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Teachers' Knowledge of ICT and e-learning in Pakistan: The wave of e-learning during COVID-19

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Abstract

World is experiencing major developments in its education system since the past two years due to COVID-19. The e-learning came up as the only solution to sustain the education system during that period. But it questioned the teachers' competence to deal with technology. Therefore, the need arouse to find out the teachers' level of knowledge regarding integration of ICT into teaching and e-learning. Current study was planned to find out the teachers' level of knowledge regarding ICT and e-learning. Sample of study were 251 secondary school teachers. They gave their response on the provided questionnaire. The study found that the teachers have advanced level of knowledge about the multiple technological tools and they also know about its usability. But the teachers are novice in the field of e-learning. The findings suggest that there is a need to first train the teachers so they may be able to utilize ICT for e-learning in classroom practices.

Keywords: ICT, e-learning, technological developments, Teachers' knowledge, Teacher training, COVID-19, Pakistan

Introduction

A voyage of e-learning

In today's digital age, moving with the only face-to-face mode of instruction has become a thing of the past (5, 19). As a result it has been replaced with Web 2.0 technology that introduced e-learning. The advantages of e-learning are vast as huge volume of instructional material are available to use anytime (8). Online content is accessible anywhere that can be revisited anytime. The online sessions are also recorded so the students may watch it later (7). Students may no longer need to move to other places in search of knowledge as e-learning removes social and physical obstacles. e-learning also provides an opportunity to the teachers to extend their knowledge and experience. They are able to expand and upgrade their skills through interacting with the international experts. This technology transforms

the mobile screen into the classroom as well (8). One cannot deny the importance of ICT and e-learning in education as it is no longer just a "nice to have" extra part in education. Indeed it proved to be an integral part of our education system during COVID-19 (19). In such circumstances, use of ICT and specifically e-learning has facilitated to survive the Education around the globe (16).

The possibility of integrating ICT into teaching and e-learning in Pakistan during pandemic

The possibility of continuing the education across the globe was just made possible through ICT and e-learning during COVID-19 Pandemic. Without having ICT tools and the concept of e- learning one couldn't imagine to run the education system at any level, anywhere (16). Pakistan took the global crises caused by COVID-19 as an opportunity and showed greater developments in the education system (16). In Pakistan, the Government has realized that complete closure of the institutes was not the right choice to deal with this chaos. So, it presented the term 'Smart Lockdown' and took initiative by launching first Television School where e-learning was officially introduced (1). The education system moved with the online mode of instruction mainly then gradually hybrid form was utilized. During this period many challenges were faced that included; concerns regarding the quality of education, technological resources, internet accessibility, lack of online content, difficulties in parental support, and lack of urge to learn (8). One of the most highlighted issue was that the teachers were not trained enough to deal with such situation. There was an open query that whether the faculty are qualified enough to integrate ICT into teaching and teach online efficiently (11). They themselves have a very superficial knowledge regarding ICT integration and e-learning (Ahmed, 2020). Therefore, the thought arise to talk about its familiarity among the teachers or instructors who are the back bone of any education system.

Teachers' knowledge of ICT and e-learning

In the context of ICT, the teachers need to have sufficient ICT skills, high confidence, readiness to use, and training to teach with ICT (6). They are the one to use the ICT investments for educational development. Their proficiency in ICT use, determines its effectiveness in the classroom (11). Results showed that the use of ICT and e-learning are affected by the teachers' attitude and level of knowledge (18). Their skills and readiness in using ICT plays essential role in using ICT for teaching learning purposes (4). Just providing a technological tool to teacher and expecting him to maximize the learning potential of the students is a strategy destined for failure. As majority of the teachers raised in a digital age have only superficial or limited knowledge and skills to use the technology in teaching effectively (4). Those who have some knowledge, are not using it in their classrooms (4). Being novice, the teachers don't know how to utilize ICT for teaching learning purposes during the COVID-19 for online mode of instruction (12). For those administrators who want to increase teachers' use of ICT in classrooms and for e-learning they must ensure first the teachers' understanding and knowledge regarding ICT use (15). Therefore, there is a need to gather information about the teachers' knowledge of integrating ICT in education and e-learning first before making it a part of the actual classrooms.

