University Teachers knowledge about technological devices and their use: An Analytical study

***Sumera Irum, Parveen Munshi , Tarique Bhatti, and Jawad Hussain Awan**

Abstract
This study focused on the existing status of technology integration in universities through the lens of TPACK. The main objectives of the study were; to analyze the current status of technology used by Teacher Educators, in terms of frequently used devices and purpose to use technology. And explore the perceptions of Teacher Educators about the Technological Knowledge (TK) domains of TPACK in Teacher Education Institutions in the province of Sindh, Pakistan. The study was Survey. The questionnaire was used for data collection. The questions are adopted through literature. Thirty-Three (33) Teacher Educators were selected through census sampling technique. Data was analyzed through SPSS, percentage, mean, standard deviation and chi-square. The findings of the study revealed that most of the teacher educators were using a Laptop and Smart phone. Mostly Teacher Educators used technology for research, teaching-learning process, and communication. Majority of Teacher educators rated themselves low in Technological Knowledge. Only those teachers were possessed high Technological Knowledge those had degrees in technology related disciplines. The study recommends that all Teacher Educators should provide facilities essential for effective technology use; training courses should be organized for teacher educators to effectively utilize technology in pedagogy. Teachers should be motivated by rewards and incentives for successful utilization of technology in Teacher Education Universities.

Keywords:
Technology, device, purposes, Knowledge, Teacher Education, Teacher Educator.

1. Introduction

The use of Technology is spreading in present time, which makes life easier in different contexts and fields. The use of technology helps people to do things quickly and properly. Nowadays, a new generation is frequently used technologies like computers, video games, iPhone, tablets, laptop, social media (Facebook). That's why different researchers in their studies have used different terms to address this new technology oriented generation, such as digital natives, native speakers, Net Generation etc. The reality of this generation is that when they join formal schooling they possess prior knowledge of computers and gadgets because of their frequent touch with modern gadgets. To meet the demand of this technology rich generation, teachers of today are required to change their teaching methods approaches and philosophies. [1] [2] To fulfill the need and demand of this generation teachers are required to equip themselves with the modern devices.

In order to equip Teacher Educator with modern pedagogies, Teacher Education Institutions are changing their curriculum and integrating technology in their curriculum. Nowadays the emphasis of teacher education institutions is on preparing prospective teachers to teach with technology and to blend content, pedagogy and technology effectively in their teaching process so that they can meet the expectation of up-coming generations. "An important phenomenon that has emerged in recent time is to guide and help teachers to use Technological Pedagogical Content Knowledge (TPACK) in their classroom practices". [3]

Many researchers conducting research regarding the utilization of technology in the education. [5] Proposed a framework based on Shulman' Model (PCK) [4] called Technological Pedagogical Content Knowledge (TPACK) framework. It provides essential domain of knowledge that teachers must know for effective application of technology in their teaching. Different researches have proved that the three knowledge domains of Technological Knowledge (TK), Content Knowledge (CK), and Pedagogical Knowledge (PK) have become essential part of modern classroom teaching." [6]

Over the globe, technology from being used by teachers in teaching. And many researches shows that the use of technology provides endless potentials if use in Teaching and Learning Process. And support teachers to attain educational objectives. In developed countries due to availability of resources, it is easy for teachers to integrate technology in education; they do not have to face any problems or barriers. Therefore, developed countries are now reaping the fruit of technology integration and developed countries and not also very far from this race, they are trying to use technology in their system, but facing problems. Such as lack of resources, power failure, non-cooperative and non-supportive environment.

Pakistan is a developing country, and from the last two decades, the Government in Pakistan are taking many initiatives to promote technology culture in the system. In the providence of Sindh, Pakistan, efforts are being made by the provincial government to introduce innovative technology based teacher education program. But contrary to all this, there are still barriers and problems in the implementation of technological based teaching-learning

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approaches in all teachers educational institutions in the province. [7]

In the context of Pakistan there is a dearth of research on TPACK. However, in other developed and developing nations, the issue of TPACK has been widely studied in the education context, some researchers for instance, [8] based on his survey point out that there have been approximately 1200 research works published so far. But this estimation may not be accurate since every day research on technology is being conducted.

