

ORIGINAL RESEARCH ARTICLE

Factors influencing teachers' utilisation of ICT: the role of in-service training courses and access

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The main purpose of this study is to investigate the influencing factors of ICT integration at secondary schools of Isfahan province. In order to obtain a realistic view of the factors especially among those teachers who attended ICT training courses, a total sample of 180 secondary school teachers were recruited randomly and a survey was completed. A researcher-approved questionnaire was developed to measure participants' access rate to ICT resources, ICT skills and their ICT integration practices. The content validity method was used for estimating the validity of the questionnaire and Cronbach's alpha coefficient was calculated to verify its reliability. The results were analysed using descriptive and inferential statistics methods. Based on the results, teachers have adequate access to hardware at home and school. However, the access rate to software is not of a desirable level. In spite of attending ICT training courses, secondary teachers were not proficient in using ICT tools and their technology usage in education, research and communication domains is less than the desired level. Results indicate that though there is a tendency to get computers and use the Internet, still using them in different areas remains an unsolved problem. The findings address implications for teacher educators and professional development programme providers.

Keywords: ICT integration practices; ICT resource access; ICT knowledge; In-service training; Secondary education

Introduction

Information communication technology (ICT) has witnessed tremendous innovations and changed our daily lives. It is mentioned that technology transformed the way we think, learn, work and live (Boggs 2019). In educational settings, the integration of ICT is becoming a significant concern and has gained the governments' support and attention in both developed and developing countries (Albugami and Ahmed 2015; Lane 2012). There is an increasing demand on educational systems to adopt and integrate ICT tools and techniques into teaching and learning processes.

ICT shows remarkable potential for teachers and learners to improve the quality of teaching and learning. Research findings have proven that ICT plays an important role in teaching and learning and enhances the depth and breadth of these processes once it has been integrated into the curriculum appropriately (Razak *et al.* 2018). A positive association between ICT availability at school and students' academic success

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has been shown (Hu *et al.* 2018). There is ample literature showing the positive role of ICT integration into education in pre-schools (Papadakis, Kalogiannakis and Zaranis 2016; Butler *et al.* 2019), primary (Meluso *et al.* 2012) and secondary education (Cheung and Slavin 2011; Higgins, Angelo and Crawford 2019; Shahriarpour and Kafi 2014). Studies revealed that ICT implementation increased students' achievements (Tuzun *et al.* 2009), their motivation (Cagiltay, Ozcelik and Ozcelik 2015; Hwang and Chen 2016) as well as their engagement in the learning process (Annetta *et al.* 2009).

Besides all advantages that ICT can bring into classrooms and the support that is provided by the educational systems; there are still obstacles preventing teachers from using technology in their teaching in Iranian public schools (Islami 2004; Lashkari 2003; Razavi *et al.* 2014; Razavi, Mansoory and Shahi 2018). There are a variety of different barriers preventing teachers from adopting and using technology in their classroom. The major barriers as highlighted through the literature include lack of teachers' ICT knowledge, skills and their competence in using ICT, shortage of technological resources, insufficient technical and administrative supports and inadequate training opportunities (Lawrence and Tar 2018; Nikolopoulou and Gialamas 2015; Razak *et al.* 2018; Vitanova *et al.* 2015).

If teachers want to use technology efficiently to promote students' learning, it would be necessary for them to receive professional training. The training programmes should be associated with the curriculum and teaching syllabus. Besides professional development (PD) programmes, teachers need to have sufficient financial and technological resources as well as technical supports regarding how to utilise ICT in the classroom. A meta-analysis on integration of ICT into K-12 education (Hew and Brush 2007) showed 'ICT resources accessibility' as the most frequent barrier for technology integration based on literature. However, more recent studies revealed that increasing technology accessibility does not necessarily result in greater or higher quality of technology usage (Ertmer and Ottenbreit-leftwich 2010; Vongkulluksn, Xie and Bowman 2018).

