Research Article

Starting Teachers' Integration of ICT into Their Teaching Practices in the Lower Secondary Schools in Turkey[*]

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Abstract

The objective of this study is to investigate the factors influencing the integration of ICT of starting teachers in lower secondary schools in the Turkish context. Both quantitative and qualitative research was implemented for this objective. The participants were selected according to a stratified two-stage sampling design. That is, they were supposed to have graduated from one of the six state universities which were determined according to the population size of the universities in relation to three highest and lowest numbers of studying pre-service teachers. They were teachers who teach Turkish, social sciences, elementary mathematics and science in the lower secondary schools to represent teachers teaching in both social sciences and science teaching branches. The study showed that perceived competence in ICT integration and pedagogical knowledge are significant predictors for starting teachers' integration of ICT into their teaching practices. Teachers should have opportunities to access to ICT resources to integrate ICT into their teachings effectively. Besides, changes are necessary in curriculum and assessment systems to enable teachers to facilitate teaching with ICT.

Keywords

Starting teachers • ICT integration • ICT competency • Lower secondary schools • Mixed research method

The world is changing rapidly. Modernization and globalization are mostly accepted to impose challenges to individuals and societies (Schleicher, 2012). Furthermore, Voogt and Roblin (2012) assert how we live, work and learn are constantly being transformed by the globalization and internalization of economy accompanying with the rapid development of ICT. To illustrate, individuals have to master changing technologies to interpret a large quantity of available information in order to make sense of and function well in this diverse and interconnected world (Organization for Economic Co-operation Development [OECD], 2005).

In the 21st century, effective citizens and workers are required to have functional and critical thinking skills such as information literacy, media literacy and ICT literacy (Partnershipfor 21st century learning, 2015). In this regard, teachers are expected to enable citizens, workers to acquire those functional and critical thinking skills. This indicates that teachers have to be competent in the use of information and communications technology (ICT). They need to be prepared to provide their students with technology-supported learning opportunities to support student learning (UNESCO, 2008). Furthermore, Zhu, Wang, Cai, and Engels (2013) have stated that innovative teaching is necessary for all teachers to meet the educational needs of the new generations. They have also found out that teachers' technological competency is positively related to their innovative teaching performance. Therefore, teachers have to be proficient in using ICT in their class activities to enhance teaching and learning process.

It is widely acknowledged that the use of technology will make a significant contribution to enhancing teaching and learning process. Based on this acknowledgement, it is seen that both developed and developing countries have made huge investments in the employment of ICT in education. When Turkey with its limited budget in respect to the huge investments in ICT policy including ICT infrastructure, human resources, particularly teachers, in the educational system is taken into account, the employment of ICT in the transformation of education needs to be implemented effectively and rationally. In this transformation, teachers undertake important responsibilities. In this respect, it is important for teachers to be competent in ICT to facilitate the teaching and learning process. Therefore, teachers' integration of ICT into teaching practices is a frequently studied topic in the literature.

Research results indicate that teachers integrate ICT into at a low level or a basic level (e.g.,Aslan & Zhu, 2015; Somekh, 2008; Tezci, 2009). Inan and Lowther (2010) have stressed out that it is not empirically sufficient to claim that access to technology has improved the quality of instruction to support student learning. Furthermore, most teachers do not use technology for the instructional delivery and do not integrate it into their curriculum, either (Afshari, Abu Bakar, Luan, Abu Samah, & Fooi, 2009). Therefore, the issue of teachers', particularly starting teachers, integration of ICT

into their teaching practices needs to be studied in a more inclusive way to gain a deeper understanding the factors influencing teachers' integration of ICT in their courses and reveal their perceptions for the strengths and weakness of the teacher training programs to prepare them to use ICT for educational purposes. This study aims to focus on the following research questions:

- What are the starting teachers' perceptions of the ICT-related variables, namely perceived ICT competence, perceived competence in ICT integration in education, attitudes towards ICT, computer anxiety and external barriers to the use of ICT, perceptions concerning ICT-related courses, pedagogical knowledge, and prior experience concerning ICT training? (RQ1)

- To what degree do the starting teachers use ICT in their teaching practices? (RQ2)

- To what degree do the ICT-related variables predict the starting teachers' "integration of ICT into teaching practices"? (RQ3)

- What do the starting teachers perceive the infrastructure for ICT integration into education and the ICT-related courses in teacher training program? (RQ4)

- What do the starting teachers perceive the integration of ICT into education? (RQ5)

- To what degree do the starting teachers' perceptions of the use of ICT in education affect their teaching practices with ICT? (RQ6)

Theoretical Background

Integration of ICT into education plays an important role in facilitating and enhancing student learning. As Aslan and Zhu (2015) have pointed out that teachers' integration of ICT into their teaching practices is a complex and challenging issue. So, it is necessary to investigate the variables which enable or disable teachers to utilize ICT for instructional purposes. The research model of ICT integration (Figure 1) was formed based on teacher variables, training related variables and institutional variables in relation to teachers' integration of ICT into education as a result of the extensive literature review. The descriptions of the variables are presented in Table 1. In the context with the teacher variables, teachers' gender, perceived ICT competence, perceived competence in ICT integration, attitudes towards technology, computer anxiety and prior experience concerning ICT were selected. Unified Theory of Acceptance and Use of Technology (UTAUT), Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM) and Social Cognitive Theory (SCT)were taken into account to form the theoretical basis of these variables. Direct determinant variables including performance expectancy, effort expectancy, social influence and facilitating conditions and moderator variables containing gender, age, experience and voluntariness are regarded to have a significant