Use of research methodology has been a serious issue for exploration and understanding the use of TPACK, the most common method to study this problem has been surveyed, as [9] by using meta analysis found that quantitative survey has been widely used consisting of self-assessment of teachers to evaluate their knowledge and practice regarding TPACK in education context. In the self-assessment, usually respondents were requested in response a statement on 5- to 7 Likert scale, numerically wherever a subset or the TPACK knowledge domains were explored by [9]. However, some other researchers have used different methods, for example, [10] studied teachers' TPACK knowledge. The qualitative understanding like observation helped him gain a proper understanding of the classrooms and teachers' perspectives on the problem. This method is suitable when a researcher wants to gain first-hand knowledge of the problem under research.

In this present research, researcher used triangulation method, along with his self reported survey, because students are the main stakeholder in the system and can be the best judge to evaluate teachers' knowledge, their views regarding their teachers' knowledge about TPACK also included in the study. Because in the self- reporting usually teachers view themselves as more efficient, most hardworking and dedicated towards their teaching. But when it is found through systematic research, the teachers do not use proper methods in their teaching. As it is normally said that the saying is actually different than knowing about the things. Therefore, classroom observations were also taken as tool of study. And then triangulate these three sources of knowledge.

In the world, many research studies have been carried out for understanding the use of technology in education, with special emphasis on its use in teaching methods or in pedagogy. Many studies show the importance of the use of technology in education, such use of technology make education effective, classroom environment becomes more interactive, help teachers to clear concept of students' about difficult topics. There are many studies in the field of education which shows that technology is helpful in better understanding the issues related to education, for example [11] found that in this era technology integration is an important part of teaching and learning process. A teacher education programs all over the world going through a transitional phase and technology integration is replacing traditional modes of teaching. Teacher education institutions recognize these challenges and incorporating innovative teaching methods to enhance the quality of teachers for incorporating technology in teaching learning process. Another researcher also has the same opinion of the importance of the use of technology, such as [12] suggests that teacher education programs need to shift the focus from the mastery of specific technology skills to developing knowledge "related to the intersection of technology and pedagogy" (p. 868) .

In different countries, many studies have been conducted on the use of technological device, for example [8] Saudi Arabia founded that (50%) teachers were using laptops (50%) and (42%) Smart phones whereas only (7%) used and desktop (0.5%) used Personnel Computers. A research conducted found that most of the students use the internet to collect information for their homework and they used the Internet for using social media, gaming, downloading music and films [13]. In addition, it was also found (75%) majority of Teachers perceived themselves expert in the use of the internet and they frequently use the internet for the teaching-learning process.

2. Theoretical framework

The "Technological, Pedagogical, and Content Knowledge (TPACK)" model explains that comprising of various categories of knowledge that teachers required to incorporate technology effectively in the teaching learning. [14] That multifaceted knowledge mainly consists of Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Knowledge (TK) and their interplay. [14] Content knowledge (CK) – domain- means knowledge about the particular content that teachers have to teach. The second main domain is Pedagogical knowledge (PK) – knowledge about the teaching methods, classroom management, teaching principles and assessment. Technological Knowledge (TK) domain can be defined as knowledge about all technologies' from traditional to modern. [15]

The TPACK model shown in Figure 1.1 clarifies the connection of the three domains for teaching and learning;

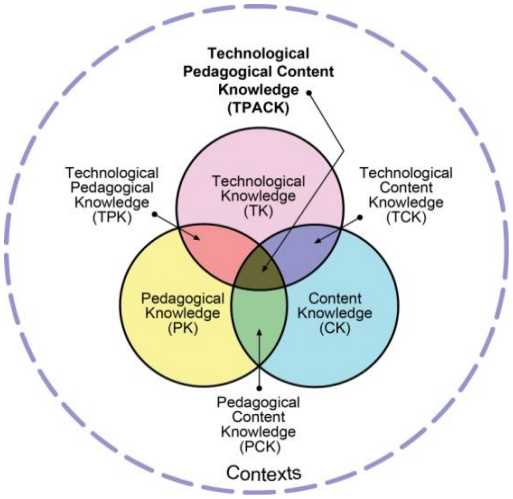

Fig. 1 Three domains for teaching and learning

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3. Objectives of the study

The following objectives were formulated for the study;