It seems that in different educational settings, factors influencing ICT integration are different and the solution to improve the results of technology utilization might be different. In Iranian secondary schools, similar to many other developing countries, a considerable amount of financial resources is allocated for technology access and development of teachers' training programmes. It is important for school administrators to know how efficient these efforts were. Addressing the mentioned concern, this research aims to investigate the influencing factors of ICT integration at secondary schools in Isfahan province. To achieve this purpose, it is sought to investigate the role of ICT resource access, teachers' ICT knowledge and PD trainings in teachers' ICT utilisation as the major ICT integration factors based on the literature.

Background

ICT resource accessibility

Lack of access to ICT resources is referred as one of the first-order barriers for technology integration in the classroom (Ertmer 1999). In Iranian schools, this factor is frequently reported as a major obstacle for teachers trying to integrate ICT in both primary (Razavi *et al.* 2014; Razavi, Mansoory and Shahi 2018) and secondary schools (Islami 2004; Salehi and Salehi, 2012). Ghaseminejad (2005) in his research

investigating the status of computer labs at Iranian secondary schools noted that the activation of ICT labs in schools is dependent on educational, managerial, administrative, motivational, recreational and constitutive deeds. In this context, teachers pointed to the provision of adequate equipment and technical support as a driver for them to integrate ICT in teaching and learning (Mirzajani and Mahmud 2016).

In other countries, researchers have similarly referred to improvement of technology resources at the schools as a driver for ICT utilisation (Makki *et al.* 2018; Vitanova *et al.* 2015). Vitanova *et al.* (2015) indicated that access to technical equipment can also contribute in developing teachers' ICT competencies. In Kenyan secondary schools that have made effective ICT investments, the access rates have been observed to be much higher and have resulted in a better utilisation of ICT in education (Kipitalam and Rodrigues 2010). Greek high school teachers likewise perceived the lack of technological resources (especially Internet access) as the major obstacle in utilising ICT in their classrooms (Nikolopoulou and Gialamas 2016).

Research findings revealed that teachers' perception of the ICT resources significantly influences their attitude towards use (ATU) of ICT as well as their perceived usefulness (PU) of ICT. These two factors (ATU and PU) have significant impacts on teachers' intention to use ICT (Teo 2019).

ICT knowledge and skills of teachers

During last few years, teacher education programmes (TEPs) in Iran have experienced evolution through which nurturing teachers' ICT competencies has been perceived as an important goal. Including three different units in TEPs regarding ICT integration into the curriculum indicates the fact that teacher trainers strive for educating the next generation of teachers to work with digital natives more efficiently. However, teachers who received their education before this evolution did not have the chance to be prepared for ICT integration into teaching and learning. As research findings show one of the most frequent personal barriers for not using ICT among teachers is lack of their skills and knowledge in this regard (Atashak and Mahzadeh 2011; Mirzajani and Mahmud 2016). When it comes to using online tools, research shows that lack of English language skills in Iranian educators is another barrier that prevents them from employing ICT for teaching and learning (Yaghoubi and Shamsayi 2004).

It has been mentioned that ICT integration requires much more than technology skills. For integrating ICT into teaching and learning effectively, teachers need to develop their TPACK which comprises technological, pedagogical and content knowledge (Koehler and Mishra 2009). Hosseini (2015) studied the impact of constructivist teaching approach on teacher students' TPACK in Iranian teacher training programmes. The findings of her study revealed how constructivism activities enhanced the teacher students' TPACK. Inter- and intra-group interactions among teacher students and their trainers along with the received feedback were found to be the most important activities to enhance TPACK. The role-playing strategy has also appeared as an effective strategy to enhance teachers' TPACK understanding and to foster their TPACK lesson design and practice (Lee and Kim 2017).

Research findings have proven that TPACK components have a significant and positive correlation with teachers' self-efficacy beliefs about technology integration into teaching and learning (Abbitt 2011). Pre-service teachers' digital nativity has been found to be a significant predictor of their TPACK competency (Yurdakul 2018).