Purpose of research

This study was conducted to find out the level of teachers' knowledge about the integration of ICT into teaching and e-learning. This study would provide a base to further plan the teachers' training program specifically, during this COVID-19 pandemic situation where more e-learning or Hybrid (Blended) form of instruction was taking place all over the world.

Research question

The objective of research was to explore the teacher's knowledge of ICT and e-learning for which following research question was formulated:

- What is the level of teachers' knowledge about the integration of ICT into teaching and e- learning?

Methodology

The research question called for more quantitative approach. Therefore, a close-ended quantitative questionnaire was used for data collection. There are 30 Federal Government Secondary Schools in Rawalpindi Garrison. For current study, all the F.G Secondary School Teachers in Rawalpindi Garrison, teaching 9^{th} and 10^{th} grade specifically, were chosen as a sample. Out of 30, five schools were selected for pilot testing. The remaining 25 schools took part in the actual survey. There were 400 teachers in those schools. The survey questionnaire was distributed among all the teachers. The response rate was 78% i.e 310 questionnaires were received. Out of those 310 questionnaires, only 251 questionnaires were fully responded by the teachers, therefore, they were included in the current study. Data was analyzed through descriptive analysis, where Frequencies and Percentages were calculated.

Instrument of data collection

In current study, a survey questionnaire with a total of 44 items was used as a data collection instrument. Two standardized questionnaires were merged for that purpose. First questionnaire was adapted from the MEDA-ETE Project report, 2009, titled "E-Learning for teacher training: from design to implementation handbook for practitioners" (9). Second questionnaire was adapted from IEA International Computer and Information Literacy Study, 2018 (3). The relevant questions were chosen from those two questionnaires. A quantitative close-ended questionnaire was finalized for current study. It was further forwarded for expert validation and pilot testing after which the validity and reliability of the instrument for current study was established. After going through a rigorous process of expert validation, pilot testing of the survey questionnaire was carried out to make sure its reliability. Five schools were selected for that purpose. The reliability analysis was carried out through Cronbach's alpha. The calculated 0.82 value of alpha reliability showed that the questionnaire was reliable to use in the Pakistani context.

Results and findings

	Never		Less than two years		Between two and five years		More than five years	
	Freq	Per	Freq	Per	Freq	Per	Freq	Per
During lessons	87	35%	55	22%	17	7%	29	12%
Preparing lessons	44	18%	68	27%	7	3%	62	25%

The survey questionnaire had two parts. Part A was about the teachers' knowledge of ICT and Part B was about e-learning. The results and major findings of both parts are presented in detail below.

Part A

Teachers' knowledge of ICT

Teachers' use of ICT for teaching learning purposes

In part A, the first question was about, 'how long the teachers have been using ICT for teaching purposes'. Two further questions that were asked under this question were; (a) During lessons and (b) Preparing lessons. The options that were provided include; Never (1), Less than two years (2), Between two and five years (3), and More than five years (4). The teachers marked their choices in each row. Table 1 shows its results.

Table1 teachers' use of ICT for teaching learning purposes

Table 1 showed that majority of the teachers use ICT for preparing lessons most often than during lesson. As out of 251 participant teachers, 68 (27%) were using ICT for less than two years and 62 teachers (25%) were using ICT for more than five years to prepare their lessons for teaching. However, 87 teachers (35%) haven't used ICT during their teaching . Still 55 teachers (22%) have been using it for less than two years. Overall, it is concluded from the results presented in table 1 that teachers' have advanced level of knowledge regarding the use of ICT for preparing lessons than utilizing it during teaching. As 101 teachers (40%) out of 251 have been using ICT during teaching while 137 teachers (55%) are using it for preparing the lesson. It means they have more knowledge of utilizing ICT for preparing lessons than using it for classroom instruction.

