

Secondary School Teachers' Level of Knowledge and Use of ICT in Classroom

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Abstract

Current study intended to identify teachers' level of knowledge and ICT use into pedagogy at secondary level. It was a mixed method study. Quantitative data were collected from 100 teachers of secondary schools Rawalpindi. Descriptive statistics was applied and results were found out through percentage, mean, frequency and standard deviation. Interviews were also conducted with the secondary school teachers. Quantitative data revealed that teachers use only those ICT tools in which they have adequate level of knowledge. Qualitative data also backed these results and highlighted that teachers' lack knowledge in ICT tools therefore they don't utilize them. They demand administrative support and need-based training in the development of ICT skills and knowledge. It is recommended that ICT integration in the field of education needs greater consideration than it is receiving. Teachers' fewer knowledge in area of ICT depicted the need of enhancing their level of knowledge regarding advanced ICT tools.

Keywords: Teachers, Knowledge, ICT, Classroom

Introduction

In today's world of Information, skills that are necessary for an individual include, decision making, problem solution, reflective practices, critical thinking and higher order thinking skills. For effective development of these skills, ICT is considered a necessary tool that has a potential (Oweis, 2018; Hopson, et al., 2001-2002). Information and communication technologies (ICTs) are considered as significant tools for the effective delivery of instructions in the classroom. Most of the academic institutions around the world are moving towards technology and also utilize in the classroom. Hence, ICT is becoming essential part of teaching-learning process (Ismail, Almekhlafi, & Al-Mekhlafi, 2010; Beketova et al., 2020).

In the prevailing situation and in the era of technology, old method of pedagogy is no more effective. It is the requirement to transform teacher-centered method into more interactive student-centered method (Staker & Horn, 2012; Richter & McPherson, 2012). Now with the help of technology, students as well as teachers can access information from anywhere around the world. ICT removes the barriers to communicate with anyone and gain knowledge (Wu, Hao, Lau, Wong, Leung, Wu & Leung, 2020; Hodges, Moore, Lockee, Trust & Bond, 2020). Although technology have the potential to solve the problems of teaching learning process and remove the barriers nevertheless, here it comes the duty of teachers to play their role so that schools may become more efficient and effective one to transform the whole process of teaching-learning process (Solhaug, 2009). These reforms cannot be brought through ICT alone; it can work as a catalyst. Several reasons are identified that causes failure of ICT integration. These include provision of knowledge and access of teachers to ICT tools. Other reason includes teachers' lack of motivation and willingness to use ICT in teaching method (Suparjan, 2021). This study aims at finding out the teachers' knowledge for the use of ICT classroom.

Literature Review

ICT serves as effective and important educational tools when properly equipped and used by skilled teachers (Levin & Wadmany, 2008; Ghavifekr & Rosdy, 2015). Technological tools depends upon the work, willingness and motivation of teachers for its effective use (Huang et al., 2019). Although, proper utilization of ICT needs availability of infrastructure. Nevertheless, more is required for widespread utilization of ICT in teaching learning process apart from provision of hardware and

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infrastructure (Tondeur et al., 2009; Keengwe & Anyanwu, 2007; Shepherd & Mullane, 2010). In this context, teachers' role is important.

To effectively use ICT in teaching process, teachers go through multiple stages. To reach at the level of best utilization of ICT, different researchers gave different names to these stages (Groff & Mouza, 2008). To have a basic knowledge of technology is the first requirement of ICT usage. Second one focuses on the development of professional competence through the employment of ICT. At the third stage teachers practically apply ICT tools in the classroom. After going through three stages teachers started use of ICT in the teaching-learning process. For widespread integration finally, teachers reflect on their practices and make relevant improvement (Hixon & Buckenmeyer, 2009).

Teachers need to use ICT for the purpose of instructions as well as use as a professional tool and requires knowledge about. Teachers need expertise in making decision about the ways to use ICT in any subject. Highest level of expert teaching skills is required for the integration of technology because it entails teacher's selection of strategies and deciding on how to integrate technology into any given lesson. (Painter, 2001). For effective integration of ICT, teacher's knowledge and skills are highly important. It is identified that the more teachers have knowledge of ICT the more they will incorporate ICT into the teaching-learning process (İşman, Evirgen & Çengel, 2008; Paraskeva, Bouta & Papagianni, 2008).