Professional development programmes

The failure of ICT integration programmes in many countries specifically in developing ones is a result of providing access to ICT facilities at schools, but not preparing teachers for integration of ICT in teaching and learning (Tondeur *et al.* 2015). In developing countries, teachers lack the ability and motivation to integrate ICT in teaching and learning, because they found themselves to be poorly prepared for technology-enhanced teaching and learning (Khokhar, Gulab and Javaid 2017). Hajforoush and Crangi's (2003) study revealed that Iranian secondary school teachers who had participated in ICT training courses were more likely to engage students in learning from and with ICT. However another research has shown that even in cases where secondary school administrators provided PD programmes, teachers have not perceived it to be effective and useful (Atashak and Mahzadeh 2011).

Literature shows different impacts of the PD programmes on teachers. An (2018), in her research, examined the effects of a PD course on teachers' perceptions, attitudes, self-efficacy and behavioural intentions regarding the use of ICT in the classroom. This research indicated the fact that the PD programme significantly changed teachers' perceptions, attitudes and self-efficacy regarding the ICT integration in the classroom. An effective PD programme needs to be content-focused, integrate active learning, support collaboration, apply models, provide coaching and expert support, present feedback and reflection and be of a sustained duration (Darling-Hammond, Hyler and Gardner 2017).

A thorough review of the literature revealed that there is no research investigating ICT integration factors in Iranian secondary schools. However, two most recent studies investigating ICT integration in primary schools revealed that the most significant barriers for primary school teachers for ICT utilisation comprised teachers' negative attitudes, cultural issues, lack of ICT skills and knowledge and insufficient technological infrastructures (Razavi *et al.* 2014; Razavi, Mansoori and Shahi 2018).

While there is a considerable amount of research findings on positive impacts of ICT integration into teaching and learning, there is still a controversy related to the factors influencing successful technology integration in schools. Although training programmes were considered as a solution to increase the teachers' ability and tendency for using technology, there is limited evidence in Iranian secondary education context about the influence of these programmes on the teachers' ICT utilisation.

This study investigates the teachers' access rate to facilities such as computers and other ICT tools at home and school, ICT teachers' training and the quality of the acquired knowledge and skills for ICT integration in education, research and communication. The mentioned domains are new research fields in Iranian ICT integration studies at secondary education.

Method

Research purpose

The main purpose of this study is to investigate the influencing factors of ICT integration in secondary schools of Isfahan province. Specifically, we sought to investigate the role of ICT resource access, teachers' ICT knowledge and PD trainings in teachers' ICT utilisation. Consequently, the research has designed to answer the following questions:

1. To what extent do the secondary school teachers have access to ICT resources?
2. How much is the quality and quantity of pre-service and in-service ICT training courses?
3. To what extent do the secondary school teachers have ICT knowledge and skills?
4. How do these teachers utilise ICT for education, research and communication?

Participants and procedure

The population of this research comprised all secondary school teachers in Isfahan province who participated in the ICT trainings administered by the Ministry of K-12 Education ($N=2629$). Undertaking a pilot study and calculating the standard deviation, the number of participants for this study was determined by the following formula:

$$n = \frac{Nt^2 St^2}{Nd^2 + t^2s^2}$$

$$n = \frac{2629(1/96)^2 \times (0/828)^2}{2629(0/17)^2 + (1/96)^2 \times 0/828} = 179/27 \approx 180$$

Therefore, the sample of study included 180 teachers who were selected randomly. The selection was proportional to the number of teachers in each educational district. Information about the participants' background is summarised in Tables 1 and 2.