- To analyze the current status of technology use by Teacher Educators in universities of Sindh in terms of:
  - i.Frequently used devices.
  - ii.Purpose to used Technology
- To explore the perceptions of Teacher Educators about the technological knowledge (TK) domains of TPACK in Teacher Education Institutions in Sindh.

4. Research Methodology

The mixed method approach was adopted. The questionnaire used for data collection was based on TPACK survey adopted and adapted from [15]. The reliability of the questionnaire was calculated through Cronbach's alpha method which came out to be (0.80) and the validity of the questionnaire was determined through expert opinion. The census sampling technique was used for sample selection. According to [16] "when the population is too small then census sampling is used". Total forty (40) teacher educators were there in teacher education faculties/departments in four general public sector universities in the Sindh Province. For data collection from teacher educators, questionnaire was distributed among the all forty (40) teacher educators and got thirty three (33) returned back. This article is part of my Ph.D. thesis. The data used in this article actually was collected for my Ph.D. research, in 2016.

5. Data Analysis

5.1 Frequently used devices

Use of technology is expanding, this is technological era, and our country is a technology savvy country, therefore Teacher Educators were also using varieties of technologies, the question was asked about the use of different devices, teachers have to select the devices that they have been used very frequently. As we can see Figure No: 01 below teacher educators frequently using laptops and (90%) teacher educators having their own laptops while only (39.4%) were using PC-tablet. There was the same percentage about (54.50%) of teacher educators using smart phone and Personal Computer (PC). This is obvious from the data that nowadays everyone using these devices, in general life. But use of these devices in teaching-learning was not very common.