Teachers' ability to perform certain tasks using ICT

This item of the questionnaire was about how well the teachers can do certain tasks using ICT. A list of tasks were provided for which the options that were given include; Not interested (1), I don't think I could do this (2), I haven't done this but I could find out how (3), I know how to do this (4), and I am good in using it (5). Results are shown in Table 2.

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Table 2 teachers' ability to perform certain tasks using ICT

	Not interested		**I don't think I could do this**		**I haven't done this but I could find out how**		**I know how to do this**		**I am good in using it**	
Question 2	**Freq**	**Per**	**Freq**	**Per**	**Freq**	**Per**	**Freq**	**Per**	**Freq**	**Per**
a) Find useful teaching resources on the Internet	2	1 %	4	2%	34	14 %	98	39 %	113	45 %
b) Contribute to a discussion forum/user group on the Internet (e.g., a wiki or blog)	30	12 %	40	16 %	57	23 %	67	27 %	57	23 %
c) Produce presentations (e.g., Microsoft PowerPoint or a similar program) with simple animation	8	3 %	27	11 %	58	23 %	99	39 %	59	24 %
d) Use the Internet for online purchases and payments	36	14 %	23	9%	54	22 %	72	29 %	66	26 %
e) Prepare lessons that involve the use of ICT by students	8	3 %	25	10 %	60	24 %	98	39 %	60	24 %
f) Use a spreadsheet program (e.g., Microsoft Excel) for keeping records or analyzing data	8	3 %	34	14 %	66	26 %	106	42 %	37	15 %
g) Assess student learning	2	1 %	28	11 %	50	20 %	103	41 %	68	27 %
Collaborate with others using shared resources (e.g., Google	14	6 %	20	8%	45	18 %	77	31 %	95	38 %

h) Docs, OneNote, Padlet)										
	16	6 %	30	12 %	58	23 %	80	32 %	67	27 %
Use a learning management system (e.g., Blackboard, i) Edmodo, Moodle)										

Results showed that teachers were good in finding useful teaching resources on the internet (45%), collaborate and shared resources with others using e.g Google Docs etc (38%). Although not so good in its use, but the teachers knew how to contribute to a discussion forum or user group on the internet (27%), Produce presentation e.g Powerpoint with simple animation (39%), Using internet for online purchase and payments (29%), Preparing lessons that involve using ICT by students (39%), Using spreadsheet program e.g Miscrosoft excel for record keeping and data analysis (42%), Assessing students' learning (41%) and using LMS (32%).

Overall, the results confirmed teachers' advanced level of knowledge in finding useful teaching resources on the internet and in collaborating with others using shared resources e.g Google Docs etc. It also shows that the teachers' have the knowledge to contribute to discussion forum, using powerpoint, spreadsheet e.g Miscrosoft excel, LMS.

Teachers' use of multiple ICT tools in teaching

The third question in Part A of the survey questionnaire gathered some information regarding the teachers' use of multiple ICT tools in teaching. A list of different ICT tools (ranging from a-q) were mentioned for which 4 choices were given; Never (1), In some lessons (2), In most lessons (3), and In every or almost every lesson (4). Table 3 shows the results.

Table 3 Teachers' use of ICT tools in teaching

	Never		**In some lesson**		**In most lesson**		**In every or almost every lesson**	
Question 3	Freq	Per	Freq	Per	Freq	Per	Freq	Per
a)Practice programs or apps where you ask students questions (e.g., Quizlet, Kahoot)	111	44 %	115	46%	15	6%	10	4%
b) Digital learning games	173	69 %	46	18%	30	12 %	2	1%
c) Word-processor software (e.g., Microsoft Word)	91	36 %	116	46%	36	14 %	8	3%
	101	40	98	39%	40	16	12	5%