Research instrument

In this study, to collect the data, a researcher-made questionnaire was developed. The questionnaire comprised three sections; the first of these is about the demographic background of the respondents. The other two sections focused on the evaluation of influencing factors of ICT integration and consisted of 35 close-ended questions (bi-polar scale and five-point Likert scale) and an open-ended question inviting participants to reflect on their ICT integration practices and its influencing factors. In order to estimate the questionnaire validity, a content validity ratio (CVR) was calculated based on the ratings from judgements of 10 experts. The standard of CVR for the case of 10 experts is 0.62; therefore, items with CVR value smaller than 0.62 ($n=5$) were deleted. To examine the questionnaire's reliability Cronbach's alpha coefficient was calculated (0.87). More details of the research tool are outlined in Table 3.

Table 1. Participants' teaching experiences.

Years	6–10	11–15	16–20	more than 21	Sum
Frequency	32	40	54	38	180
Percentage	17.8	22.2	30	21.1	100

Table 2. Participants' teaching background.

Sum	Other	Art	Language	Literature	Social Science	Chemistry	Physics	Biology	Math	Computer	Subject areas
180	37	13	6	16	31	11	16	10	15	25	Frequency
100	20.6	7.2	3.3	8.9	17.2	6.1	8.9	5.6	8.3	13.9	Percentage

Table 3. The research tool.

Variables	Subscale	Description
ICT resources' accessibility	Hardware	11 bi-polar scale
	Software	
	Human resources	
ICT training courses	Pre-service	2 bi-polar scale
	In-service	1 five-point Likert scale
ICT knowledge and skills	Hardware	8 five-point Likert scale
	Software	
ICT integration	Internet tool	12 five-point Likert scale
	Education	
	Research Communication	

Table 4. Availability of computers and related resources.

#	Items	Yes	No
1	Access to computer at home	133*	47
		73.9	26.1
2	Access to Internet at home	113	67
		62.8	37.2
3	Have E-mail address	86	94
		47.8	52.2
4	Access to computers at school	135	45
		75	25
5	Access to Internet at school	151	29
		83.9	16.1
6	Schools' computers are connected	89	91
		49.4	51.6
7	Proportion of speed and capacity of computers memory	84	94
		47.8	52.2
8	Access to printer	111	69
		61.7	38.3
9	Access to scanner	76	104
		42.2	57.8

* First row numbers indicate frequency and second row indicates percentage.

Results

Results of quantitative data

1. To what extent do the secondary school teachers have access to ICT resources?

To collect data regarding this question, two groups of questions in the research tool were developed. These two groups enquire about teachers' accessibility to: (1) computers and related resources; (2) software related to specific subject areas. The results of the questions related to the availability of computers and related resources are summarised in Table 4.

As Table 4 indicates, teachers' access to computers at home and schools is above 50%. Data also indicates that although they have access to Internet at home and school, less than 50% of teachers have electronic mail address. The computers' memory and their speed too were not optimal.

The number of hours for which computers in schools were used is illustrated in Table 5.

Findings from Table 5 indicate that 51.7% of teachers had a 1 h access to computers per week; 18.3% of teachers had access of 6 h and more. Based on the findings of Tables 4 and 5, one may infer that above 50% of teachers had access to computer and Internet at home and school and they used these technologies for at least 1 h per week.

The distribution of educational software for specific subject area in schools is summarised in Table 6.

According to the findings of Table 6, the most widely available software in schools was math software, with a prevalence of 25%, and the least was literature software, with a prevalence of 10.3%.

Each school had a computer lab administrator who was responsible for repairing and maintenance of computers. Teachers' attitudes about the knowledge of computer lab administrator and access to software bank are summarised in Table 7.

Based on the results of Table 7, only 21.7% of teachers declared that they had access to a suitable software bank in their schools and 41.7% stated that they were satisfied with the technical knowledge of computer lab admins.

Considering the results of Tables 5, 6 and 7, one may infer that most of the budget of the Ministry of Education has been invested on purchasing hardware and setting up the computer labs. On the contrary, software facilities such as instructional software, Internet access, up-to-date and suitable software bank as well as providing a full-time computer expert with sufficient knowledge and specified duties have been neglected.

