (Teo, 2009; Yücel, Acun, Tarman & Mete, 2010; Aslan & Zhu, 2014), teachers' perceptions for ICT integration such as their ICT self-efficacy, technology attitudes, computer anxieties etc. are investigated to predict to what extent teachers integrate ICT into their teaching practices. In this study, the perceived impact of pre-service teachers' perceptions concerning ICT integration in education on their practices was investigated. The rationale behind this idea was to see the link between their perceptions and practices for ICT integration in education. The link is believed to give an important insight to understand pre-service teachers' ICT integration on their teaching practices holistically.

Objectives of the study

As a result of the literature review, it shows that the number of the studies dealing with pre-service teachers' perceptions with regard to ICT integration in teacher education and its associations with their teaching practices is very limited. Therefore, the objectives of this study are to understand Turkish pre-service teachers' perceptions concerning the conditions for the infrastructure for ICT integration and the integration of ICT courses in teacher education, their perceptions for ICT integration, their views with regard to the effective integration of ICT in education and the perceived impact of pre-service teachers' perceptions concerning ICT integration in education on their teaching practices.

Research questions
This study focused on the following research questions.

1. What are Turkish pre-service teachers' perceptions concerning the conditions for the integration of ICT in education in terms of infrastructure for ICT integration?
2. What are pre-service teachers' perceptions concerning the conditions for the integration of ICT in education in terms of the integration of ICT courses in teacher education?
3. What are pre-service teachers' perceptions regarding ICT integration in education?
4. What are pre-service teachers' views regarding effective integration of ICT in education?
5. What is the perceived impact of pre-service teachers' perceptions concerning ICT integration in education on their practices?

METHOD
A qualitative method was used in this study to investigate pre-service teachers' perceptions of ICT integration in education in Turkey. A total of 782 pre-service teachers answered a survey with open ended questions and 15 pre-service teachers were interviewed.

Participants
A stratified two-stage probability sampling design was used. Firstly, three Turkish state universities with the highest and lowest number of the pre-service teachers were chosen. Secondly, pre-service teachers from the subject domains of Turkish language, social sciences, elementary education mathematics and science were selected. Student Selection and Placement Center's 2012 quota was taken into account to determine the population size (ÖSYM, 2012).

The qualitative study consists of the two sections. The first section composes of the open ended questions in a survey involving 782 pre-service teachers studying in Turkish teaching, Social Sciences teaching, Science teaching and elementary education mathematics teaching in their fourth year level of education at Aksaray, Gazi, Marmara, Dokuz Eylül, Niğde and Fırat Universities in the spring semester in 2014 in Turkey. The second part involves interviews with 15 pre-service teachers (nine female and six male) in the same period in Turkey.

Procedure
A questionnaire with open ended questions was sent to 782 pre-service teachers at six different universities in four different subjects in the spring semester in Turkey in 2014 to investigate their perceived ICT competences and their integration of ICT into teaching practices. Informed consent was obtained from all the universities and participants to conduct the study. The questions included the following elements: the pre-service teachers' perceptions of conditions for ICT integration, integration of ICT courses in teacher educations, and their perceptions regarding ICT integration into education. The open ended questions are provided in Appendix I.

Interviews were conducted with 15 pre-service teachers studying in Turkish teaching, Social Sciences teaching, Science teaching and elementary education mathematics teaching in their fourth year level of education at Aksaray, Niğde and Dokuz Eylül Universities. The interview questions were semi-structured. The interview questions aimed to understand pre-service teachers' thoughts regarding the link between their perceptions and their teaching practices. The interview questions are given in Appendix II.

Both the open ended and interview questions were developed by the researcher together with an expert in educational sciences based on a review of the related literature (Alev 2003, Göktaş 2006). The questions were evaluated in terms of content validity by two experts in the field of educational sciences. All interviews were conducted individually. Each interview lasted for about 10-15 minutes. Additional questions sometimes were asked to clarify the issues in their experiences to use ICT in their teaching practices. The participants gave consent to audio record the interviews.

Coding and analysis
The participants' responses to the open ended questions were transcribed and each case was assigned a case number. All interviews were transcribed and entered into QSR NVivo 8.0 for analysis.

Qualitative data analysis was used to analyze the responses given to the open ended questions and the interviews. Thematic coding was used to analyze the data. The unit of analysis was based on units of meaning. Open coding was used to ascertain the themes and axial coding was applied to connect the sub-themes under the related themes. Three major themes emerged from open coding, namely "conditions for ICT integration in education", "pre-service teachers' perceptions of ICT integration", and "the perceived impact of pre-service teachers'

perceptions concerning ICT integration in education on their practices". The sub-themes related to each major theme and the frequencies of the themes and sub-themes are presented in Appendix III.

The first author and two other independent researchers did the coding of all data and constructed the main themes and sub-themes. The results of the three researchers were compared. Cohen's Kappa coefficients were calculated for the interrater reliability. The results of the reliability are shown in Table 1. The interrater reliability for the themes and sub-themes varied from 0.615 to 1.00. The reliability results show that the coding procedure was reliable. For those sub-themes that had a lower reliability, discussions were conducted among the researchers in order to reach a consensus.

Table 1. Cohen's Kappa coefficients for the interview and open ended questions

1.A.1. Infrast. for ICT int.				1.A.2. ICT sources				1.A.3. Access to ICT				1.B) Integration of ICT courses			
K2				K2				K2				K2			
	+	-	Σ		+	-	Σ		+	-	Σ		+	-	Σ
+	3	1	4	+	3	0	3	+	10	2	12	+	5	1	6
K1 -	0	2	2	K1 -	1	4	5	K1 -	2	12	14	K1 -	0	4	4
Σ	3	3	6	Σ	4	4	8	Σ	12	14	26	Σ	5	5	10
Kappa: .667 p:.083				Kappa: .750 p:.028				Kappa: .690 p:.000				Kappa:.800 p:.010			