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d) Presentation software (e.g., Microsoft PowerPoint)		%				%		
e) Spreadsheets (e.g., Microsoft Excel)	110	44 %	111	44%	20	8%	10	4%
Video and photo software for capture and editing (e.g., f) Windows Movie Maker, iMovie, Adobe Photoshop)	114	45 %	103	41%	28	11 %	6	2%
Concept mapping software (e.g., Inspiration, g) Webspiration)	164	65 %	66	26%	11	4%	10	4%
h) Simulations and modelling software (e.g., NetLogo)	171	68 %	59	23%	17	7%	4	2%
i) A learning management system (e.g., Blackboard, Edmodo, Moodle)	84	33 %	108	43%	44	17 %	15	6%
J) Communication software (e.g., email, direct messaging, Skype)	64	25 %	111	44%	64	25 %	12	5%
k) Collaborative software (e.g., Google Docs, OneNote, Padlet)	115	46 %	95	38%	35	14 %	6	2%
l) Computer-based information resources (e.g., topic-related websites, wikis, encyclopaedia)	51	20 %	111	44%	62	25 %	27	11%
m) Interactive digital learning resources (e.g., learning objects)	100	40 %	95	38%	46	18 %	10	4%
n) Graphing or drawing software	160	63 %	59	23%	20	8%	12	5%
o) e-portfolios (e.g.,	162	64 %	62	25%	15	6%	12	5%

VoiceThread)								
p) Digital contents linked with textbooks	82	33 %	93	37%	57	23 %	19	8%
q) Social media (e.g., Facebook, Twitter)	100	40 %	82	33%	50	20 %	19	8%

The results in table 3, showed that majority of the participants have never used some of the ICT tools in their teaching as they have never used digital learning games (69%), concept mapping softwares (65%), Simulations and modelling softwares (68%), collaborative softwares (46%), Graphing or drawing software (63%), e-portfolios (64%), and Social media e.g Facebook and twitter (40%) in teaching. However, in using some of the ICT tools, the teachers have either never used it or use it in some lessons in teaching.

For example, 44% teachers have never practiced a program where they may ask the students questions but still 46% have practiced it in some lessons, 40% have not used presentation software in their teaching but still 39% have used it in some lessons, An equal number of teachers (44%) have either never used the spreadsheets in their teaching or used it in some lessons, Video and photo software was also never used by the 45% teachers but still 41% have used it in some lessons, 40% teachers have never utilized interactive digital learning resources in their teaching but 38% have used it in some lessons and for the Digital contents 37% have used it in some lessons while 33% have never used it. For the remaining ICT tools the results showed that the highest percentage of teachers were using them in some lessons for example majority was using word-processor software (46%), LMS (43%), Communication software (44%), and Computer-based information resources (44%). Overall the results confirmed the teachers' initial level of knowledge for utilizing word-processor software, communication software and computer-based information resources in teaching.

However, for some of the ICT tools like the presentation software, practicing a program to ask students the questions, spreadsheets, video and photo software, interactive digital learning resources and digital content, it can be concluded that the teachers have an initial level of knowledge to use these ICT tools in teaching.

To conclude, majority of the teachers have advanced level of knowledge regarding utilizing ICT for preparing their lessons than during the lessons. Also, they are either good in performing various tasks or they know how to do certain tasks using ICT as well. But still majority are either not utilizing multiple ICT tools in teaching or they practice it in some lessons of their teaching .

Part B

Teachers' knowledge of e-learning

Teachers' experience with e-learning

Part B of the survey questionnaire was about exploring the teachers' knowledge of e-learning. As described above, it was having 3 major questions. The first question was about indicating

for how long they have been involved in e-learning for teaching learning purposes. The given 5 options were; Less than 6 months (1), 6 months-2 years (2), 3-4 years (3), 5-10 years (4), More than 10 years (5). Table 4 shows the results.

Table 4 Teachers' experience with e-learning

	Less than 6 months		**6 months - 2 years**		**3-4 years**		**5-10 years**		**More than 10 years**	
Question 4	Freq	Per	Freq	Per	Freq	Per	Freq	Per	Freq	Per
Please indicate how long have you been involved in e-Learning for teaching learning purposes?	137	55 %	48	19 %	31	12 %	29	12 %	6	2%

Table 4 shows that 137 teachers out of 251 (55%) have been involved in e-learning for teaching learning purpose, for less than 6 months. Therefore, being novice in the field, it can be concluded that the majority of the teachers have an initial level of knowledge about e-learning.