2. How much is the quality and quantity of pre-service and in-service ICT training courses?

The results regarding this question have been summarised in Table 8.

Table 5. Distribution of schools' computer use.

	Without answer	1-0	3-2	5-4	6 and more	Sum
Frequency	28	93	18	8	33	180
Percentage	15.6	51.7	10	4.4	18.3	100

Table 6. Distribution of educational software in schools.

	Math	Science	Social science	Literature	Language	Art	Sum
Frequency	17	15	8	7	11	10	68
Percentage	25	22.0	11.8	10.3	16.2	14.7	100

Table 7. Teachers' attitudes toward computer administrators' knowledge and software.

#	Items	Yes	No	Sum
1	Satisfaction with ICT knowledge of lab administrators	75* 41.7	105 58.3	180
2	Accessibility to the software bank appropriate with teaching subject	39 21.7	141 78.3	180

*First row numbers indicate frequency and second row numbers indicate percentage.

As shown in Table 8 33.3% teachers declared that they had received ICT instruction in pre-service courses and 62.2% stated that they had participated in the in-service ICT courses. The distribution of in-service ICT courses is outlined in Table 9.

According to the findings of Table 8, most teachers acquired their computer knowledge by passing in-service courses. Besides, most of the teachers had passed three of the seven existing courses.

3. To what extent do the secondary school teachers have ICT knowledge and skills?

Table 10 represents the distribution frequency of teachers’ familiarity with ICT applications in education.

Table 8. Distribution of pre-service and in-service courses.

#	Item	Yes	No
1	Attending computer courses in pre-service training	60*	120
		33.3	66.7
2	Attending computer courses during in-service training	112	61
		62.2	33.9

*First row numbers indicate frequency and second row numbers indicate percentage.

Table 9. The distribution of in-service ICT courses.

	Without answer	1 course	2 courses	3 courses	4 courses	5 courses or more	Sum
Frequency	14	7	14	60	58	27	180
Percentage	7.8	3.9	7.8	33.3	32.2	15	100

Table 10. The distribution frequency of teacher’s familiarity with ICT applications.

#	Items	Very low	Low	Av	high	Very High	SP*	Mean	SD
1	Familiarity with hardware	38** 21.1	53 29.4	64 35.6	21 11.7	4 2.2	13.9	2.50	1.12
2	Familiarity with operational systems	7 3.9	23 12.8	92 51.1	43 23.9	15 8.3	32.2	3.20	0.90
3	Familiarity with word processors	9 5	27 15	75 41.7	49 27.2	20 11.1	38.3	3.24	1.00
4	Familiarity with PowerPoint software for presenting content	102 56.7	38 21.1	21 11.7	8 4.4	11 6.1	10.5	1.82	1.17
5	Familiarity with excel	48 26.7	38 21.1	54 30	30 16.7	10 5.6	22.3	2.53	1.20
Total average								2.66	1.08

*SP = Summative percentage.

**First row numbers indicate frequency and second row numbers indicate percentage.

According to Table 9, the highest mean related to familiarity with computers in educational domain belongs to work with application programs such as Word Processor, with a mean of 3.24, and the least mean belongs to presenting content with PowerPoint (1.82). The distribution frequency of teachers' familiarity with ICT applications for communication is summarised in Table 11.

As can be seen from the data in Table 11, although teachers know chat and social media tools more than email as a communicative tool; their familiarity with communicative ICT applications is below average.

4. How teachers utilise ICT for education, research and communication?

The distribution frequency of teacher's computer utilisation in the educational domain is summarised in Table 12.

Findings also indicate that teachers use computers for application programs to perform their job. According to data presented in Table 12, the highest mean of

Table 11. Teachers' familiarity with ICT applications for communication.