2. Computer I & II				3. Instructional technologies and…				1. Available Personnel				2. Perceived importance of..			
K2				K2				K2				K2			
	+	-	Σ		+	-	Σ		+	-	Σ		+	-	Σ
+	6	1	7	+	8	2	10	+	2	0	2	+	6	1	7
K1 -	1	7	8	K1 -	1	11	12	K1 -	0	1	1	K1 -	1	7	8
Σ	7	8	15	Σ	9	13	22	Σ	2	1	3	Σ	7	8	15
Kappa: .732 p:.005				Kappa: .723 p:.001				Kappa: 1,00 p:.083				Kappa: .732 p:.005			

3. Perceived importance of ICT				5. Pre-serv. teachers' barriers…				6.1.Pre-servive teaches' attitude to ICT				7. Perceived role of ICT in teaching			
K2				K2				K2				K2			
	+	-	Σ		+	-	Σ		+	-	Σ		+	-	Σ
+	5	1	6	+	2	0	2	+	18	3	21	+	3	0	3
K1 -	0	4	4	K1 -	0	1	1	K1 -	4	15	19	K1 -	0	1	1
Σ	4	4	10	Σ	2	1	3	Σ	22	18	40	Σ	3	1	4
Kappa: .800 p:.010				Kappa: 1.00 p:.083				Kappa: .648 p:.000				Kappa: 1.00 p:.046			

8.Pre-service teach. prior experience.				9. Pre-service teachers' ICT anxiety				10. Interest to learn ICT skills				11. Teachers' roles and responsibilities			
K2				K2				K2				K2			
	+	-	Σ		+	-	Σ		+	-	Σ		+	-	Σ
+	3	0	3	+	8	2	10	+	5	1	6	+	3	0	3
K1 -	1	4	4	K1 -	1	6	7	K1 -	0	4	4	K1 -	1	2	3
Σ	3	4	7	Σ	9	8	17	Σ	5	5	10	Σ	4	2	6
Kappa: 1.00 p:.008				Kappa: .643 p:.008				Kappa: .800 p:.010				Kappa: .667 p:.083			

11.2. Teachers' responsibilities				3.The perceived impact of pre-service teachers' practices			
K2				K2			
K1	+	-	Σ	K1	+	-	Σ

+	2	0	2		+	4	0	4				
-	1	2	3		-	1	4	5				
Σ	3	2	5		Σ	5	4	9				
Kappa: .615		p:.136			Kappa: .780		p:.016					

RESULTS

As a result of the open coding of the participants' responses concerning the open ended questions and the interview transcripts, three major themes emerged. They are "conditions for ICT integration in education", "pre-service teachers' perceptions of ICT integration" and "the perceived impact of pre-service teachers' perceptions concerning ICT integration in education on their practices". In this section, the themes and their sub-themes were explained in detail. The descriptions were supported with direct quotations from the participants.

Conditions for ICT integration in education

Infrastructure

As a result of axial coding, "Infrastructure" was identified as one of main themes related to conditions for ICT integration in education. Related to "Infrastructure" three sub-themes were identified, namely "infrastructure for ICT integration", "ICT resources" and "access to ICT".

The sub-theme "infrastructure for ICT integration" consisted of three sub-components, namely "overcrowded classes", "physical settings" and "power failure". Among 71 participants in the survey, 30 participants stated that their classes were overcrowded. For example, one female participant (number 45th from the survey) said that "*Each student should be allocated a personal computer. Classroom size should be arranged in a way that students take their lessons in groups*". As for the physical setting, 38 participants said that the physical setting (e.g. building and classroom) should be reorganized taken into account ICT such as audio and visual aspects. Besides, three participants indicated that they had difficulty in using ICT due to power failures.

The sub-theme "ICT resources" consisted of three elements, namely "software", "hardware" and "ICT labs". Out of 120 participants in the survey and interview, 11 respondents commented that appropriate software programs should be made available for their courses. For example, one female participant (number 263th from the survey) indicated that "*Games and animations complying with the needs of the courses should be developed*". Besides, 102 participants indicated that hardware resources (e.g. computers, projectors etc.) should be increased for the integration of ICT in their teaching practices. Moreover, seven participants out of the 15 interviews pointed out that the number of ICT laboratories should be increased as well.

The sub-theme "access to ICT resources" is referred to the level of access to ICT resources Among 190 participants in the survey, 53 participants stated that they had difficulty in accessing to ICT resources at their universities, 137 participants did not encounter any problem regarding access to ICT resources at their universities. Out of 189 participants in the survey, they accessed to ICT resources through computer laboratories (n=67), ICT courses (n=55), library (n=30), personal computer (n=17), internet (n=13), wifi in campus (n=5) and residences (n=2).

Integration of ICT courses in teacher education

The sub-theme "integration of ICT courses in teacher education" was identified as one of the components of "Conditions for ICT integration in education". With regard to "integration of ICT courses in teacher education", three elements were identified, namely "ICT integration", "Computer I and II" and "Instructional technologies and material development".

With regard to the course "ICT integration", among 49 participants in the survey and interview, 23 participants pointed out that the ICT course hours should be increased. For example, a female participant (number 50th from the survey) stated that "*The course hours are limited and the curriculum is heavy and the course hours should be increased…*" Four participants from the interviews stated that ICT courses should be extended throughout the program. Another female participant (number 39th from the survey) stressed that the ICT courses should be given starting from the first year. Five participants (three in the survey and two in the interview) mentioned that ICT training should be given considering the subject area. For example, a male participant (number 44th from the survey) said that "*…the integration of ICT into the content knowledge has to be increased.*" and a female participant (number 44th from the survey) stated that "*…the ICT courses do not include the knowledge concerning science and technology teaching.*" In parallel with this this sub-component, six participants from survey indicated that ICT should be integrated into their courses.