Teachers' experience with different e-learning arrangements

Second question was about the different e-learning arrangements that the teachers have experienced so far. The available choices were; combination of e-learning and face-to-face courses (1), Self-study e-learning (2), e-learning with online support from an e-tutor (3), and e-learning with offline support, e.g handing in paper assignment (4). Some space was also provided to specify other than these options. They could also choose more than one option. Following table 5 shows the result.

Table 5 Teachers' experiences with different e-learning arrangements

	Combination of e-Learning and face-to-face courses		**Self-study e-Learning**		**e-Learning with online support from an e Tutor**		**e-Learning with offline support , e.g. handing in paper assignment**	
Question 5	Freq	Per	Freq	Pre	Freq	Per	Fre	Per

With which of the following e-Learning arrangements have you made experiences so far? (Several choices are possible)	72	29 %	97	39%	45	18%	29	12%

The table 5 shows that majority of the teachers (39%) were involved in e-learning activities for self-study purposes while some of them (29%) have also experience e-learning in combination with face-to-face courses. Overall it is concluded that majority of the teachers have some knowledge about using e-learning for self-study purposes and practicing it along with face-to-face courses (Blended learning) as well.

Utilizing multiple technologies for e-learning

Third question was about exploring which kind of technology the teachers have used for e-learning so far. The given 5 options were No experience (1), Some experience (2), Comfortable with using (3), Substantial experience (4), and expert (5). Three different sections were mentioned like Communication tools, Collaboration tools, and further technologies. Under Communication tools the given list included (a) discussion forum (b) Live Chat (synchronous), (c) Email, and (d) Instant messaging. Under Collaboration tools the given list included (e) Wiki, (f) Blog, (g) Shared calendar/ Virtual agenda, and (h) Shared whiteboard. And under Further technologies the given list included (i) CD-ROM / DVD-ROM based learning, (j) Web Conference System, (k) Video- conference system, (l) Learning Environment, Learning Platform (LMS, LCMS), (m) Website resources (e.g. Website content or interactive exercises) and (n) Authoring software to create materials or documents.

Table 6 utilizing multiple technologies for e-learning

	No experience		**Some experience**		**Comfortable with using**		**Substantial experience**		**expert**	
	Freq	**Per**	**Freq**	**Per**	**Freq**	**Per**	**Freq**	**Per**	**Freq**	**Per**
a. Forum discussion	11	4%	123	49%	70	28%	39	16%	2	1%
b. Live Chat (synchronous)	8	3%	108	43%	67	27%	46	18%	18	7%
c. Email	22	9%	66	26%	78	31%	46	18%	16	6%
d. Instant messaging	31	12%	37	15%	80	32%	53	21%	20	8%
e. Wiki	26	10%	122	49%	39	16%	35	14%	16	6%
f. Blog	13	5%	154	61%	55	22%	18	7%	7	3%
g. Shared calendar/ Virtual agenda	29	12%	136	54%	52	21%	19	8%	15	6%

h. Shared whiteboard	18	7%	113	45%	63	25%	26	10%	18	7%
i. CD-ROM / DVD-ROM based learning	10	4%	132	53%	66	26%	6	2%	24	10 %
j. Web Conference System	14	6%	162	65%	49	20%	8	3%	12	5%
k. Video-conference system	10	4%	127	51%	70	28%	15	6%	23	9%
l. Learning Environment, Learning Platform (LMS, LCMS)	13	5%	146	58%	51	20%	15	6%	18	7%
m. Website resources (e.g. Website content or interactive exercises)	21	8%	86	34%	81	32%	22	9%	13	5%
n. Authoring software to create materials or documents	18	7%	132	53%	71	28%	16	6%	2	1%

Table 6 shows that majority of the participants have some experience of utilizing multiple technologies for e-learning e.g Forum discussion (49%), Live chat (43%), Wiki (49%), Blog (61%), Shared calendar (54%) , Shared whiteboard (45%), CD-ROM/DVD-ROM based learning (53%), Web conference system (65%), Video-conference system (51%), Learning environment like LMS (58%), and Authoring software to create material or documents (53%). However it also shows that majority were comfortable with using email (31%). A close tie have been found in Instant messaging and website resources as 32% teachers were comfortable with instant messaging and 33% were having substantial experience in it. On the other hand, 34% teachers have some experience in using website resources while 32% were comfortable with using it. Overall it is confirmed that teachers have an initial level of knowledge in utilizing multiple technologies for e- learning.