role on user acceptance and usage behavior in UTAUT (Venkatesh, Morris, Davis, & Davis, 2003).The moderator variables were considered to include gender and experience variables in the teacher variables in the current study. On the other hand, attitudes toward behavior, subjective norm and perceived behavior are seen to be independent determinants of intention for behavior (Ajzen, 1991).Besides, people are inclined to perform behaviors toward which they have positive attitudes according to TAM (Davis, Bagozzi, & Warshaw, 1989). Attitudes toward behavior is seen to be an important component in TPB, TAM and SCT. Therefore, attitudes toward technology variable was decided to be added in the teacher variables. Besides, self-efficacy, affect and anxiety are considered as core constructs for computer utilization in SCT (Venkatesh et al., 2003). With regard to these core constructs in SCT, perceived ICT competence, and perceived competence in ICT integration and computer anxiety variables were included in the teacher variables. In the context with the training related variables, the teachers' subject areas, the universities where they study in their teacher training program and graduate from, ICT-related courses and pedagogical courses in relation to ICT integration in teacher training program were studied. The theory of school improvement and the TPACK framework were taken into account to conceptualize the training related variables. The contemporary school improvement is seen to deal with curriculum and instruction issues. Curriculum is regarded as a principal agent of educational reform (Hopkins, 2005). Therefore, the universities with respect to the teachers' acquisition of ICT competences were investigated at institutional level. The dynamic, transactional relationship among content, pedagogy and technology components in the TPACK framework (Koehler & Mishra, 2005) was considered to include ICT-related courses, pedagogical courses in teacher training program and subject domains in the training related variables. As far as the institutional variables are concerned, the external barriers to ICT use teachers confront in teacher training program and at the school settings were studied. These variables are constituted based on Ertmer's (1999) classification of the barriers for technology integration.

The conceptual model of the current study is based on the relevant research in the Turkish context regarding teachers' integration of ICT into teaching practices (Aslan & Zhu, 2017).To further validate the research findings, the present study focuses on the starting teachers who have been teaching for not more than three years. As they are new graduates, they can evaluate the effectiveness of the teacher training programs to acquire and apply ICT competence in their teaching practices. Besides, new teachers are more inclined to integrate technology compared to more experienced peers given their knowledge or training on technology integration (Inan & Lowther, 2010). In this study, starting teachers are hypothesized to be more competent to integrate ICT into their classroom uses in comparison to their more experienced counterparts. Therefore, it is crucial to investigate to what extent they are using ICT in their instructions to understand and identify the factors affecting teachers to use ICT in their teaching practices.

Aslan and Zhu (2017) found out that the subject teaching programs (e.g., Turkish language, social sciences, elementary mathematics and science teaching) significantly affect pre-service teachers' use of ICT in their teaching practices. The current study investigates whether this finding is valid for those graduates of the abovementioned programs as well. That is, the teachers from the subject domains of Turkish, social sciences, elementary mathematics and science to represent both social science and science teachers to investigate whether the subject domains have significant effects on teachers' teaching practices. As those teachers can work in lower secondary schools which are the four year compulsory education following the four year compulsory education in primary education (Ministry of National Education of Turkey [MONE], 2015), teachers' integration of ICT into lower secondary school was investigated in the present study.

Figure 1. The research model of the current study.

Method

In this study, both quantitative and qualitative research was used to investigate the participants' integration of ICT into their teaching practices as the research questions aimed at investigating the different dimensions of ICT integration into education. In this respect, the quantitative and qualitative research were conducted respectively to comprehensively understand the issue in multiple dimensions.

Table 1
Description of the Variables in the Conceptual Model

Variables	Description
Gender	Teachers' genders
Subject	Teachers' subject areas (e.g., Turkish Teaching, Science Teaching etc.)
University	Universities teachers graduated from
Perceived ICT competence	Basic ICT skills (e.g., using search engines to look for information on the Internet, using presentation programs, using the Internet to communicate, using a word processing programs, etc.)
Perceived competence in ICT	Integration of ICT skills (e.g., using simulated tasks to discover, experience and experiment, selecting and evaluating educational software, creating lesson plans through ICT, having the knowledge and skills necessary for ICT integration, etc.)
Attitudes towards technology	Teachers' attitude towards the general use of ICT
Computer anxiety	Teachers' perceived anxiety stemming from the specific use of ICT in teaching practices
External barriers to ICT use	Barriers being extrinsic to teachers (e.g., lack of access to computers and software, insufficient time to plan instructions etc.)
ICT-related courses	ICT-related courses in teacher education programs.
Pedagogical knowledge	Pedagogical courses involved in pre-service training, with regard to ICT integration
Prior experience concerning ICT	ICT courses provided at secondary education level
Integration of ICT into teaching practices	Teachers' self-rating of frequency with regard to their integration of ICT in their teaching practices

The Data Collection Instruments

In this study, the survey instruments developed and validated by Aslan and Zhu (2017) were used. The aim of these instruments is to investigate the variables predicting Turkish pre-service teachers' integration of ICT into teaching practices. The instruments consist of two parts, namely "teachers' ICT competence" (TIC) and the "integration survey" (IS). At the end of the survey, open ended questions are also included to get a deeper and further understanding what pre-service teachers perceive the use of ICT in their teaching practices.

The first part (TIC) consists of 49 items and four components: "perceived ICT competence", "perceived competence in ICT integration in education", "attitudes towards ICT" and "anxiety concerning ICT usage in teaching practices." The second part (IS) involves 40 items and five components: "barriers related to the teacher-training programs, human and physical conditions", "perceptions concerning ICT-related courses in the teacher-training programs", "pedagogical knowledge in the teacher-training program, in terms of integration of ICT into education", "prior experience concerning ICT training" and "integration of ICT into teaching practices." Five-point Likert-point scaling has been used in both TIC and IS. The following Likert measurements have been used for the different scales: for instance, (1) None, (2) Low, (3) Confident, (4) High and (5) Very High are used in the scales for "perceived ICT competence" and "perceived competence in ICT integration in

education", in TIC. The Likert-point scaling used in the other scales in TIC and IS, except in the scale for "integration of ICT into teaching practices" as follows: (1) Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree, and (5) Strongly Agree. (1) The Least, to (5) The Most Likert point scaling is used for the last scale to determine how often teachers use ICT in their teaching practices.

The fit index values for the TIC competence scale were as follows: $X^2 = 425$; AGFI = .90; NFI = .95; CFI = .96; RMSEA = .039; $X^2/sd = 1.71$; and SRMR = .041. The internal consistency reliability for TIC varied from .85 to .91, while for IS it ranged from .86 to .97.

