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ANALYSING THE PERCEPTIONS AND TECHNOLOGICAL KNOWLEDGE OF TEACHERS AT HIGHER EDUCATION LEVEL

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ABSTRACT

Technology has become the main game changer in all fields of study including education. The purpose of this research study was to analyze the teachers' perceptions about using technology and their technological knowledge at higher education level. A sample size of 123 teachers consisting 79 male teachers and 44 female teachers was selected by using the stratified random sampling technique. The sample was selected from the six social sciences departments of Bahauddin Zakariya University, Multan, Pakistan. The data was collected by adopting a questionnaire based on five point Likert scale. Frequency distribution and descriptive statistics were used to analyse the collected data by applying SPSS-25. The findings of the study indicated that most of the teachers of the social sciences departments of Bahauddin Zakariya University, Multan have positive perceptions about using technology at higher education level though their technological knowledge was not so good. So, it was recommended that trainings and workshops must be conducted to improve the technological knowledge of teachers at higher education level.

Keywords: *Analysing, Perceptions, Technological Knowledge, Teachers, Higher Education Level*

INTRODUCTION

The development of information and communication technology and the requirement to understand current technology for use in teaching and learning process have made teaching as one of the most difficult professions. Technology can offer more adaptable and efficient means or methods for teachers to continue their professional development, enhance their competences, and interact with the global teacher community (Hafeez et al., 2021; Bakhsh et al., 2022). The goal of technology is to raise the efficacy and efficiency of education system by enhancing the performance of teachers and students. Technology enhances the educational process, helps administer and organize educational institutions, and permeates all facets of social and economic life. However, a solid comprehension of the underlying ideas and concepts of technology is required in order to adapt to it (Hafeez et al., 2022).

Technology has substantially enhanced communication and corporate performance and has become a necessary component of our everyday personal and professional life. Through engaging learning activities, the application of technological tools and devices in classroom offers students chances for creativity and collaboration. In order to learning by using various technical tools and gadgets, emerging technologies have generated learning opportunities that challenge standard pedagogical techniques (Iqbal et al., 2021).

Teachers play a crucial role in incorporating technology at all educational levels including higher education. So, their valuable experiences and

suggestions must be completely grasped before any action for integrating the technology is taken (Basit et al., 2021). Technology integration being a complicated process, consists of several aspects such as an individual's perceptions about technology and technological knowledge (Musyaffi et al., 2024).

Teachers' technological competence is a significant element in using technology in the teaching and learning. Technological competence is a comprehensive concept that includes not only the abilities of an individual but also the perceptions, knowledge, and attitudes toward the use of technology (Núñez-Canal et al., 2022). In this regard, technological competence entails successfully applying technology to gather, assess, store, generate, present, share information, interact over the Internet, and engage in collaborative networks (Hafeez et al., 2023). Hourcade et al. (2018) pointed out that technological competence should be viewed as the capacity to integrate context-based knowledge, abilities, and skills. Many teachers of the globe including Pakistan face difficulties in using suitable technological tools according to the requirements of the contents in higher education (Akram et al., 2021). Some of the teachers don't want to use the technology due to the anxiety of not right executing the applied technological tool. Some teachers do not have so much technological knowledge and skills how to integrate the right technological tools in the teaching and learning process and some teachers have strange perceptions about using technology in teaching and learning (Minamatov, 2021).

Objectives

1. To determine the perceptions of teachers about using technology at higher education level.
2. To find the technological knowledge of teachers at higher education level.

Research Questions

1. What are the teachers' perceptions about using technology at higher education level?
2. Do the teachers have technological knowledge at higher education level?