It is concluded that teachers are novice in the field of e-learning as majority are having less than 6 months of experience with e-learning. Up till now, they often use it for self-study purposes mostly where some also experience combination of face-to-face courses along with e-learning. It is also concluded that the teachers are having an initial knowledge of practicing multiple technologies for e-learning.

Discussion and conclusion

The results of this study presented the teachers' level of knowledge regarding integration of ICT into teaching and e-learning. About the integration of ICT into teaching, results showed that the teachers utilize ICT for preparing their lessons more, than using it in the classrooms. The results are in line with the findings (9) that the frequency of teachers, utilizing ICT in their classrooms, is very low.

It appeared from results that the teachers are good in performing certain tasks using ICT. For example, they can find useful resources on internet and they can collaborate online with

others. The results also show that they know how to use PowerPoint, spreadsheet and LMS (Learning Management System). But still majority of the teachers were not utilizing different ICT tools in teaching. Only few practice it in some lessons. These results are akin to the study (4) that although teachers have some knowledge and understanding of multiple ICT tools but still they are not utilizing it in their classroom practices. It also supports the results (2) that teachers have only superficial knowledge regarding ICT use in teaching.

Regarding the teachers' knowledge of e-learning, the results indicated that the secondary school teachers are novice in the field of e-learning as majority of the teachers have less than 6 months experience. Those who have experienced e-learning, are utilizing it for self-study purposes mostly. The results confirmed the findings (16) where it has been said that teachers are more novice to deal with e-learning and most of them have experienced it for the first time during COVID-19.

The results also showed that the teachers have an initial level of knowledge regarding utilizing multiple technologies for e-learning. The results of Part-A of the questionnaire are linked with Part-B, that shows although teachers know about the different technological tools but they are much novice in using them for e-learning. The results supported the claim (12) that the teachers know about the multiple ICT tools but being novice they haven't utilized it for e-learning yet.

We have experienced during COVID-19 pandemic that only ICT helped to sustain the education all over the world. When the education system was standing at the verge of chaos and the government couldn't meet with that unexpected challenge around the globe. At that time, the only possibility was to take advantage from the technology that was being ignored for many years. Before the pandemic, online or e-learning was one of the many options that was opted for improving the quality of teaching learning process. Yet, after COVID-19 pandemic, it emerged as the only option to survive the education all around the world. Through e-learning it was made possible to overcome the loss in education caused by pandemic.

e-learning was utilized to continue the education system that was disrupted by the pandemic during 2019. It was not a difficult task for the developed countries. However, a developing country like ours, faced serious issues when it was decided to move with e-learning or hybrid learning. In both situations the difficulty was with the online mode of instruction. One of the major issues highlighted by the research was that the teachers were not knowledgeable, competent, skillful and experienced enough to integrate ICT into teaching effectively. Therefore, being a practitioner in the field, it is believed that there is a need to first prepare our teachers to deal with such situation skillfully. In that preparation, the first step is to explore the ground realities then plan a professional development training program accordingly. This study is an initial step that will assist in conducting further research on teachers' professional development. To conclude, this study explored that the teachers have the knowledge of multiple technological tools and they know how to utilize them but practically they don't use ICT during their teaching. It was also found that the secondary school teachers don't have much expertise in e-learning as majority have experienced it in the past six months hardly. There is a dire need to seriously work on the professional development of the teachers in that aspect. Keeping in view the challenges that were faced during COVID-19, this study demands to make sure that our teachers are

experienced and prepared enough to integrate ICT into education and teach through e-learning efficiently.Therefore there is a need to provide training to the teachers so they may practically integrate ICT into teaching and utilize it for e-learning purposes as well.

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