The participants' perceptions concerning the sub-theme "Computer I and II" courses were examined in regards to their sufficiency to equip them to with ICT competency. Among 180 participants in the survey and interviews, 81 participants perceived the courses sufficient, and 91 participants found them insufficient. Meanwhile, eight participants' perceptions concerning the courses were somewhat sufficient. For example, a female participant (number 85th from the survey) mentioned that "*These courses are actually sufficient in terms of their content...through the right plan and program; they develop our ICT skills...*" However, a female participant (number 124th from the survey) said that "*In my opinion, Computer I and II courses should have focused on up-to-date programs. For example, for our subject teaching, a course called "Turkish in Computer Use" could have been given. In the context with the course, how an e-mail is written on computer can be taught…*" and a female participant (number 171th from the survey) stated that "*When I compare my ICT knowledge before and after the courses, they did not have an effect on my knowledge*". Among 57 participants, 13 participants demanded that the courses should be given in more detail and 44 participants stressed that more practice should be conducted in these courses.

The participants' perceptions in regards to the sub-theme "Instructional technologies and material development" course were investigated whether it was sufficient for the participants to acquire the competency to integrate ICT in their teaching practices. Among 138 participants in the survey and interviews, 79 participants cited that the course was sufficient. For example, a female participant (number 342th from the survey) stated that "*I developed my skill to prepare presentations considerably. I even prepared software for educational purpose.*" Whereas 7 participants perceived the course somewhat sufficient, 52 participants perceived it insufficient. 76 participants made some suggestions to make the course more effective. Those suggestions can be grouped under the four elements, namely more detailed, more practice, more emphasis on instructional technologies and using smart boards in education. Six participants demanded that the courses should be arranged in detail. Besides, 17 participants emphasized that they should make more practice in the course. On the other hand, 39 participants stressed out that they focused on the material development rather than instructional technologies in the course and they demanded that more emphasis should be allocated to the instructional technologies. For example, a male participant (number 83rd from the survey) said that "*we did not develop anything in technology but something in material.*" And lastly, 14 participants stated that they should use smart boards in their teaching training. For example, a female participant (number 476th from the survey) stressed that "*…teachers should be trained how to use smart boards in education.*"

Factors related to ICT integration (as perceived by pre-service teachers)
The theme "pre-service teachers' perceptions of ICT integration" deals with ICT integration into education with regards to staff issue and teacher related variables. The theme consists of several sub-themes.

Available personnel
With regard to "available personnel" sub-theme, the personnel issue was examined in terms of academic members and technical assistants. Out of 26 participants in the survey and interviews, 22 participants emphasized that academic members should be more competent to use ICT in their teachings. For example, a female participant (number 83rd from the survey) cited that "*More competent academic members in instructional technologies should give lessons…*" Four participants demanded that technical support should be available when they need some help in their use of ICT.

Perceived importance of ICT integration in education
The sub-theme "perceived importance of ICT integration", consisted of six elements. Among 14 participants in the survey, the participants stated that enabling to gain positive attitudes to ICT (n=4), encouraging using ICT (n=3), arousing interest for ICT integration (n=2), increasing motivation to use ICT (n=2), overcoming the prejudice against ICT (n=2) and being aware of using ICT (n=1) are important to integrate ICT into education.

Perceived importance of ICT competence for ICT integration
The sub-theme "perceived importance of ICT competence for ICT integration" examines the relationship between ICT competence and pedagogical knowledge for ICT integration. Among 132 participants in the survey and interviews, four participants cited that just having ICT competence is adequate for ICT integration. On the other hand, the majority of the participants (n=114) indicated that in addition to having ICT competence, pedagogical knowledge is necessary to integrate ICT into education. For example, a female participant (number 62th from the survey) stated that "*Just having ICT competence is not sufficient because auto parts constitute a good car. A driver drives it. A car is nothing apart from an ornament unless it is used.*" and a female participant (number 62th from the survey) cited that "*it is not sufficient to have ICT competence...pedagogical knowledge and content knowledge are also necessary.*" and a female participant (number 100th from the survey) stressed that "*if just ICT competences would be adequate, we would not study in education faculties. An engineer would*

also teach. Teaching as a profession is to teach by touching humans' soul." In this context, five participants stated that having ICT competence and pedagogical knowledge complement each other regarding ICT integration into education. Six participants indicated that pedagogical knowledge is a prerequisite for ICT integration. For example, a male participant (number 6th interview) stressed that "…*pedagogical knowledge should be a pre-requisite for ICT integration. How does child development occur? What do children learn under different circumstances…?*" What is more, three participants emphasized that pedagogical knowledge is absolutely necessary for the integration of ICT into education.

Perceived barriers for integration of ICT in education
The sub-theme "perceived barriers for integration of ICT in education" consisted of two elements, namely "lack of experience" and "lack of ICT skills". Among 26 participants in the survey, 14 participants cited that their lack of experience makes it difficult to integrate ICT into education. For example, a male participant (number 347th from the survey) stated that "*I have difficulty in planning and teaching lessons. I think I have to be more experienced.*" 12 participants indicated that they encounter barriers for their integration of ICT into education on account of not having ICT skills. For example, a female participant (number 261th from the survey) stated that "…*I am not skilled to use the programs in preparing or presenting lessons.*"

Pre-service teachers' attitude to ICT
The sub-theme "perceived attitude to ICT" consisted of several elements. One of them is "investment in ICT". Among 15 participants in the interviews, 12 participants cited that in order to integrate ICT into education, it is necessary to make investment in ICT. However, one participant stated that it is not necessary to do so. Besides, one participant indicated that how the investment in ICT with regards to its integration into education made is more important than how much the investment is made. For example, a female participant (number 12th interview) stated that "…*it is more important to make the investments in ICT in education effectively. For instance, there is electricity matter in rural areas, villages. Unless this matter is overcome, it will be no use distributing computers, tablets to schools…*" On the other hand, a female participant pointed out that she is anxious for her subject teaching in regards to the investment in the integration of ICT in education. For example, a female participant (number 15th interview) stressed that "…*smart boards can have a negative impact on written expression…*" The other elements regarding the perceived attitudes to ICT out of 54 participants in the survey and interviews as follow: it is necessary (n=10), useful (n=10), economic (n=2), effective (n=3). It facilitates teaching (n=1), makes learning permanent (n=9) and abstract issues concrete (n=3), saves time (n=6), supports learning and understanding additionally (n=1), contributes to diversity (n=3), lifelong learning (n=1), multiple intelligence (n=3). It is preferred in teaching (n=2).