Review of the Literature

Teachers' Perceptions

Teachers' perceptions are often regarded as the most important element influencing technology adoption. Teachers' perceptions are essential because they influence how teachers use or do not use technology (Herro et al., 2021). Teachers' perceptions are critical in influencing if and how much technology is used by the teachers in the classroom. These impressions can affect whether or not a teacher's trust in the educational technology tool is suitable for the content being taught (Iriani & Andjarwati, 2020). Mertala (2019) stated that the way instructors perceive technology has a significant impact on technology usage. Abel et al. (2022) concluded in their research that teachers' perceptions about using technology are affected by their perceptions of the benefits of technology. Moreover, Edannur and Marie (2017) agreed that teachers' backgrounds, including their perceptions, technological knowledge, and openness to try new things, are significant components that can inspire them to technology integration in the classroom. Similarly, Katemba (2020) noted that essential elements influencing successful technology integration in the classroom are related to instructors, such as teachers' perceptions and behaviors.

The majority of the studies on the subject of technology integration is concerned with how people perceive the application of technological tools in education. Given the wide variety of perceptions among instructors, concentrating just on opinions about teaching and learning ignores the complex and nuanced aspect of being a teacher. It has been demonstrated that teachers have opinions on a variety of issues, including opinions regarding instruction. As a result, instructors decide whether or not to employ technology based on whether they believe it will assist them accomplish their educational goals (Redmond & Lock, 2019).

Teacher-centered and student-centered perceptions are the two categories into which teacher perspectives on the use of technology in the classroom have been divided. Instructor-centered perceptions, which are connected with behaviorism, frequently place an emphasis on abiding by moral standards and laws. Instructors manage the learning accomplishment process like a competent specialist in an organized learning environment. On the other

hand, the instructors who adopt a learner-centered perception provide more consideration to the desires and welfare of specific learners. They frequently use instructional strategies inspired by constructivism (Kesh Rana & Karna Rana, 2020).

Technological Knowledge

The instruments utilized in modern education differ greatly from those used in past years, and the age and extent to which young students have access to these resources creates a constantly changing technological environment for instructors to work in. Although instructors and scholars have long recognized this, it does not make it any easier for instructors to negotiate the always shifting environment (Mahmood et al., 2023).

The 21st century students have access to digital resources that enable them to communicate instantly both locally and worldwide stated by Buckley and Hashai (2020). The challenge for teachers is to help students use and comprehend these tools as well as to grasp them themselves. However, being able to do so is essential for both instructors and students, as the abilities and procedures required for using these technologies effectively have long been acknowledged as essential job abilities for success in the twenty-first century.

Teachers must first identify technologies and their intended instructional functions in order to fully comprehend them. Teachers can employ a wide range of contemporary technology tools to improve their lesson plans and student participation. For example, social networking offers a lot of potential as a digital teaching tool if handled wisely and intelligently. Students who use technology tools in educational settings must exercise critical thinking, be able to integrate and analyze real-world events, and have genuine learning abilities. Although there are numerous issues with these technologies, contemporary students are already using them both inside and outside of the classroom (Hafeez, 2021).

The application of technological tools can alter or improve the organization of a classroom. One of the main advantages of educational technology tools is the capacity to relocate simpler learning assignments outside of the classroom, freeing up time in class for more complex critical thinking learning opportunities. Teachers and students may have the time they require to guarantee that more relevant activities are carried out during in-class time as a result of the potential shift in the structure and organization of a typical classroom. Since the conventional classroom environment frequently does not meet the physical demands of students who operate in an interconnected virtual world, this change may even have an impact on how educators think about the actual space in which a class is conducted (Sauers & McLeod 2018).

What is Technological Knowledge?

It's helpful to know how the word "technology" came to be used. Its name is derived from the Greek word technologia, which means the methodical approach to an art. The word "techno" combines the connotations of "art" and "technique," implying both an understanding of the pertinent principles and the capacity to produce the desired effects. To put it another way, technique includes the practical knowledge and abilities of doing. Though the core word logos have a broader definition that includes argument, explanation, and principle, reason is perhaps where it applies to us the most. Therefore, technology includes the use of logic (Durodolu, 2016).