However, it is proved that teachers face numerous hurdles in imparting important decisions regarding effective use of ICT in teaching-learning process (Ranellucci, Rosenberg, & Poitras, 2020; Chen & Chang, 2006). It is highlighted that teachers have no advanced level of knowledge regarding the utilization of ICT (Albirini, 2006; Al-alwani, 2005). Lack of confidence is another factor that affect the use of ICT because teachers are neither confident usually nor willing towards the use of ICT. It creates obstacles in the way of technology integration and create negative attitude towards the use of ICT in classroom (Hashemi & Kew, 2021).

Situation in Pakistan/ Need for this research

Pakistan is struggling hard to incorporate ICT facilities in schools. Ten professional standards for teachers in Pakistan were set for the preparation of teacher. These standards were given by the policy and Planning Wing of the Ministry of Education in 2009. One prominent standard was effective use of ICT (Ministry of Education, 2009). For achieving this goal, it is clearly stated in National Educational Policy 1998-2010 of Pakistan that "computer shall be introduced in secondary schools" and "Educational institutions shall be provided internet facilities". However, the efforts of providing ICT in schools is ongoing and yet not reached its destination (Hassan & Sajid, 2013; Rehman et.al, 2021; Shaikh, 2009).

Recently, the pandemic situation highlighted the need of integration of ICT in Pakistani schools (Rehman et.al, 2021). At first, It sounds attractive to go with the stream of virtual education. Nevertheless, ground realities were different especially in developing countries like Pakistan. One of the major challenges was that the teachers were not well-versed with technology. They don't have enough knowledge regarding the use of ICT in actual classrooms (Rehman et.al, 2021). Current study aimed at exploring the teachers' knowledge of ICT and its use in the classroom at secondary school level, in Pakistani context. It was an exploratory study that will assist in planning the future teachers' training program regarding the utilization of ICT at school level. For this purpose, following questions were formulated:

- What is the level of secondary school teachers' knowledge towards ICT?
- What is the extent to which secondary school teachers use ICT in classroom?
- What are the views of secondary school teachers towards the use of ICT in classroom?

Methodology

The study design is a mixed method and both qualitative and quantitative methods were used. Through purposive sampling, ten schools of both boys and girls, were selected that have computer lab facility in them. Ten teachers were selected as a sample from each secondary school that made 100 teachers in total.

Instrument of Data Collection

To study the teachers' knowledge towards ICT and its use in classroom, quantitative data were collected. For quantitative data, Factors Affecting Teachers Teaching with Technology (SFA-T3) 2008 scale was used which measures teacher's level of knowledge and ICT use in classroom. In particular, first part of the questionnaire used a Likert-scale type questions with response option from

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1 to 5 where 1 stand for the option of 'can use it', 2 depicts 'can use it to small extent', 3 refers to 'satisfactory', 4 stands for 'use it well', and 5 'can use it very well. This section used to measure teachers' knowledge about different software. To measure the frequency of software use, the second part of the scale used a 5-point Likert-type scale. The options of answer used 1 for 'never', 2 refers to 'once or twice a session', 3 stands for 'once or twice a month', 4 stands for 'once or twice a week' and 5 to 'use it almost every day'. For qualitative data interview protocol was utilized.

Reliability of scale

It was considered that the scale SAF-T3 used for the first time in Pakistan, therefore, it was necessary to find out its suitability. Therefore, the scale was administered to 50 secondary school teachers as pilot study. Internal consistency reliability of the scale was calculated through SPSS (0.935) that indicates this scale is reliable to use in Pakistan.

Interview guide

Interviews were conducted with the secondary school teachers. To know the extent of ICT use, interview guide was developed. To keep track of responses, interviews were audio recorded and note taking was considered necessary. Teachers were interviewed on voluntary basis and their interviews were recorded after taking permission from the respondents.

Quantitative data analysis

Descriptive statistics was applied on quantitative data for data analysis. Descriptive statistics was used to identify teacher's knowledge and ICT use through percentage, mean and standard deviation.

Results

Teachers' level of knowledge regarding ICT

Teachers' knowledge about ICT was determined through 14 items responses from 1-5. Result in the form of percentages, mean and standard deviation for each item is presented in table 1.1 below.

It is indicated through the highest percentage, mean scores and standard deviation of items that teachers have high level of knowledge towards first three technological tools mentioned in the scale. Results presented in Table 1 showed that 48.1 % participants can use internet well or very well (M=3.38, SD=1.21). For word processing (M=3.35, SD=1.04), and Email use with score (M=3.17, SD=1.40). 42.5% can use word processing and Email well or very well.