Perceived role of ICT in teaching and learning process
With regards to the sub-theme "perceived role of ICT in teaching and learning process", among 15 participants in the interviews, three participants stated that ICT will change teaching and learning process to some extent and six participants stressed that ICT will change teaching and learning process definitely and five participants cited that ICT will facilitate teaching and learning process.

Pre-service teachers' prior experience concerning ICT use
The sub-theme "pre-service teachers' prior experience concerning ICT use" consisted of three elements, namely "positive effect", "necessary" and "insufficient". Among seven participants in the survey, four participants cited that their prior experience in regards to their ICT use has positive effect on their integration of ICT into their teaching practices. In this respect, two participants indicated that it is necessary to learn ICT before studying at university. A female participant pointed out that her prior experience for ICT use was insufficient for her integration of ICT into education.

Pre-service teachers' ICT anxiety
The sub-theme "perceived ICT anxiety" out of 15 interviews consisted of eight elements, namely difficulty in learning ICT (n=1), process of preparing lesson (n=1), taking time (n=1), communication problem among students (n=1), using constantly causes monotony (n=2), teachers' being of the second importance (n=2), giving more importance to ICT (n=1) and misusing ICT (n=1).

Interest to learn ICT skills and knowledge
The sub-theme "interest to learn ICT skills and knowledge" out of 15 interviews investigates why the participants are interested in learning ICT skills and knowledge. The sub-theme consisted of five elements, namely work oriented (n=2), to some extent (n=2), like (n=1), obligation (n=2), certainly (n=5).

Teachers' roles and responsibilities concerning the use of ICT
The sub-theme "teachers' roles and responsibilities concerning the use of ICT" out of 15 interviews examines teachers' roles and responsibilities with regards to the use of ICT. Nine participants pointed out teachers' roles with regards to ICT will decrease. In this regard, one participant stated that there will be no change in teachers' role. As for teachers' responsibilities regarding ICT, seven participants cited that their responsibilities will increase whereas seven participants stated that their responsibilities will decrease.

The association between pre-service teachers' perceptions of ICT integration and their teaching practices (as perceived by pre-service teachers)
The last theme "the perceived impact of pre-service teachers' perceptions concerning ICT integration in education on their practices" consisted of four elements, namely presentation, basic level, facilitating teaching and changing teaching approach. Out of the 15 interviews, eight participants indicated that they use ICT to present their subjects. Only one participant cited that they use ICT to facilitate teaching. For example, a female participant (number 5th interview) stated that *"…we are now going to schools to teach practices. I think that ICT is our biggest support in teaching. It supports us in every respect. It makes students join lessons."* Besides, two participants stated that they use ICT in their teaching practices with a basic level. What is more, two participants emphasized that ICT has changed their teaching approach. For example, a male participant (number 1st interview) said that*"…through the Internet, we were searching how to teach a subject more simply, easier and effectively. In the end, we were preparing a presentation. In consequence of these experiences, a number of my friends changed their ideas to use ICT in their teachings…"*

DISCUSSION AND CONCLUSION
As a result of the qualitative data analysis for the pre-service teachers' perceptions with regard to ICT integration into education, three major themes emerged from open coding, namely "conditions for ICT integration in education", "pre-service teachers' perceptions of ICT integration", and "the perceived impact of pre-service teachers' perceptions concerning ICT integration in education on their practices".

The findings of this study indicate that classroom sizes should be small for pre-service teachers to acquire ICT skills and use it in education. Besides, the physical conditions of classrooms and buildings such as audio and visual aspects should be enhanced for ICT integration. In this context, power failures could be prevented. It is understood that there are differences among the universities in terms of ICT infrastructure. While some participants can have access to ICT sources at their universities without encountering any problem, the others have difficulty in accessing to the sources. Infrastructure policies and programs should deal with inequities in the distribution of ICT sources (Kozma, 2008). The differences among the universities can be overcome by increasing the quantity and quality of the hardware, software and ICT labs at the universities. According to Kay (2006), it is critical to provide software, hardware and support. But other strategies are needed to use technology in a meaningful and effective manner. Therefore, it should be ensured that every pre-service teacher should have access to the ICT sources without any difficulty.

The findings of this study suggest that some changes for ICT courses including increasing the course hours, extending the courses throughout the program and integration of the content knowledge into the courses should be made. While more participants perceived Computer I and II courses insufficient, more participants perceived "Instructional technologies and material development" course (ITMD) sufficient. These results show parallelism with the study by Aslan and Zhu (2014). The authors found out that the ICT courses were moderately effective. In this context, the participants made some suggestions for the effective integration of the ICT courses in education. For Computer I and II courses, participants demanded that the courses should be given in more detail and more practice should be applied in the courses. With regard to ITMD, participants suggested that the course should be provided in a more detailed way; more practice should be ensured in the course, more emphasis should be allocated to instructional technologies rather than material development and smart board should be used in education. Akbulut, Odabaşı and Kuzu (2011) found out that teacher training programs were insufficient to facilitate the effective integration of ICT and use of ICTs for instructional purposes. In this regard, Bozdoğan and Özen (2014) report that pre-service teachers should observe best practices of technology use and make practices with technology to facilitate learning, and have hands-on experiences with technology in their pre-service teacher education. It is inferred from the explanations that pre-service teachers should be given more opportunities to use ICT in their courses to be a competent user in ICT integration in education.

Another finding of this study is related to the available personnel. Participants stated that academic members should be more competent to integrate ICT into their teaching practices. This issue is very important in the sense that their competency in ICT influences their designing, planning and teaching their courses. For instance, it is understood from the participants' responses in the context with ITMD course that less competent academic

members in ICT focus on more material development rather than instructional technologies. This is confirmed by Yücel et al. (2010). The authors point out that ICT training should be given by trainers who are competent in teaching technology and curriculum needs. Besides, participants demanded that technical support should be available when they need it.

The study indicates that the participants perceive ICT important in their teaching processes. In this regard, they have a positive attitude to the integration of ICT into education. So, it is significant for pre-service teachers to have positive attitude to ICT. The study also shows that prior experience concerning ICT use has a positive contribution on their integration of ICT in education.