As opposed to the quantitative research, it was addressed in the open ended questions in the qualitative study what the participants perceived the infrastructure of ICT integration into education, the ICT-related courses in the teacher training programs and the use of ICT in education.

Upon receiving informed consent from the Ministry of National Education (MoNE) and the participants, phone interviews were implemented with them independently. It took about 15-20 minutes to conduct each interview with them on phone. Sometimes additional questions were posed to make clear what they experienced in their teachings with ICT. All the interviews were audio recorded following their consent.

The interview questions were based on the study of Aslan and Zhu (2015). The questions tried to elicit the participants' perceptions how the integration of ICT into the teacher training programs and lower secondary schools could be improved and how ICT transformed their teachings in the school setting.

Participants

The participants were chosen based on a stratified two-stage sampling design. At the first stage, they should graduate from one of the six state universities which were determined according to the population size of the universities in relation to three highest and lowest numbers of studying pre-service teachers to identify whether the population sizes have considerable effects on teachers' practices. The Student Selection and Placement Centre's 2012 quota was used to determine the sampling universities in this study (ÖSYM, 2012). At the second stage, the teachers from the subject domains of Turkish, social sciences, elementary mathematics and science were chosen.TIC and IS were applied to 105 starting teachers who were at most three year experienced in teaching Turkish, Social Sciences, Science and Elementary Mathematics during the 2014 Spring and Autumn Semesters in Turkey. The demographic information of the participants is displayed in Table 2.

Table 2
Demographic Characteristics of the Participants (n=105)

		N	%
Age	18–23	21	20
	24–30	68	64.8
	31–40	16	15.2
Gender	Female	43	41
	Male	62	59
University	University A	2	1.9
	University B	11	10.5
	University C	42	40
	University D	29	9.5
	University E	11	10.5
	University F	10	13
Subject Area	Elementary Mathematics Teaching	113	18.9
	Science Teaching	214	35.7
	Social Sciences Teaching	121	20.2
	Turkish Teaching	151	25.2
Working Period	1 year	31	29.5
	2 year	27	25.7
	3 year	47	44.8

In the qualitative study, 62 starting teachers answered the open ended questions in the quantitative research of this study. As these teachers have worked in geographically different parts of Turkey, phone interviews were implemented to reach them. Fourteen starting teachers (eight female and six male teachers) participated into the phone interviews in the 2015 Spring Semester. The total number of the participants involved in the qualitative part of the study was 76. The names of the universities from which the participants graduated, were anonymized by assigning A, B, C, D, E and F letters to the universities.

Coding and Data Analysis

The mean scores of the scales were tested against the baseline value 3. Multiple regression analysis rather than structural equation modeling (SEM) data analysis was conducted to test the relationship between the predicting variables and integration of ICT into teaching practices on account of the relatively limited number of the sampling (N=105). In other words, the fit index values for SEM were seen not to be at the desirable level. So, multiple regression analysis was decided to be used in the current study. Before conducting multiple regression analysis, the variance inflation factor (VIF) and tolerance values were calculated to determine whether there is multicollinearity among predicting variables. According to Cohen, Cohen, West, and Alken (2003, pp. 423–424), any VIF of 10 or more and tolerance values of .10 or less (equivalent to a VIF of 10) show evidence of serious problems of multicollinearity concerning independent variables. While the VIF values were seen to vary from 1.00 to 2.18, the tolerance values ranged from 0.45 to 0.99. There results indicate that multiple regression analysis can be conducted.

The participants' responses to the open ended questions in the survey and interview data were analyzed with qualitative data analysis. The responses and all interview data were transcribed and a number was assigned to each case for the open ended questions in the survey (S) and interview (I) in the qualitative data. Thematic coding was implemented for the analysis of the data involving the unit of analysis which took into account units of meaning. The themes were formed through open coding and the sub-themes were connected to the related themes through axial coding. As a result of open coding, three main themes were formulated. They are "conditions for ICT integration in education", "starting teachers' perceptions of ICT integration", and "the perceived impact of ICT on starting teachers' teaching practices".

The coding of the data and the construction of the themes and sub-themes were conducted by the first author and two other independent researchers. Their results were compared afterwards. Cohen's Kappa coefficients had been calculated to determine whether the coding procedure was reliable. The coefficients for the themes and sub-themes were seen to vary from 0.62 to 1.00. Based on these results, it was decided that the coding procedure was reliable. Furthermore, the researchers discussed those sub-themes that had a lower reliability to reach a consensus.

Results

Descriptive Results of Key Variables on ICT Integration of Starting Teachers (RQ1)

The mean scores and standard deviation for TIC are summarized in Table 3. Based on the data in Table 3, it appears that the starting teachers' perceived ICT competence level is relatively high (M = 3.82; SD = .74, $p < .001$). They are almost all confident, but not necessarily competent, about integrating ICT into their lessons (M = 2.85; SD = .74, $p < .001$). Their attitudes towards ICT are positive (M = 3.82; SD = .64, $p < .001$). It can be inferred that they are anxious for ICT usages in their teaching practices to some extent (M = 2.54; SD = .89, $p < .001$).

The mean scores and standard deviation for IS are summarized in Table 3. The starting teachers reported that they encountered external barriers to ICT integration (M = 3.59; SD = .67, $p < .001$), and that their perceptions with regard to the effectiveness of the ICT-related courses were moderately effective (M = 3.53; SD = .90, $p < .001$). In this regard, they also perceived the effectiveness of pedagogical courses (M = 3.33; SD = .98, $p < .001$) and prior experience concerning ICT training at secondary education level to be moderately (M = 3.37; SD = 1.44, $p < .001$) effective at developing their ICT competence.