Moderate level of knowledge indicated from the scores in six areas of ICT use. These six areas are use of Spread sheets (M=2.89, SD=1.13) Presentation software use (M=2.76, SD=1.26), usage of graphics (M=2.58, SD=1.22) data bases (M=2.54, S.D= 1.337), concept mapping (M= 2.14, S.D= 1.27), multimedia authoring software (M= 2.08, S.D= 1.30).

The least widely use of ICT was identified towards: Publishing software (M=1.94, SD=1.21), programming language (M=1.83, SD=1.27), Web page authoring software (M=1.79, SD=1.18), Micro worlds/ simulations (M=1.78, 1.21), and modeling software (M=1.70, SD=1.12).

Questions	Cannot use it (%)	Use it to a some extent (%)	Satisfactorily use (%)	Use it well (%)	Use it very well (%)	Mean	S.D
Word processing	1.9	19.8	30.0	28.3	14.2	3.35	1.038
Data bases	27.4	24.5	51.1	18.9	8.5	2.54	1.337
Spread sheets	9.4	29.2	26.4	20.8	8.5	2.89	1.136
Graphics	19.8	31.1	19.8	16.0	7.5	2.58	1.224
Multimedia authoring software	47.2	51.1	16.0	9.4	6.6	2.08	1.308
Presentation software	17.0	27.4	21.7	17.9	10.4	2.76	1.264
Internet	7.5	16.0	22.6	29.2	18.9	3.38	1.213
Concept mapping	42.5	17.9	18.9	8.5	6.6	2.14	1.279
Email	17.0	13.2	21.7	21.7	20.8	3.17	1.400
Publishing software	48.1	22.6	9.4	9.4	4.7	1.94	1.213
Webpage authoring software	57.5	15.1	9.4	8.5	3.8	1.79	1.183
Programming languages	57.5	15.1	9.4	4.7	7.5	1.83	1.272
Modeling software	61.3	12.3	11.3	6.6	2.8	1.70	1.115
Micro worlds/Simulations	59.4	13.2	8.5	9.4	3.8	1.78	1.203

Table 1.1 Teachers' knowledge about ICT

Frequency of ICT use in classroom

Teachers' answers were collected on 5 point likert type scale. Percentage of respondents, Mean score and Standard Deviation is presented for each item which indicated frequency of ICT use. The results are presented in table 1.2.

Results confirm that teachers most widely use the internet with (M= 3.58, S.D= 1.444). 37.7% respondents use internet almost every day. Next most widely use ICT type was communication (M= 3.51, S.D= 1.36) and play games (M= 3.23, S.D=1.55). Moderate level of ICT type use includes Process text (M= 2.92, S.D= 1.376) followed by create graphics (M= 2.66, S.D= 1.257), make presentation (M=2.62, S.D= 1.170), prepare spreadsheets (M= 2.57, S.D= 1.208), use educational CDs (M= 2.16, S.D= 1.229). The least use of ICT type items described below.

The lowest percentage, Mean and standard deviation was scored by secondary school teachers for publish material (M= 1.97, S.D= 1.150), program the computer (M= 1.83, S.D= 1.181), develop web pages (M= 1.61, S.D= 1.058), map concepts (M= 1.50, S.D= .916), develop multimedia (M= 1.46, S.D= 1.049), model complex systems (M= 1.45, S.D= .947), author micro worlds/ simulations (M= 1.36, S.D= .882)

Items	Never use it %	Use it Once or twice a year %	Use once or twice a month %	Once or twice a week usage %	Almost every day usage %	Mean	S.D
Play games	17.0	22.6	7.5	16.0	31.1	3.23	1.556
Make presentations	17.0	30.2	26.4	13.2	7.5	2.62	1.170
Process texts	19.8	18.9	18.9	22.6	14.2	2.92	1.376
Publish materials	44.3	24.5	12.3	10.4	2.8	1.97	1.150
Prepare spreadsheets	20.8	28.3	22.6	16.0	6.6	2.57	1.208
Create graphics	18.9	28.3	23.6	13.2	10.4	2.66	1.257
Communicate]	10.4	16.0	11.3	28.3	28.3	3.51	1.367
Access the Internet	10.4	17.0	12.3	17.0	37.7	3.58	1.444
Develop web pages	61.3	18.9	6.6	1.9	4.7	1.61	1.058
Develop multimedia	74.5	8.5	2.8	4.7	3.8	1.46	1.049
Author micro worlds/ simulations	76.4	10.4	6.6	.9	94.3	1.36	0.882
Map concepts	67.0	14.2	7.5	4.7	.9	1.50	0.916
Model complex systems	70.8	14.2	1.9	5.7	1.9	1.45	0.947
Program the computer	55.7	14.2	13.2	7.5	3.8	1.83	1.181
Use educational CDs	38.7	23.6	14.2	14.2	3.8	2.16	1.229