It also appears that participants encounter barriers in integrating ICT due to lack of experience and lack of ICT skills. If the barriers stemming from lack of experience and ICT skills are minimized, they can use ICT in their teaching practices more often.

Our study shows that some participants are anxious for ICT usage because of difficulty in learning ICT, process of preparing lesson, taking time, communication problem among students, using constantly causes monotony, teachers' being of the second importance, giving more importance to ICT, and misusing ICT. A number of teachers suffer from computer anxiety and this will prevent those teachers from using educational technologies effectively (Pamuk & Peker, 2009). In this regard, it is crucial for the participants to overcome their anxiety for ICT use. It can be suggested that more practice and experience with a variety of ICT sources in using ICT in teaching will reduce their anxiety for ICT use in education.

It indicates that participants learn ICT skills and knowledge because of work oriented, liking, and obligation. More participants perceive that their roles will decrease thorough ICT. However, participants are neutral whether ICT will increase their responsibilities in teaching with ICT.

Majority of the participants perceive that just having ICT competence is not adequate for ICT integration and pedagogical knowledge. They stated that pedagogical knowledge in addition to having ICT competence is necessary for the integration of ICT into education. Whereas some participants perceive as ICT competence and pedagogical knowledge complementary, others perceive pedagogical knowledge as a prerequisite. It is understood that pedagogical knowledge is a crucial component for ICT integration. According to Koehler, Mishra and Yahya (2007), technology cannot be thought of being separate and unrelated from teaching tasks and contexts. They support the complex interplay between technology, content and pedagogy.

The study shows that the participants use ICT with a basic level. They mostly use it for presentation in their teaching practices. Teachers use ICT with a basic or entry level (Açıkalın, 2014; Aslan & Zhu, 2014; Tezci, 2009). Teachers should use advanced ICT skills in their teaching practices and this will enhance teaching and learning process significantly.

The samples of this study were from six state universities and 782 pre-service teachers studying in their fourth year from the subject domains of Turkish language, social sciences, elementary education mathematics and science. A longitudinal study can be conducted with the same participants to investigate ICT integration in teacher education and its association with their teaching practices further in the future studies to find out to what extent their perceptions concerning the issue change. ICT integration in teacher education can be evaluated from the point of instructors, administrators and other stakeholders in education in future studies. The number of the universities, population and the variety of subject domains can be increased in future studies to study this issue further.

In conclusion, there are differences among the universities in terms of ICT integration sources. While some universities have more ICT integration sources, the others have less ones. In this regard, more investment in ICT integration sources has to be made to enable pre-service teachers to have access to the sources. The ICT courses, Computer I and II and ITMD, are the main courses in which pre-service teachers acquire ICT competences. These courses should be rearranged to make them more competent in ICT. In these courses, not only how to use technology, but also how technology can be used for teaching and learning should be focused on (Tondeur et al., 2011). In this regard, the courses should be revised considering pedagogical knowledge and content knowledge. The participants should be given more opportunity to use ICT in their teaching practices. It can be suggested that the hours of ICT courses be increased and ICT training be extended throughout the program. This can reduce their anxiety for ICT use and increase their tendency to use it in their teaching practices.

REFERENCES

Açıkalın, F. S. (2014). Use of instructional technologies in science classroom: Teachers' perspectives. *The Turkish Online Journal of Educational Technology*, 13(2), 197-201.

Akbaba-Altun, S. (2006). Complexity of integrating computer technologies into education in Turkey. *Educational Technology & Society*, 9 (1), 176-187.

Akbulut, Y., Odabaşı, H. F., & Kuzu, A. (2011). Perceptions of preservice teachers regarding the integration of information and communication technologies in Turkish education faculties. *The Turkish Online Journal of Educational Technology*, 10(3), 175-184.

Alev, N. (2003). *Integrating Information and Communications Technology (ICT) Into Pre-service Science Teacher Education: The Challenges of Change in a Turkish Faculty of Education*. Unpublished PhD Thesis, University of Leicester, School of Education, UK.

Aslan, A., & Zhu, C. (2014). Investigating variables to predict Turkish pre-service teachers' ICT integration into teaching practices. *Submitted to British Journal of Educational Technology*.

Becker, H. J. (2000). Findings from the teaching, learning, and computing survey: Is Larry Cuban right? Retrieved October 10, 2014 from http://www.crito.uci.edu/tlc/findings/ccsso.pdf

Beckers, J. J. & Schmidt, G. H (2003). Computer experience and computer anxiety. *Computers in Human Behavior*, 19, 785-797.

Bozdoğan, D., & Özen, R. (2014). Use of ICT technologies and factors affecting pre-service ELT teachers' perceived ICT self-efficacy. *The Turkish Online Journal of Educational Technology*, 13(2), 186-196.

Celik, V., & Yesilyurt, E. (2013). Attitudes to technology, perceived computer self-efficacy and computer anxiety as predictors of computers supported education. *Computers & Education*, 60, 148-158.

Drent, M., & Meelissen, M. (2008). Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Computers & Education*, 51, 187-199.

Göktaş, Y. (2006). *The current status of information and communication technologies integration into schools of teacher education and K-12 in Turkey*. Unpublished PhD Thesis, Middle East Technical University, Graduate School of Natural and Applied Sciences, Turkey, Number of Thesis:199023.

Göktaş, Y., Yıldırım, Z., & Yıldırım, S. (2008). The keys for ICT integration in K-12 education: Teachers' perceptions and usage. *Hacettepe University, Journal of Education*, 34, 127-139.

Gulbahar, Y., & Guven, I. (2008). A survey on ICT usage and the perceptions of social studies teachers in Turkey. *Educational Technology & Society*, 11 (3), 37-51.

Gündüz, Ş., & Odabaşı, F. (2004). Bilgi çağında öğretmen adaylarının eğitiminde öğretim teknolojileri ve materyal geliştirm dersinin önemi. *The Turkish Online Journal of Educational Technology*, 3 (1), 43-48.