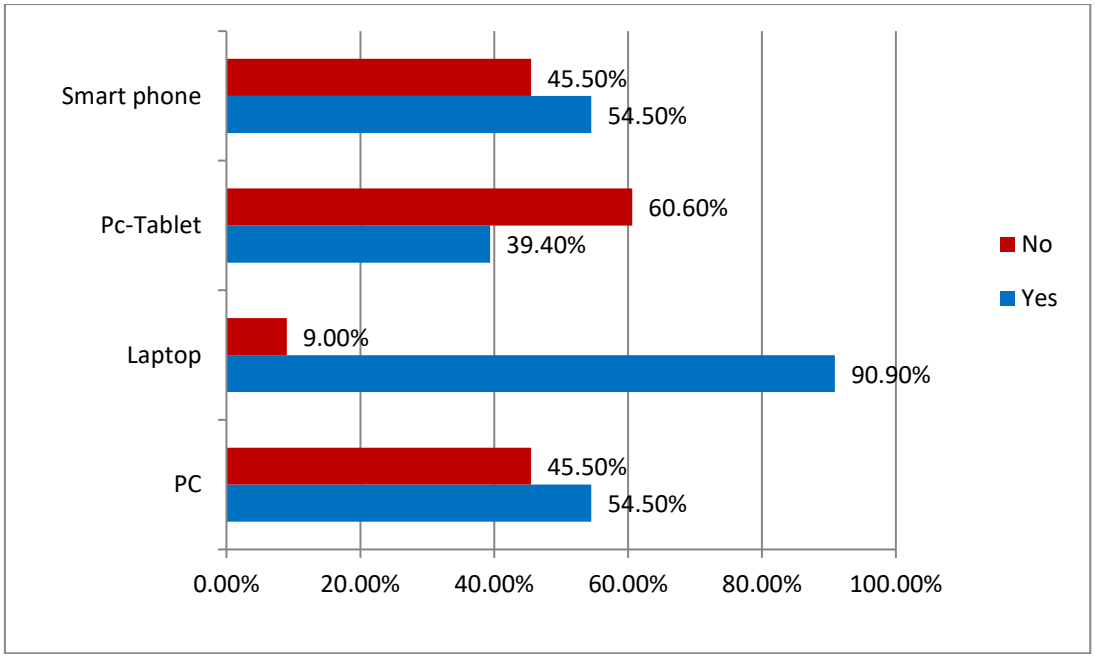

Fig. 2 Frequently used devices

5.2 Purpose to Use Technology

The teacher educators were asked about the reasons to use technology, mostly in their personal and professional life. The purpose to use technology by teacher educators were (98%) Research and (93%) Teaching- Learning, for (87%) communication, (73%) Facebook. The less, but still reasonably popular purpose to used technology was Entertainment (57%). The least popular purpose to used technology was a discussion group (31%) and LMS (13%).

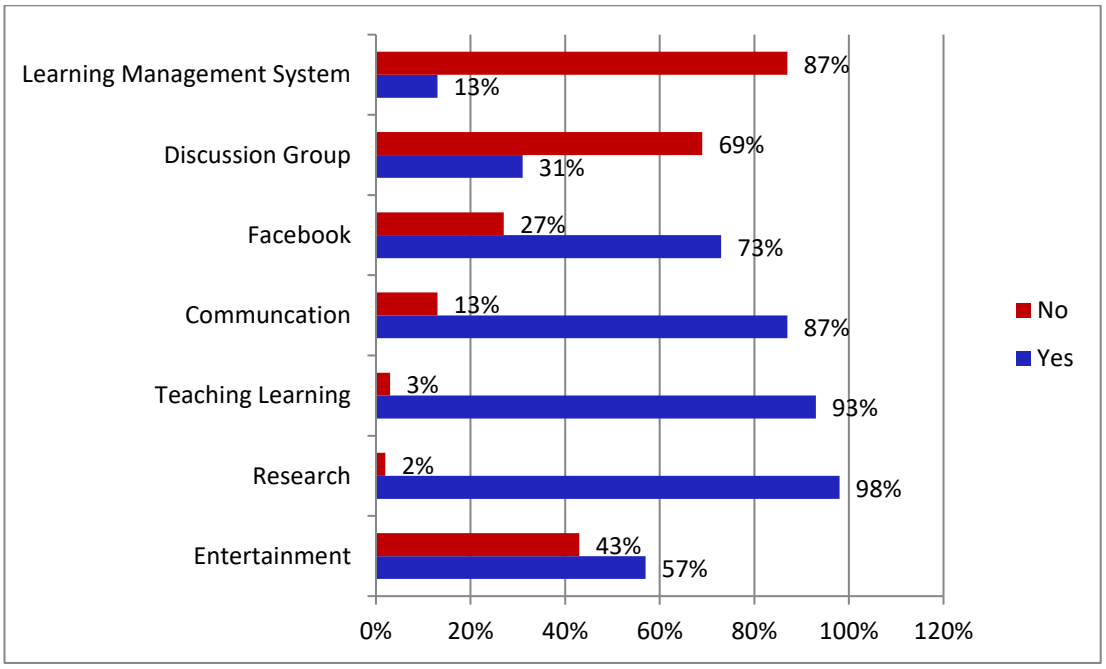

Fig. 3 Purpose to use Technology

5.3 Technological Knowledge (TK) of Teacher Educators

Table 1: Technological Knowledge (TK) of Teacher Educators

S#	Statements	A	U	D	Mean	SD	Chi χ^2	Inference
	Technological Content Knowledge							
1	Solve all the technical problems related to the Hardware.	12 36%	2 6%	19 57.5%	3.3	1.4	6.2	Insignificant (Disagreed)
2	Teachers solve all the Software.	10 30%	6 18%	17 51.5%	3.1	1.3	5.9	Insignificant (Disagreed)
3	Teachers remain updated about the arrival of new technologies.	11 33%	6 18%	16 48.4%	3.2	1.1	9.8	Insignificant (Disagreed)
4	Teachers use a variety of technologies.	12 33%	2 18%	19 48.4%	3.3	1.3	9.2	Insignificant (Disagreed)

Quantitative analysis revealed (58%) Teacher Educators viewed that teachers were not capable to solve technical problems likes' hardware. (52%) Teacher Educators and viewed that teachers were not capable to solve technical problems related to software. (48%) Teacher Educators viewed that teachers were not updated about the arrival of new technologies. (48%) Teacher Educators viewed that teachers were not using a variety of technologies.