Table 3
Descriptive Statistics and Reliability Coefficient for Tic and is for Starting Teachers (n=105)

Subscale	Number of items	Mean	SD	α
Perceived ICT competences	8	3.82	.74	.88
Perceived competence in integrating ICT into lessons	13	2.85	.74	.89
Attitudes towards ICT	21	3.82	.64	.94
Anxiety concerning ICT usages in teaching practices	7	2.54	.89	.81
Barriers related to the teacher-training programs, human and physical conditions	10	3.59	.67	.85
Prior experience concerning ICT training	3	3.37	1.44	.97
Perceptions concerning ICT-related courses	3	3.53	.90	.87
Pedagogical knowledge	12	3.33	.98	.94
Integration of ICT into teaching practice	12	3.10	.72	.87

Integration of ICT into the Teaching Practices of Starting Teachers (RQ2)

The results show that the starting teachers use ICT in their teaching practices to a moderate extent (M = 3.10; SD = .72, $p < .001$). The results indicate that the starting teachers heavily use search engines to look for information on the Internet (M = 4.26; SD = 1.02, $p < .001$), creating instructional materials (M = 3.72; SD = .94, $p < .001$), evaluating information on the Internet in terms of social, legal and ethical issues (M=3.67; SD = .97, $p < .001$), and creating lesson plans using ICT (M = 3.27; SD = .96, $p < .001$), respectively. They do not frequently use an overhead projector (OHP) to present subject matter (M = 2.20; SD = 1.22, $p < .001$), simulated tasks for experiment (M = 2.50; SD = 1.15, $p < .001$), simulated tasks for discovery (M = 2.53; SD = 1.20, $p < .001$) and simulated tasks for experience (M = 2.57; SD = 1.14, $p < .001$), respectively. It is seen that they do not use simulation and animation programs in their teaching practices extensively.

Table 4
Starting Teachers' Use of ICT in Teaching Practices

Competences	Least %	Less %	Moderate %	More %	Most %	Mean	SD
Using search engines (e.g., Google, Yahoo, etc.) to look for information on the Internet	3.8	2.9	10.5	28.6	54.3	4.26	1.02
Evaluating information on the Internet in terms of social, legal and ethical issues	3.8	5.7	28.6	42.9	19	3.67	.97
Creating instructional materials (e.g., handouts, tests, etc.) using ICT	1.9	6.7	30.5	39	21.9	3.72	.94
Creating lesson plans using ICT	1.9	19	40	27.6	11.4	3.27	.96
Using an OHP to present subject matter	39	23.8	20	12.4	4.8	2.20	1.22
Using data-show projectors to present subject matter	9.5	22.9	31.4	20	16.2	3.10	1.20
Using presentation programs (e.g., PowerPoint, etc.) to present subjects	11.4	13.3	34.3	25.7	15.2	3.20	1.19
Preparing visual effects to enhance learning concepts through ICT	7.6	14.3	36.2	29.5	12.4	3.24	1.09
Preparing sound effects to enhance learning concepts through ICT	15.2	17.1	37.1	23.8	6.7	2.89	1.13
Using simulated tasks for experiment	24.8	23.8	32.4	14.3	4.8	2.50	1.15
Using simulated tasks for discovery	25.7	22.9	29.5	16.2	5.7	2.53	1.20
Using simulated tasks for experience	21.9	24.8	32.4	16.2	4.8	2.57	1.14

The Relationship between the Predicting Variables and Integration of ICT into Teaching Practices (RQ3)

Hierarchical multiple regression was implemented to test to what degree the ICT-related variables predict the starting teachers' integration of ICT into their class activities. The independent variables were examined in terms of Model A, B and C. In Model A, the categorical variables such as gender, subject and university variables were tested to examine whether these variables have a significant impact on their integration of ICT into education. In Model B, the teacher variables, training related variables and institutional variables were added to test to what extent they predict the dependent variable. The variables in Model A and Model B were collected in Model C to test to what extent they predict the integration of ICT into teaching practices. The results are displayed in Table 5. The variables in Model A do not significantly predict the dependent variable ($R^2 = .01$) and gender is negatively associated with the integration of ICT ($\beta = -.08$, $t = -.89$; $p = .37$). Unlike Model A, the variables in Model B appear to account for 51% of the integration of ICT into education. Besides, "perceived competence in ICT integration" ($\beta = .42$, $t = 4.75$, $p < .001$)and pedagogical knowledge ($\beta = .29$, $t = 3.10$, $p < .001$) variables significantly predict the integration of ICT into teaching practices. The results indicated that the variables in Model C explain 52% of the dependent variable. It was also confirmed that gender, subject and university variables do not have a major impact on teachers' integration of ICT integration into their lessons. It was seen that just perceived competence in ICT integration ($\beta = .43$, $t = 4.81$, $p < .001$) and pedagogical knowledge ($\beta = .29$, $t = 3.06$, $p < .001$) have a predictive value for the dependent variable.

Table 5
The ANOVA Results and Standardized Regression Coefficients (B) and Significances of the Independent Variables With Regard To "Integration of ICT into Teaching Practices"

	Model A			Model B			Model C		
		FSig.			F	Sig.		F	Sig.
ANOVA results		.46.70			12.66	.001*		9.34	.001*
	B	T	P	B	T	P	B	T	P
Gender	-.08	-.89	.37	-	-	-	-.58	-.77	.43
Subject	.06	.59	.55	-	-	-	.033	.42	.67
University	.05	.51	.61	-	-	-	.086	1.17	.24
Perceived ICT competence	-	-	-	.16	1.56	.12	.16	1.58	.11
Perceived competence in ICT integration	-	-	-	.42	4.75	.001*	.436	4.81	.001*
Attitudes towards technology	-	-	-	.10	1.03	.30	.08	.75	.45
Computer anxiety	-	-	-	-.05	-.69	.48	-.06	-.76	.44
External barriers to ICT use	-	-	-	.087	1.07	.28	.07	.93	.35
ICT-related courses	-	-	-	-.10	-1.09	.27	-.09	-.96	.33
Pedagogical knowledge	-	-	-	.29	3.10	.001*	.29	3.06	.001*
Prior experience concerning ICT	-	-	-	.04	.61	.53	.04	.49	.62
R^2 "integration of ICT into teaching practices"		.01			.51			.52	

*$p < .05$.