HEC (2006). Eğitim fakülte uygulanacak yeni programlar hakkında açıklama. Retrieved April 26, 2013, from http://www.yok.gov.tr/egitim/ogretmen/yeni_programlar_ve_icerik.htm

Kay, R. H. (2006). Evaluating strategies used to incorporate technology into preservice education: A review of the literature. *Journal of Research on Technology in Education*, 38 (4), 383-408.

Koehler, M. J., Mishra, P., & Yahya, K. (2007). Tracing the development of teacher knowledge in a design seminar: integrating content, pedagogy, technology. *Computers & Education*, 49(3), 740-762.

Kozma, R. B. (2008). Comparative analysis of policies for ICT in education. In International Handbook of Information Technology in Primary and Secondary Education (eds J. Voogt & G. Knezek), pp. 1083-1096. Springer, New York, NY.

ÖSYM (2012). ÖSYS Yükseköğretim programları ve kontenjanları kılavuzu. Retrieved February 12, 2013 from http://www.osym.gov.tr/belge/1-13589/2012-osys-yuksekogretim-programlari-ve-kontenjanlari-ki-.html

Pamuk, S., & Peker, D. (2009). Turkish pre-service science and mathematics teachers' computer related self-efficacies, attitudes, and the relationship between these variables. *Computers & Education*, 53, 454-461.

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & Education,* 37, 163-178.

Pinedia, F. O. (2011). Competencies for the 21st century: Integrating ICT to life, school and economical development. *Procedia Social and Behavioral Sciences*, 28, 54-57.

Teo, T. (2009). Modelling technology acceptance in education: a study of pre-service teachers. *Computers & Education*, 52, 302-312.

Tezci, E. (2009). Teachers' effect on ICT use in education: The Turkey sample. *Procedia – Social and Behavioral Sciences*, 1, 1285-1294.

Tondeur, J., Van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2011). Preparing pre-service teachers to integrate technology in education: a synthesis of qualitative evidence. *Computers & Education*, doi:10.1016/j.compedu.2011.10.009.

UNESCO.(2008). ICT competency standards for teachers, policy framework. Retrieved December, 2012, from, http://unesdoc.unesco.org/images/0015/001562/156210e.pdf

Voogt, J., Knezek, G., Cox, M., Knezek, D., & Ten Brummelhuis, A. (2011). Under which conditions does ICT have a positive effect on teaching and learning? A call to action. *Journal of Computer Assisted Learning*. doi: 10.11111/j.1365-2729.2011.00453.x

Voogt, J. & Roblin, N., P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of Curriculum Studies*, 1-23.

Yapıcı, İ.Ü. & Hevedanlı, M. (2012). International educational technology conference IETC2012. Pre-service biology teachers' attitudes towards ICT using in biology teaching. *Procedia Social and Behavioral Sciences*, 64, 633-638.

Yücel, C., Acun, İ., Tarman, B., & Mete, T. (2010). A model to explore Turkish teachers' ICT integration stages. *The Turkish Online Journal of Educational Technology*, 9(4), 1-9.

APPENDIX I

Open ended questions in the survey

1. How have you accessed to ICT sources at the university? Have you had any difficulty in accessing ICT sources at the university?
2. What do you think it can be done to promote the integration of ICT into teacher education better?
a) Physical factors:
b) Human factors:
c) Teacher training program:
d) Others:
3. Have you had any difficulty in integrating ICT into your courses? If yes, what kind of difficulties are they? What do you suggest to tackle these difficulties?
4. What do you think about the ICT courses in your teacher training program to integrate ICT into your lessons?
Computer I and II:
Instructional Technologies and Material Development:
5. Do you think that having ICT competences is sufficient to integrate ICT into education effectively? Do teachers need to have pedagogical knowledge besides ICT competences in this regard?
6. Do you have other suggestions concerning ICT integration into your lesson?
Thank you very much for your assistance.

APPENDIX II

The Interview Questions for Pre-service Teachers

Name: **E-mail address:**
Age
Gender   Male   ☐ Female   ☐
Your university
☐ Aksaray University   ☐ DokuzEylül University   ☐ Fırat University
☐ Gazi University   ☐ Marmara University   ☐ Niğde University
Department
☐ Mathematics for primary and middle school Turkish   Science educa☐n

☐ Social Sciences   Turkish   ☐
1- Are you interested in developing your skills and knowledge in ICT?
2- What do you think about the role of ICT in teaching learning process? Will ICT change the teaching and learning process?
3- Do you think that the integration of ICT into education will decrease the role and responsibility of teachers in classrooms?
4- As you know that there is a huge investment in ICT in Turkey. For instance, a new project called "FATIH" has been put into effect. Do you think that such huge investments are necessary for the integration of ICT into education?
5- What do you think about the advantages and disadvantages of ICT use in your subject matter?
6- What do you think about the integration of ICT into pre-service teacher education program?
7- Are the ICT courses in the teacher training program enough to prepare you to integrate ICT into your subject matter in your future teaching career?