Table 1.2 Frequency of ICT use in classroom

Qualitative data analysis

Qualitative data was collected to explore teachers' views on integration of technology into pedagogy. Semi-structured interviews were conducted from secondary school teachers. All interviews were transcribed. Qualitative data analysis was conducted through coding and thematic analysis of all transcripts, using Nvivo 8. To analyze qualitative data, coding process is the main facet (Creswell & Clark, 2007). Qualitative data analysis was done by grouping all the data. Systematic and rigorous reading of transcripts helped to code them. Qualitative data analysis follows the inductive approach. Inductive approach starts from extensive reading of transcript. To start analysis procedure, all interview transcripts were imported to Nvivo 8 in the form of word document. In open coding, possible codes were assigned to text or phrases found in transcript. To move from descriptive coding to analytic it makes easier to explain the phenomena. Axial coding started when the codes that gave same meaning and the labels given to phrases, were then grouped under categories or sub themes. These sub themes were then categorized under main themes. Themes are actually 'big ideas' which underlie a list of codes and sub themes (Lodico et al., 2006; Holliday, 2007). For accuracy and completeness of codes assigned to transcripts, were crosschecked by other academic in the field of research.

After thematic analysis the main themes that emerged are discussed below:

Administrative support

All teachers were of the view that school administration plays vital role in changing the prevailing traditional ways of teaching. One teacher was of the view that our administration lack competencies about use of ICT therefore, they are not as much willing to introduce new pedagogical ways in schools. Two among five teachers highlighted that our administration never asked our views towards the use of ICT into pedagogy. They further stated that administration usually not send us to the training however sometimes send a teacher from our school without even know about the nature of the training. One teacher stated that,

“After the completion of a training, administration never arrange a schedule so that a teacher can share material and knowledge of training with other staff members that he/she attended”.

Teachers' Professional development

All the teachers were of the view that our administration never asked us about the need of our training. Training programs arranged by professional development organizations needed to ask the audience about their needs. One teacher highlighted important point that,

“Professional development training needed to be need based. Whenever arrange a training it is needed to consider the skills, knowledge and competencies of teachers. Most of the training are arranged just to meet the objectives of our educational policies”.

Two teachers also highlighted that some teachers in our school even don't know the basics of computers therefore the purpose of training organized to integrate technology in classroom not fulfill.

Other teacher highlighted that there was no practical experience in the training we attended. There was nothing about the updated software, programs and methodologies to integrate technology into our classroom teaching.

All the teachers were agreed that some training are just based on theoretical knowledge however some are too much advance that we can't implement in our classrooms as we lack knowledge in areas of ICT. Therefore our knowledge needed to enhance and updated so that we can integrate technology in our classrooms.

Teachers' willingness

All the teachers highlighted that although we lack in supportive administration however the teachers are also not as much willing to integrate technology into classroom teaching. They further stated that we already have a burden of heavy content material that we have to complete within a given time period. In this case utilization of technology will overburden us. One among teacher said that I tried to utilize technological tools in my classroom however content completion makes it difficult. Therefore it is needed to train us in a way so that we can integrate technology in classroom that save our time. Data also highlighted that students also don't have access to technological tools in their homes therefore teachers are not willing to ask them about the use of ICT. One teacher said that they should be given access to computer in the classroom but unfortunately computers were only in the labs and not in each classroom and they don't have access to the lab even. Sharing views a teacher said, “School should provide technical infrastructure and supportive environment for ICT use”.

ICT as Barrier or supporting agent

Teachers were asked about the usefulness of technology use in classroom setting. They were asked whether the introduction of technology created troubles for them. Was it difficult for them to integrate technology or they feel more comfort? What were the problems or difficulties they faced while using computers in classroom? All the teachers shared different problems they faced in using computer. Slow internet speed, need for multimedia projector, enhancement of teachers proficiency were some needs highlighted by the teachers. One teacher said that she was facing a problem of slow internet speed. Electricity failure was another issue they had to face in school.