Starting Teachers' Perceived Conditions for ICT Integration in Education (RQ4)

Infrastructure. According to the results of axial coding, "Infrastructure" was constructed as a main theme with regard to the "conditions for ICT integration in education". The theme consisted of the four sub-components "infrastructure for ICT integration", "ICT resources", "access to ICT" and "investment in ICT" (Figure 2).
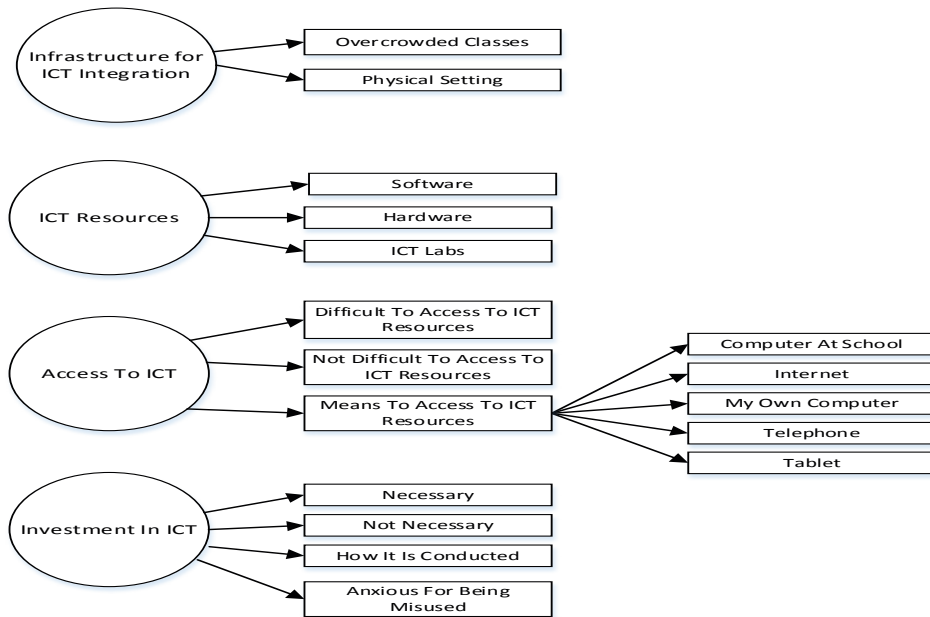

Figure 2. The themes and sub-themes for infrastructure based on qualitative data analysis.

The sub-components "overcrowded classes" and "physical settings" were connected to the sub-theme "infrastructure for ICT integration". About 3 % of the teachers indicated that their classes were overcrowded. On the other hand, nearly 20% of the teachers in the survey stressed out that the physical setting ought to be reconstructed to make use of ICT effectively in terms of audio visual aspects, lighting etc. To illustrate, a female Turkish teacher from University F (S101) suggested that "*Classrooms ought to be conveniently reorganized for ICT use. Classrooms ought to be spacious, lighting systems ought to be sufficient.*"

The sub-theme "ICT resources" incorporates the sub-components "software", "hardware" and "ICT labs". While 5% of the teachers indicated that they need appropriate software programs in their courses, 50% of them pointed out that they need more hardware resources such as computers, projectors and so forth to integrate ICT into their class activities more effectively.

The sub-theme "access to ICT resources" deals with whether the teachers confront any barriers to access to ICT resources at their schools. It was understood from their responses that a high number of the participants (almost 50%) encountered barriers

to access to ICT resources at the schools as opposed to the other teachers (24%) who reached the sources without facing any barriers.

The sub-theme "investment in ICT" includes the sub-components "investment necessary", "investment not necessary", "how it is conducted" and "anxious for not being used properly". Majority of the interviewees stated that investments should be made for the integration of ICT into education. 28% of the interviewees stressed out that the investments should be conducted rationally not just for the sake of the investments. To exemplify, a female science teacher from University A (I4) pointed out that "*Definitely, investment needs to be made in ICT. However, before initiating such ICT related projects, infrastructure for ICT should be set up well. For instance, there are teachers who lack of the competence to use smartboard. Although there are smartboards in the classrooms, they cannot be used effectively because of physical settings such as overcrowded classes etc….*" 14% of the interviewees stated that they are anxious that ICT related resources will not be used properly. For instance, a female science teacher from University B(I2) claimed that "*The fact that tablets are distributed to students may not encourage them to lessons. Students will not use them for educational purposes…*"

Integration of ICT-related Courses in Teacher Training Program

Another main theme titled "integration of ICT-related courses in teacher training program" was constructed in the context with the "conditions for ICT integration in education". The theme involves the three sub-components "ICT integration", "Computer I and II" and "Instructional technologies and material development" (see Figure3).
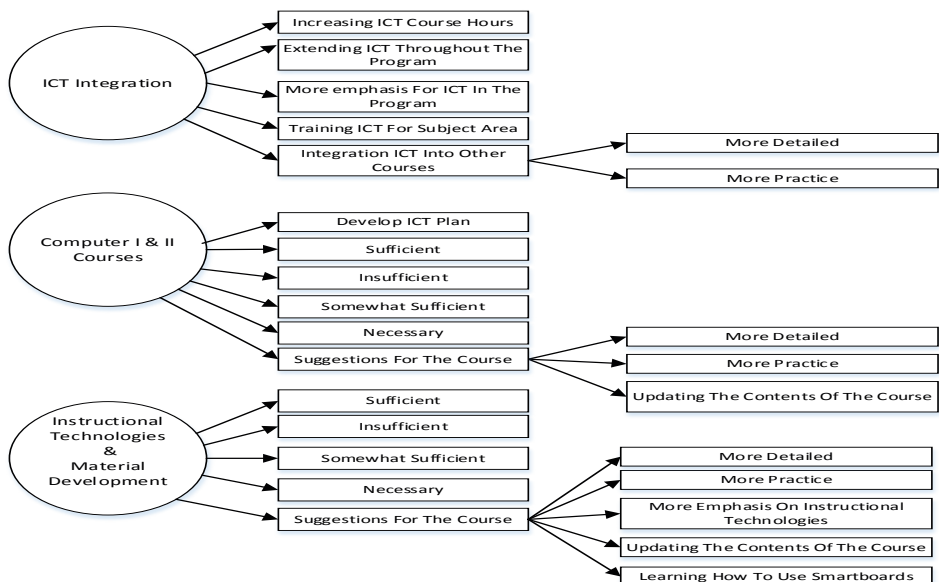

Figure 3. The themes and sub-themes for ICT-related courses based on qualitative data analysis.