Computer I and II:
Instructional Technologies and Material Development:
8- What could be done to improve the integration of ICT into pre-service teacher training program?
a) Physical factors:
b) Human factors:
c) Teacher training program:
d) Others:
9- What do you think about the integration of ICT into classes in lower secondary schools?
10- What could be done to improve the integration of ICT into classes into lower secondary schools?
a) Physical factors:
b) Human factors:
c) Teacher training program:
d) Others:
11- How do you evaluate the relationship between ICT competences and pedagogical knowledge in terms of the integration of ICT into education? Is pedagogical knowledge a prerequisite to integrate ICT into education?
12- On the whole, has ICT had an impact on your teaching?
13- Do you have anything else to add on the integration of ICT into education in terms of pre-service teacher training program or in lower secondary schools?
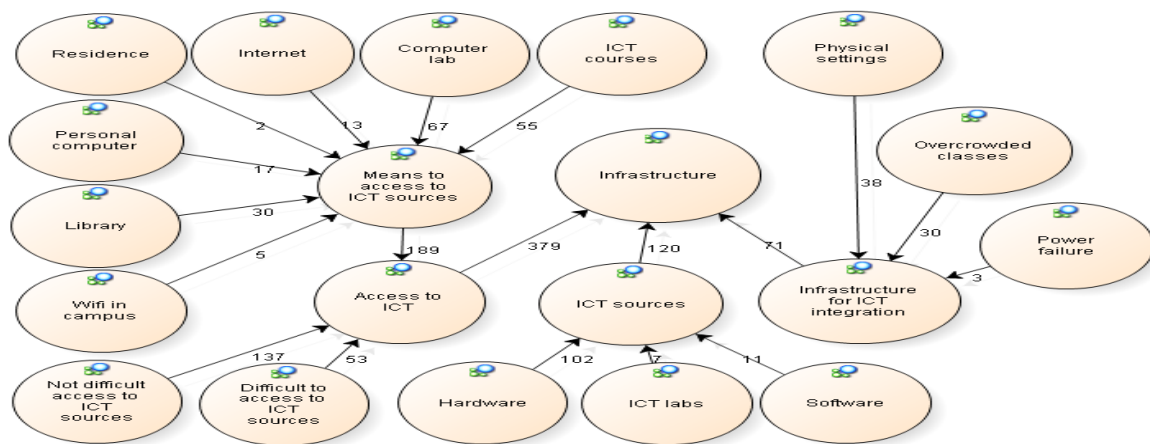The interview is over. Thank you very much for your assistance.

APPENDIX III

Figure 1. The theme and sub-themes for conditions for ICT integration in education with regard to infrastructure
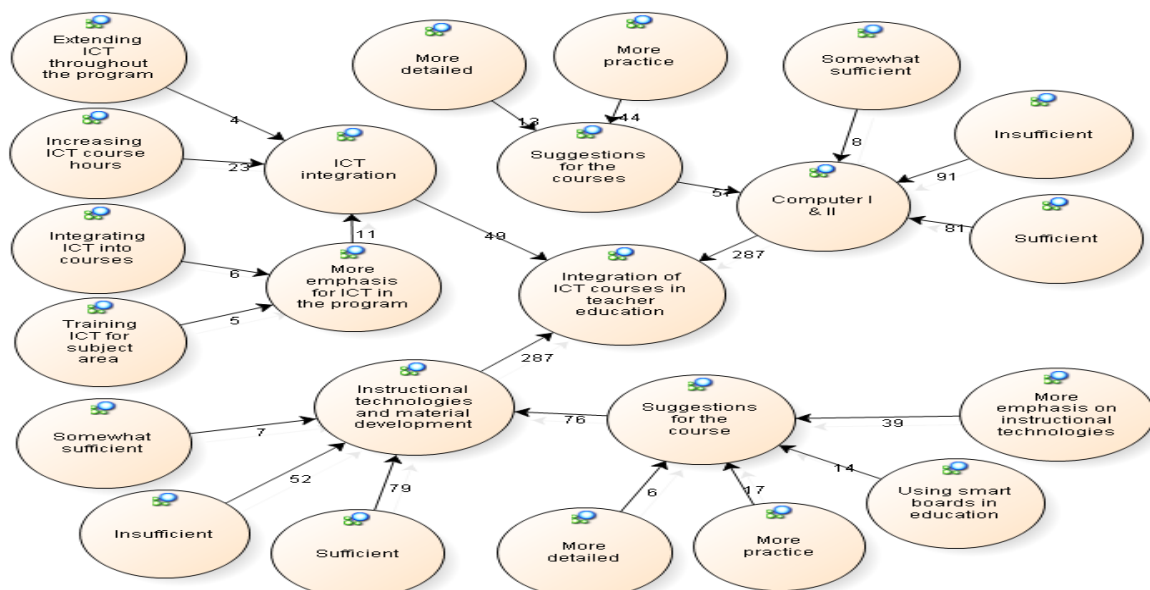
Figure 2. The theme and sub-themes for conditions for ICT integration in education with regard to integration of ICT courses in teacher education
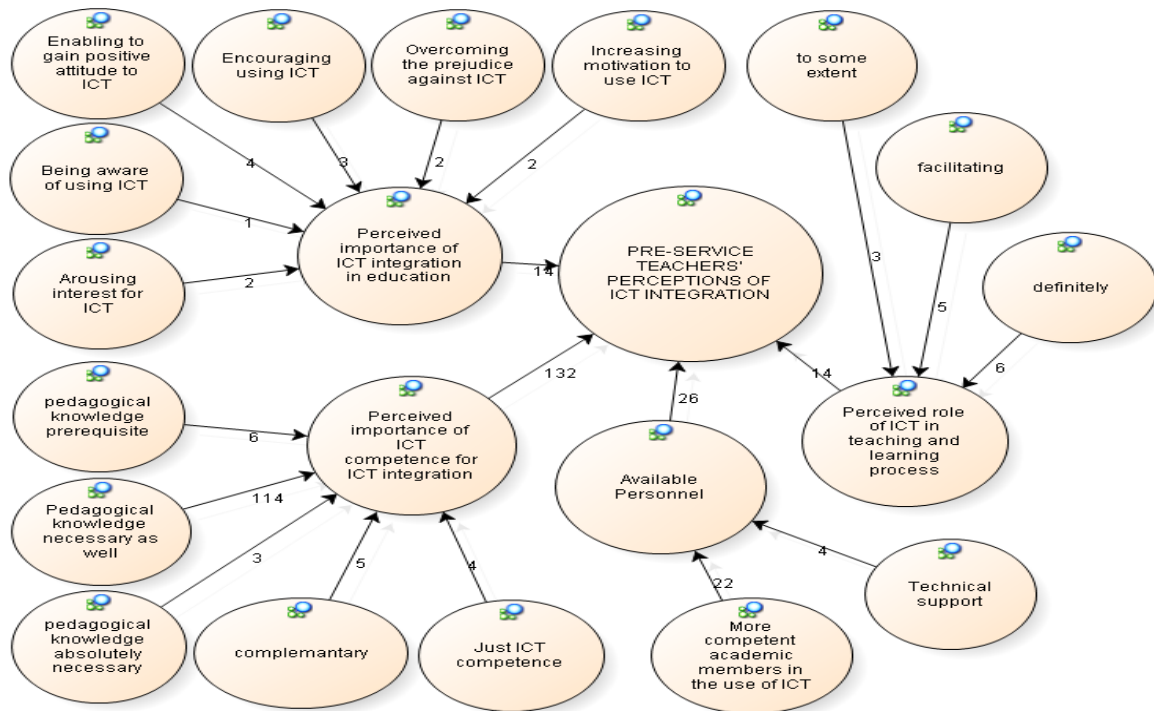