Teacher teaching computer science subject commented that

“As there was fewer computers in a lab and students were more in number therefore if teachers have the facility of multimedia then a teacher can better explain the things in front of students.”

Integration of ICT in all curriculum areas

It was highlighted in interviews that ICT use was limited to the teaching of computer science subject only. All teachers were agreed that research has proved that use of ICT in all subject areas increases student performance. Therefore it is necessary to given us training to utilize technology in our classrooms apart from its limited use in a particular subject.

Apart from the acceptance of the importance of technology, one teacher held a different and realistic view. Teacher explained that,

“The integration of technology is not as easy in other subjects as it is in computer science because in our school there were computer expert teachers’ nevertheless other teachers are not much computer literate. Through training they can become competent”.

Discussion

Current study identify teachers’ level of knowledge towards technology and ICT use in classroom.. Results highlighted that teachers have enough level of knowledge in ICT. However, these are just for the first three technological tools mentioned in questionnaire. Minimal knowledge and competencies were highlighted towards: simulations, modeling software, publishing software and programming. It was identified that ICT act as a barrier or create difficulties for the teachers when they have lack of knowledge and skills in technological tools (Son, Park, & Park (2017). Teachers having lack of competencies in areas of ICT showed that they seldom use it in their classrooms. Al-alwani (2005) and Empirica (2006) highlighted that if teachers have low level of knowledge and skills in the usage of technology in classroom then it creates difficulties towards the effective use of technology.

Results about the frequency of the usage of technological tools confirms that teachers use internet, play games and communication on daily basis however frequently make presentation, prepare spread sheets and process text. Seldom use of ICT type was programming, multimedia, simulations and development of web pages. Teachers claiming about lack of competencies, knowledge and skills do not use computers in their classroom. Therefore, it creates hindrance and restrict them from integration of ICT into classroom (Ranellucci, Rosenberg, & Poitras, 2020). For effective integration, teacher knowledge and skills are highly important (Karchmer-Klein, 2007).

The more teachers are competent and skilled in ICT use, the more they will integrate it in classroom (Williams, Coles, Wilson, Richardson, & Tuson, 2000). Qualitative data highlighted that teachers should have knowledge about the utilization of ICT in classrooms. All the teachers highlighted that they lack knowledge of ICT therefore can’t use it in their classroom teaching. Teachers were of the view that administrative support needed to be efficient. All the training needed to be according to the needs of the teachers. Objectives of the training arranged by professional development organizations need to be realistic. Data highlighted that teachers are not willing to use ICT in the classroom as they have to complete content material in a specific time period. Teachers thought that ICT overburden their teaching learning process. Study highlighted that teachers and students have no access to the available ICT resources in their schools. Teachers thought that ICT can only be utilized in teaching computer science subject and utilization in arts subjects is just a waste of time.

Conclusion

This study examines the level of teachers’ knowledge about technological tools and its usage in classroom by secondary school teachers. This study contributed to the research in the field of ICT integration in education. Findings indicated that teachers have limited level of knowledge in ICT therefore; integration or frequency of the usage of technological tools is also limited. The reasons of limited use of ICT into teaching were identified in the study. One reason highlighted by teachers was need of up gradation in knowledge and skills of teachers in using ICT. Other reason identified was burden of the content that they have to complete within a given period. Slow internet speed was another constrain identified by teachers. Therefore, it can be concluded that the highest the level of knowledge teachers’ possess that higher the use of ICT in classroom will be. It is suggested in the study that much focus should be given on increase in teachers’ knowledge, consequently, integration of technology in teaching can be increased. Teachers considered that it should be integrated across all curricular areas.

Current study has given insight to invest more on part of teachers. To increase teachers’ level of ICT knowledge they needed professional development opportunities to incorporate technology into pedagogy. With the advancement in technology teachers need to keep abreast with ICT development. Current study contributed in the field of literature regarding ICT knowledge and its integration in pedagogy. Focus of present study was not to identify relationship between ICT policy and actual classroom application; therefore, it is suggested for future research. Identification of gaps between ICT and policy in schools and its implementation could be helpful in the improvement of policy and change the focus of teachers’ professional development.

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