#	Familiarity with...	Very low	Low	Av	high	Very High	SP	Mean	SD
1	E-mail	118* 65.6	28 15.6	16 8.9	11 6.1	7 3.9	10	1.67	1.11
2	Sending files through attachments	116 64.4	32 17.8	19 10.6	7 3.9	6 3.3	7.2	1.64	1.04
3	Chat and social media tools	107 59.4	35 19.4	21 11.7	7 3.9	10 5.6	9.5	1.77	1.15
Total average								1.69	1.10

*The first row numbers indicate frequency and second row numbers indicate percentage.

Table 12. The distribution frequency of ICT integration in education

	Items	Very low	Low	Av	high	Very High	SP	Mean	SD
1	Using word processor for typing	48* 26.7	42 23.3	46 25.6	22 12.2	22 12.2	24.4	2.60	1.32
2	Using word processor for presenting content	64 35.6	53 29.4	37 20.6	18 10	8 4.4	14.4	2.18	1.15
3	Using word processor to prepare exams	50 27.8	32 17.8	45 25	32 17.8	21 11.7	29.5	2.68	1.35
4	Using PowerPoint for presentation	112 62.2	30 16.7	26 14.4	7 3.9	5 2.8	6.7	1.68	1.04
5	Using Excel to process information	87 48.3	36 20	36 20	15 8.3	6 3.3	11.6	1.98	1.15
6	Using computers as instructional aids	62 34.4	42 23.3	41 22.8	24 13.3	11 6.1	19.4	2.33	1.24
7	Using computers during term	91 50.6	33 18.3	32 17.8	13 7.2	11 6.1	13.3	2.00	1.23
8	Assignment that should be done with computer	77 42.8	23 12.8	39 21.7	25 13.9	16 8.9	22.8	2.33	1.37
Total average								2.22	1.23

*First row numbers indicate frequency and second row numbers indicate percentage.

educational use belongs to preparing exam questions (2.67) and the lowest mean belongs to using PowerPoint and Excel (1.68) for teaching and learning.

The distribution frequency of ICT utilisation in research domain has been summarised in Table 13.

As is shown in Table 13, the highest mean of ICT utilisation in research domain belongs to writing articles (2.28) and the lowest mean belongs to use ICT to get informed of the scholarly news (2.08).

The frequency of ICT utilisation rate for communication purposes is summarised in Table 14.

According to Table 14, the highest mean of ICT utilisation for communication belongs to receiving salary invoice receipt (2.16) and the lowest mean belongs to conducting chat through ICT tools (1.66).

To answer the fourth question according to the findings of Tables 9 to 14, one may infer that the rate of familiarity with ICT and the rate of its application in all three domains (education, research and communication) is less than the average of 3. The least amount of familiarity and ICT utilisation belongs to communicative domain, research domain and educational domain respectively.

Results of qualitative data

As results indicate, all teachers in this study participated in in-service ICT courses, but they could not use their knowledge in practice to integrate technology into their classrooms. According to teachers’ interviews, there were many reasons for the mentioned problem:

Trainers of ICT courses were computer experts; however, they did not have enough experience in secondary education and were not familiar with teachers’ needs for ICT integration in teaching and learning. They could not link the ICT course contents to

Table 13. The distribution frequency of ICT utilisation in research

#	Using ICT to ...	Very low	Low	Av	high	Very High	SP	Mean	SD
1	write articles	69*	36	42	20	13	18.3	2.29	1.28
		38.3	20	23.3	11.1	7.2			
2	get informed of scholarly news	88	34	27	17	14	17.2	2.08	1.31
		48.9	18.9	15	9.4	7.8			
Total average								2.18	1.29

* First row numbers indicate frequency and second row numbers indicate percentage.

Table 14. The frequency of ICT utilisation rate for communication.