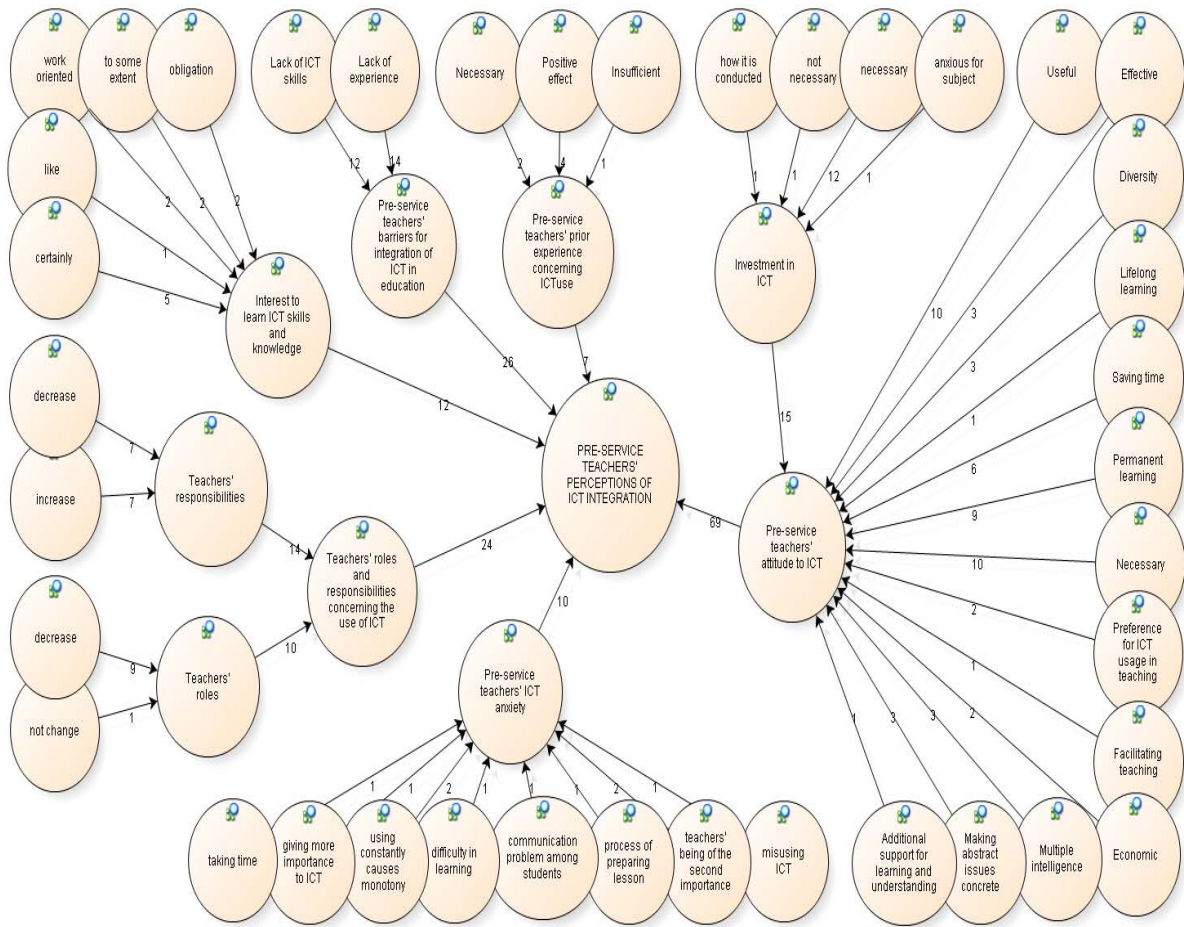Figure 3. The theme for pre-service teachers' perceptions of ICT integration and sub-themes

Figure 4. The theme for pre-service teachers' perceptions of ICT integration and sub-themes
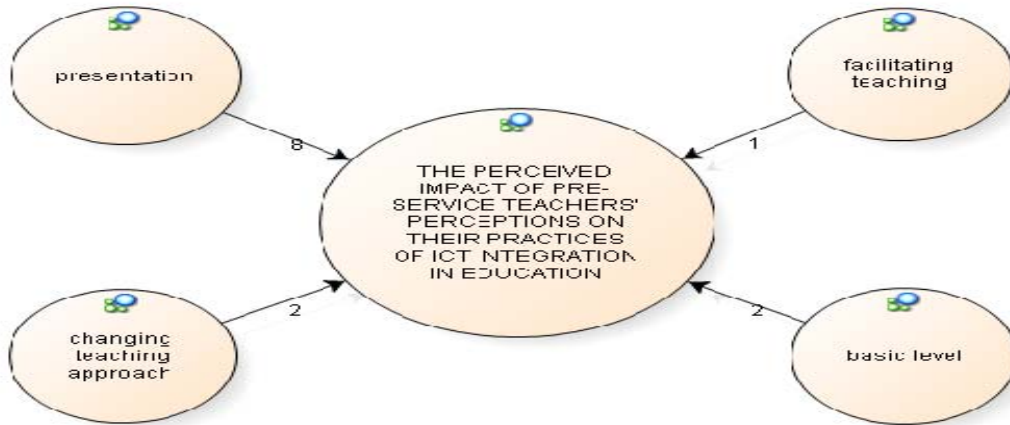

Figure 5. The theme for the perceived impact of pre-service teachers' perceptions concerning ICT integration in education on their practices and its sub-themes