According to the 59 teachers' valid responses included in the open ended questions and interview concerning the sub-component "ICT integration", 20% of the teachers suggested that the number of the hours for ICT-related courses be increased. Nearly 15% of the teachers reported that ICT-related courses ought to be taught during the whole of the training program extensively. In this regard, a female social science teacher from University C(S11) demanded *"ICT-related courses be taught in such a way that pre-service teachers can practice what they have learnt throughout the training program."*Almost 24% of the participants emphasized that more importance should be given in teacher training program. To illustrate, a male Turkish teacher from University B (S51) indicated *"...the number of ICT-related courses or issues concerning ICT in the program should be increased..."* Almost 36% of the interviewees mentioned that ICT training should be given taking into account pre-service teachers' subject areas. For instance, a female science teacher from University B (I2) emphasized that *"...as my subject area is science education, more training on ICT should have been given..."*Nearly 30% of the teachers stressed out that ICT should also be incorporated into the curriculum of the other courses in the program. To exemplify, a male mathematics teacher from University D (S100) pointed out that *"ICT-related courses should be embedded into other courses."* In this context, it is stated that more practice and more detailed information should be provided while embedding ICT into other courses. A female social science teacher from University C (I12) indicated that *"Technology plan including long term technology visions should be developed in teacher training program."*

The sub-themes "Computer I and II" and "Instructional technologies and material development" courses mainly dealt with exploring the teachers' perceptions for the courses to enable them to acquire ICT competency. Depending on the 44 teachers' valid responses in the qualitative data, almost 16% of the teachers perceived the "Computer I and II" sufficient whereas 77%of the teachers found them insufficient. To illustrate, a female science teacher from University D (S73) indicated that ""Computer I and II" courses *could be satisfactory for basic computer knowledge. However, they did not have any contribution to integrating ICT into education."* Likewise, a female Turkish teacher from University D (S102) pointed out that *"These courses did not sufficiently enable me to use ICT in my courses."* 59% of the teachers put forward some suggestions in relation to "Computer I and II" to make pre-service and in-service teachers more proficient in using ICT for educational purposes. They suggested: the courses should be given in more detail (7%); these courses should be based on more practice (41%); the contents of the courses should be updated (11%). A female science teacher from University D (S55) said that *"...In my opinion in these courses, we are trained with the outdated programs. The contents of the courses should be updated with the developing technologies."*In the context with "Instructional technologies and material development" course, almost

30% of the teachers found the course sufficient, while 59% of the teachers perceived it insufficient. For instance, a female social science teacher from University F (S70) emphasized that "*This was the first course which taught me how to use a projector, power point and overhead projector while teaching…*" On the other hand, a female science teacher from University E (S39) suggested that "*The content of the course should have been more intensive.*" About 80% of the teachers suggested a few solutions to make the course more effective. The suggestions as follows: the course should be more detailed (7%); more practice should put into effect in the course (41%); more instructional technologies should be used to develop materials (23%); using smart board in education should be taught (23%).

Starting Teachers' Perceived Factors Influencing ICT Integration (RQ5)

The theme "starting teachers' perceived factors influencing ICT integration" explored the factors influencing the integration of ICT into education with regard to staff issue and teacher related variables. The theme includes several sub-themes (see Figure 4).

The qualitative data confirm the study's research model of ICT integration indicating that starting teachers' attitude towards ICT is high; their anxiety for ICT is low; their prior experience concerning ICT use is positive; they perceive that pedagogical knowledge is crucial for teachers to use ICT in their teaching practices effectively; they significantly encounter external barriers for integration of ICT into education.

The qualitative data gives additional information with regards to ICT integration into education. Out of 27 teachers' valid responses in the qualitative data, about 26% of the teachers pointed out that academic members have to be competent users of technology in their courses. 56% of the teachers emphasized that teachers, particularly more experienced ones, need to attend to in-service training programs to increase and update their knowledge concerning their ICT skills. Furthermore, 11% of the teachers stressed that teachers have to be competent in using ICT in education. On the other hand, they face barriers for integration of ICT because of exams and intensive teaching programs in addition to lack of experience and skills in the usage of ICT, lack of ICT resources and overcrowded classes. Out of 47 teachers' valid responses to open ended questions and interviews data, 4% of the teachers stressed out that they do not have time to allocate using technology in their classes due to intensive teaching programs. For instance, a female Turkish teacher from University D (S102) said that "*I cannot find time due to heavy curriculum.*" 28% of the interviewees emphasized that the entrance exam for the upper secondary school prevent them from utilizing technology in their classes effectively. To illustrate, a female science teacher from University A (I4) cited that "*…there is an exam students need to prepare for. The exam could limit teachers' use of ICT in their classes.*" Another male science teacher from University D (I3) indicated that "*We focus on solving questions because of competitions among schools rather than teaching subjects in detail…*"
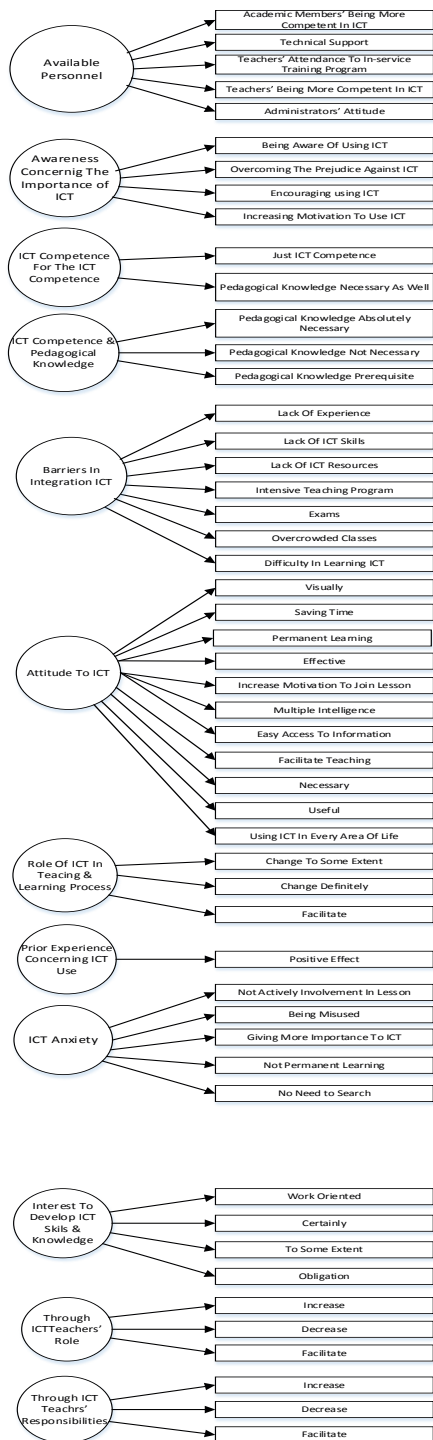
*Figure 4.*The themes and sub-themes for starting teachers' factors influencing ICT integration based on qualitative data analysis.