#	Using ICT to ...	Very low	Low	Av	high	Very high	SP	Mean	SD
1	chat.	113*	34	19	9	5	7.8	1.66	1.03
		62.8	18.9	10.6	5.0	2.8			
2	receive salary invoice receipt.	84	25	42	16	13	16.1	2.16	1.30
		46.7	13.9	23.3	8/9	7.2			
Total average								1.91	1.16

* First row numbers indicate frequency and second row numbers indicate percentage.

the teachers' needs in the classroom. In addition, most participants indicated that the trainers of ICT courses were not very knowledgeable and proficient.

From teachers' points of view, an inadequate cultural background was another obstacle for ICT integration. Many teachers felt more comfortable when they did tasks manually than with ICT tools. They used to do tasks as they did them before, so, they would resist the changes. Many research participants felt lonely while using computers.

Furthermore, they felt anxious when working with computers, because there was no technical support in their school. Another factor for not using ICT from teachers' points of view was that students were more knowledgeable about ICT than their teachers were, because they got to spend more time with computers and other ICT tools.

Discussion and conclusion

As the findings of this study reveal teachers' access rate to hardware facilities such as computers, Internet and printers is above 50%. This research demonstrates controversial results compared with the results of other studies in which technology accessibility is a major barrier in secondary schools for ICT integration (Islami 2004; Salehi and Salehi 2012). It can be inferred that during this time, the Iranian Ministry of Education contributed to address a major ICT integration barrier which was evidenced by previous studies. The findings of this research show that in recent years, investments in hardware facilities and access rates have been increased. While Kiptalam and Rodrigues (2010) in their study showed that higher access rates to ICT tools have been initiated for better utilisation of ICT-related technologies in Kenyan secondary schools, results from our study do not support this assumption. The key point here is that an effective ICT investment in education can contribute to better ICT-integration practices.

In spite of having adequate access to hardware, results indicate that teachers had less access to suitable software. Most educational software programs belong to math and a lesser number of programs belong to literature. This is due to two main concerns including language and culture. Most available software in the market is designed and produced in English and many students and teachers do not have proficiency in English language to utilise them. In addition, many of the softwares are not suitable according to Iranian culture and religion. These two concerns mostly affect ICT integration into subjects such as humanities and literature.

According to the obtained results, one may conclude that most of the budget of the Ministry of Education has been allocated to procurement of hardware and equipping computer labs at secondary schools. On the contrary, software facilities such as educational software for subject areas, up-to-date and suitable software bank in Persian language and – the most important – the full time technical expert with specified duties and optimal knowledge level are neglected issues by Ministry of Education. These results are consistent with the results obtained from previous studies (Abedi 2005; Ghaseminejad 2005). The cited studies indicated that the software dimension has been less appreciated in developing countries.

The results also show that in-service training courses did not enhance the quality and quantity of ICT integration practices among secondary school teachers. These teachers did not perceive the training courses to be efficient and were not satisfied with the quality of the courses. It seems that the Department of Secondary Education needs to review the PD trainings specifically regarding ICT integration knowledge

and skills. While nurturing skilled trainers who were equipped with TPACK competencies, the department should revise the training programmes to be up to date and efficient. These trainings should be collaborative, continuous and consistently incorporating more effective in-person courses and workshops (An 2018).

In spite of attending many ICT in-service training courses, teachers were not proficient in using ICT tools. Their self-efficacy in using computers was low. The finding is compatible with Shavakhi's (2002) research in which the lack of teachers' ICT competencies and skills was reported. The rate of familiarity with ICT applications in educational and communication field was not of the desired level and their averages were far from the assumptive average. It is therefore unlikely that Kenyan secondary school teachers increasingly use ICT tools as a means of communication (Kiptalam and Rodrigues 2010).

It has been mentioned that ICT integration trainings should provide secondary teachers with subject-specific ICT integration ideas and help them to improve their ICT skills in the context of a learner-centred approach in their subject areas (An 2018). In order to improve the current situation, all secondary school stakeholders need to work together to reflect on the existing ICT integration practices; find pitfalls and revise the ICT integration programmes and strategies.

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