Technological knowledge (TK) is the main domain on TPACK. TK define various types of technologies from traditional to modern. [17] Suggested "TPACK comprising as a dynamic process of knowledge construction, pedagogical assumptions and individual contextual considerations and as major factors for active and continuous improvement of teachers' knowledge."

6. Discussions and Conclusion

This research has found different results which show that technology can be helpful in enhancing teaching quality in university context. Teachers by using modern devices, gadgets and practices, can make their teaching standard effective and up-to-date in modern times.

The above data indicate that teachers use technology for their personal life. However, this study does not find a very positive use of modern devices' in the field of education. Which result that education is not supported by technology.

The results from this study show that few teachers were using laptops for making presentation to be used in class as to make their teaching qualitative. The finding of this study is aligned with [8]. He studied in Saudi Arabia and founded that mostly (50%) teachers were using laptops and (42%) Smart phones whereas only (7%) used and desktop (0.5%) used Personnel Computers ". Another study was carried out by [18]. He found that in this era use of laptops is constantly increasing in the classrooms, along laptops the trend of using other portable devices (likes Smartphone, PC-tablets) were also becoming ubiquitous.

When purpose to use technology, mostly was asked, it was found that most of the teacher educators were using technology for teaching and learning activities, research and communication. A good majority of teachers were also found to use social-media. Because teachers used Facebook and have joined different groups for learning purposes, but very few teachers were using the Learning Management System (LMS), this is not a satisfactory condition because the use of LMS in the teaching and learning process is very common over the globe. The LMS is extremely beneficial for teachers [19] stated that the use of LMS has become an integrated part of higher education worldwide, LMS provides a platform for teachers that they can share assignment, discussion topic, notes, important announcement, and results, and everyone (higher-ups) may check the progress of all teachers. Students can share their difficulties, suggestion and teachers can monitor their progress easily. Instead of using unsecured option the LMS provides the best solution & platform. 89.3% higher education institutions are adopting LMS. LMS is used for Blog, news, forum, video call, audio call, E-mail, chat. The (85.7 %) used text-based electronic teaching materials completely (61.0 %) Practice tests and (57.0 %) used presentation are the most frequently used by teachers and students[20].

Findings from quantitative & qualitative analysis describes that teacher educators possessed low technological knowledge (TK) while, TK is also the main domain of TPACK. It was found that only those teachers were using technology perfectly that had a degree in computer science or information technology [21]-[26]. This finding aligned with [27] they emphasized that if teachers want to use technology effectively in teaching learning, teachers are required to increase technological knowledge first then content knowledge and pedagogical knowledge competencies should be ensured. "A study conducted by [28] endorsed that teachers' perceived availability of computer resources was one of the key factors affecting their perceived frequency of technology integration.

7. Conclusion

It is concluded that for effective and advance level teaching the teachers of today are required to incorporate innovative and advanced technologies in their classroom teaching. The adoption of modern technological devices can transform their traditional teaching styles into modern teaching styles. The weak areas of teachers in teacher education institutions were mainly lack of Hardware, and software knowledge, non-familiarity with the arrival of new technologies. However, teachers were using modern devices such as laptops and smart-phone in their personal and professional life. But, use of these devices was not up to the mark. So in present time strong, strong technological background has become an integral part of teaching.

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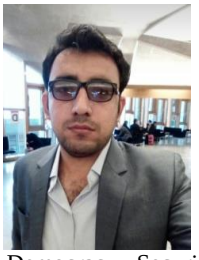

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