The Perceived Impact of ICT on Starting Teachers' Teaching Practices (RQ6)

The theme "the perceived impact of ICT on starting teachers' teaching practices" involved the sub-components "presentation", "basic level" and "facilitating teaching" (See Figure 5). Out of the 14 interviewed teachers, seven teachers reported that they utilize technology for demonstrative purposes in their classes. Besides, seven teachers indicated that they integrate technology into their classes with a basic level. For instance, a female Turkish teacher from University D (I8) stated that *"Prior to lesson, I search on the Internet, find lesson documents, print out, copy and bring them to my class."* 4 teachers indicated that they facilitate their teaching practices through ICT. To illustrate, a male Turkish teacher from University B (I7) expressed that *"I created an account for my students on the Internet. There they ask questions with regard to lessons, share videos they like. Recently, my students have learnt to use camera during one of our experiments in the science laboratory. We watched together what we did in the experiment through the projector in our class."*
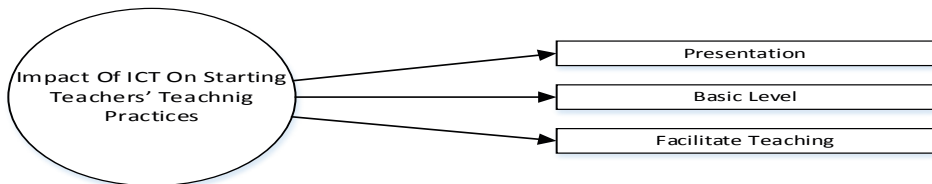

Figure 5. The themes and sub-themes for the perceived impact of ICT on starting teachers' teaching practices based on qualitative data analysis.

Discussion

Both quantitative and qualitative research was used in this research to address six research questions. While the quantitative part focused on investigating the variables predicting the integration of starting teachers in lower secondary schools in Turkey, the qualitative part dwelled on identifying their perceptions in relation to the use of ICT in education. The findings are discussed in the following six aspects.

Key Variables of Starting Teachers for ICT Integration

The study indicated that starting teachers are competent to use basic skills (e.g., presentation skills, word processors, etc.). Yet, they are not necessarily competent to use integrated ICT skills (e.g., using simulated tasks to discover, experiment and experience, etc.). These findings are supported by Aslan and Zhu (2017). The authors indicated that Turkish pre-service teachers are competent to use basic ICT skills as opposed to integrated ICT skills. The qualitative part of this study emphasizes that teachers mostly dealt with the basic ICT skills rather than integrated ICT skills in their teacher training programs. This is also supported by Schaffer and Richardson

(2004) indicated that teaching about technology rather than teaching with technology is emphasized in teacher preparation in most colleges.

The study showed that starting teachers' attitudes towards technology are positive. Their anxiety level for ICT usage in their teaching practices is low. These results demonstrate that teachers are, in general sense, in favor of integrating ICT in their instructions. However, both the quantitative and qualitative results of the study indicate that they face significant external barriers for ICT integration. This result is confirmed by Goktas, Gedik, and Baydas (2013) indicating that the significant barriers primary school teachers face in their integration of ICT as of 2011 are lack of hardware, lack of software and limitations of the hardware. The findings suggest that necessary financial resources should be allocated to cope with these barriers.

Starting teachers' perceptions for ICT-related courses are moderately effective, which is supported through the qualitative analysis of the study. Likewise, they perceive the effectiveness of pedagogical courses and prior experience concerning ICT training at secondary education to be moderately effective at developing their ICT competence.

Starting Teachers' Integration of ICT into Education

This study explored starting teachers' integration of ICT into their instructions. It indicated that they use ICT in education to a moderate extent. They mostly use basic ICT skills (e.g., using search engines to look for information on the Internet, creating instructional materials, evaluating information on the Internet in terms of social, legal and ethical issues etc.) rather than utilizing integrated ICT skills (e.g., using simulated tasks to experiment, discover and experience etc.) The finding is also in parallel with the related literature (e.g., Aslan & Zhu, 2015; Tezci, 2009; Usluel & Aşkar, 2015). Usluel and Aşkar (2015, p.34) point out that teachers have made use of ICT in their lives, prepared and utilized it mostly for administrative purposes (e.g., unit and lesson plans, study materials, official writing, students' notes and reports etc.). However, they have not used ICT for instructional purposes. According to Almerich, Orellana, Suárez-Rodríguez, and Díaz-García (2016) teachers master technological resources to a limited extent and not that competent with advanced options. They can use basic computer applications and ICT. Their knowledge in the multimedia applications and presentations is moderately basic. For instance, teachers' use of interactive board in classrooms is mostly limited with the demonstrative purposes (Pamuk, Çakır, Ergun, Yılmaz, & Ayas, 2013). Previous studies have argued that the effectiveness of the integration of ICT in instruction depends on its full and comprehensive use (Baek, Jung, & Kim, 2008). Therefore, teachers should have the integrated ICT skills to make use of ICT in education fully.

The Relationship between the Predicting Variables and Integration of ICT into Teaching Practices

Hierarchical multiple regression was carried out to what extent the independent variables predict and account for teachers' integration of ICT into their instruction. The independent variables accounted for 52% of the dependent variable. Besides, "perceived competence in ICT integration" and "pedagogical knowledge" were significantly seen to predict the dependent variable, respectively. The findings show that teachers should be competent to use integrated ICT skills to enhance teaching and learning process. Besides, their pedagogical knowledge plays an important role in integrating ICT into teaching practices, which is supported with the study by Aslan and Zhu (2017). As Lim and Chai (2008) indicated that as long as teachers do not transform their pedagogical beliefs, they may not change the way they teach with computers in classrooms.

Starting Teachers' Perceived Conditions for ICT Integration in Education

ICT infrastructure is one of the conditions for teachers to use technology in their classes effectively. The finding is also confirmed by Tondeur, Krug, Bill, Smulders, and Zhu (2015). The authors stress out that teachers have little opportunity to use the technology in their teaching practices without adequate ICT resources. In this regard, "Movement of Enhancing Opportunities and Improving Technology (known as FATIH)" project which aims at providing tablets and LCD Interactive Board in all 42.000 school and 570.000 classes in the pre-school education, the primary education and secondary education around Turkey (http://fatihprojesi.meb.gov.tr/tr/index.php) is thought to make it easier and more convenient for teachers to access to ICT resources at schools.

Another condition for ICT integration in education is concerned with the integration of ICT-related courses in the teacher training programs. The study indicates that improvements should be conducted in ICT-related courses to make teachers more competent in ICT integration. The study shows similarities with the previous several studies as well (Aslan & Zhu, 2015, 2017). According to Gülbahar (2008), teacher training programs are not effective to provide instructional technologies and computers facilities for instructional purposes. The improvements (e.g., increasing ICT course hours, extending ICT throughout the program, more emphasis for ICT in the program, training ICT for subject area, integrating ICT into other courses, developing ICT plan, providing more practice and detailed information in ICT-related courses, updating the contents of ICT-related courses, and learning how to use smart boards in education) should be made in teacher training program for teachers to integrate ICT into their teaching practices effectively.

Starting Teachers' Perceived Factors Influencing ICT Integration

The qualitative data provides complementary findings with regard to ICT integrations in addition to confirming the research model of the study. The study indicated that

academic members have to be competent users of technology in education, which is supported by Aslan and Zhu (2015). The authors stress that their competency in ICT influences how they design, plan and teach their courses. In this regard, their modeling plays an important role for teachers how to use ICT for instructional purposes. Another finding is that teachers should be involved in professional development programs to increase and update their ICT skills. In this regard, continuous professional development activities involving instructional ICT use can help teachers increase their knowledge regarding teaching-learning methods, learning communities, e-learning and e-interaction (Akbulut, Odabaşı, & Kuzu, 2011). Önal (2014) indicates in his PhD dissertation that teachers are reluctant to attend those professional development programs due to the fact that trainings are not provided by competent trainers in ICT. As in case for academic members' being competent in ICT, trainers have to be competent in this issue to enable teachers to join the programs.

Some teachers have stressed out that they do not have ICT skills and experience. This finding also supports the fact that teacher training programs are not so effective to facilitate teachers to integrate technology into education. Besides, it indicated that professional development courses are necessary to develop and integrate their ICT skills into education. The study yielded an interesting point showing that some teachers cannot integrate ICT into their courses effectively because of the heavy curriculum they should cover and the exams they should prepare students for upper secondary schools. This point is also supported by Kaleli-Yilmaz (2015, p. 145) revealing that "busy curriculum schedule, insufficient course time interval and examination system" are important factors for teachers' integration of ICT. The author suggested that "…it can be useful either to reduce the subjects in the curriculum or by having additional courses for technologic assisted mathematics lessons." In this context, Lim and Chai (2008) found out that the curriculum based on stipulated schedules to prepare students for examinations is the main barrier for teachers to engage in more constructive teaching. The authors suggested that changes in assessment systems have to be addressed for teachers to shift their teaching practices from traditional approach to constructive one.

The Perceived Impact of ICT on Starting Teachers' Teaching Practices

The study indicated that teachers mostly use ICT in their courses for demonstrative purposes rather than facilitating teaching and learning, which shows parallel with the literature (e.g., Aslan & Zhu, 2015, 2017). As Baek et al. (2008) suggested that teacher education programs must raise teachers' awareness to the fact that technology is used to enhance teaching and learning not only for demonstrative purposes. For that reason, it is necessary for them to have integrated skills to facilitate their teaching practices.

Limitations and Implications

This study is limited to 119 starting teachers who are at most three year experienced in teaching Turkish, Social Sciences, Science and Elementary Mathematics in lower secondary schools. To gain deeper understanding of the factors influencing teachers' use of ICT for instructional purposes in future studies, population sizes could be extended to teachers, administrators and students in K-12,the variety of subject domains and the number of the universities could be increased. In this respect, hierarchical cluster sampling method rather than a stratified two-stage probability sampling could be implemented owing to the heterogeneous nature of the population in the Turkish context. In future studies, multi-level analysis in quantitative data could be conducted to identify whether the data are "nested" in teacher training faculties at the institutional level (Aslan, 2016). Besides, starting teachers' perceptions for the use of ICT in education should be triangulated with the academic members in education faculties as well.

Conclusion

This study made a contribution by investigating the factors influencing the integration of ICT of starting teachers in lower secondary schools in the Turkish context. Of the variables, perceived competence in ICT integration and pedagogical knowledge were identified to be significant predictors for starting teachers' integration of ICT into their teaching practices. Teachers need to be competent in integrated ICT skills to facilitate teaching and learning. The results showed that it is important for starting teachers to acquire and apply integrated ICT skills in their subject courses extensively together with transforming their teaching beliefs regarding the use of ICT for instructional purposes in pedagogical courses during teacher training programs. In this way, they could be more efficient users of ICT at schools. Precautions such as investment in ICT infrastructure should be taken to make teachers access to ICT resources at schools to use ICT in their teachings effectively. Besides, changes are necessary in curriculum and assessment system to enable teachers to facilitate teaching with ICT.

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