In the late 19th century, the word "technology" in the English language came into limited use to describe the application of science (knowledge) to the creation and use of objects. The advancement of science and technology in the twenty-first century is intrinsically intertwined with the creation of formal knowledge. In general, more contemporary researchers stress the significance of knowledge in defining technology. Recognizing the importance of knowledge encourages us to think of technology as more than just an item, a skill, or a process (Parrish & Sadera, 2019).

The connection between technological knowledge and action, however, is what sets it apart. Although it is believed that technical knowledge has its own abstract concepts, theories, and standards as well as a unique structure and dynamic changes, these are primarily adaptations to the conditions that exist in the actual world. The source of technological knowledge is human action, as opposed to scientific knowledge, which is a reflection of the physical world and its phenomena. Javier (2020) asserted that the intellectual is at the core of the technical process, which is the acquisition and use of a body of

knowledge concerning technique, or ways of doing things. Action is what defines technical knowledge since it establishes and organizes the environment in which it is developed and used.

Technology knowledge cannot be as simply categorized and codified as scientific information due to the connection with a particular activity. When knowledge and expertise are particularly applied to certain technological activities, technology is best portrayed. Kalinga and Ndibalema (2023) stated that there are no universals, or, to put it another way, regular patterns of technical thought. The use of technology necessitates the fusion of several diverse components that are both multichanneled and multileveled, and certain fields of technology influence particular forms of thought. In other words, technology draws on formal knowledge, but its usage is multidisciplinary and tailored to individual tasks.

Forms of Technological Knowledge

Three forms of technological knowledge are distinguished by Vincenti (1984): descriptive, prescriptive, and tacit. Both descriptive and prescriptive knowledge fall under the category of explicit technological understanding; however, whereas descriptive knowledge explains things as they are, prescriptive knowledge specifies what must be done to get the desired results. Activity has implicit tacit knowledge.

Descriptive Knowledge

The foundation for the informed person's work is provided by descriptive knowledge, which takes the shape of factual assertions about things like material attributes, technical details, and tool features. Numerous scientific theories have been applied to produce these findings. Frey (1991) observed that although there could be similarities between the two, technical knowledge has some characteristics that are not evident in or derived from scientific theory. Carpenter (1995) pointed out that, despite the use of mathematical formulas and scientific concepts, descriptive knowledge is not scientific in the sense that the explanatory theoretical framework is not completely formed. Descriptive knowledge, however, comes close to resembling the formal knowledge of a profession since it depicts things as they are, might take the form of rules, abstract conceptions, or general principles, and typically has a cohesive and generalizable structure.

Prescriptive Knowledge

Prescriptive knowledge is the product of repeated attempts to increase efficacy, such as bettering processes or procedures, and it is modified and added to as more experience is gathered (Carroll & Morrell, 2006). Prescriptive knowledge, is more than just common sense; it may be analogous to the acquisition of novel intellectual information, and it is frequently supported by this knowledge (Herschbach, 1995).

Technical maxims or rules of thumb are the earliest efforts to explain generalizations about the development or use of successful skills. Predictions are made at a pre-theoretical level by using prescriptive knowledge that has been learned via experience, experimentation, and trial-and-error in certain ways. Prescriptive knowledge is difficult to codify in a general form, making it less amenable to the creation of instructional generalizations that go beyond a specific activity. Prescriptive knowledge is less bound to scientific principles and law because it is an outgrowth of specific application. Knowledge can be transmitted more effectively the more simply it can be codified (Mitcham, 2000).

Tacit Knowledge

Tacit knowledge is implicit and results mostly from individual judgment, ability, and experience. Tacit knowledge is difficult to convey officially. Tactic knowledge may be explained via descriptions, diagrams, and drawings, but it is mostly the outcome of individual practice and experience. Tacit knowledge frequently consists of trade secrets learned by experienced workers, and it is frequently protected or limited information.

A considerable portion of tacit information cannot be transferred orally or in writing. It is subjective knowledge, personal knowledge, and direct and specific information. Working beside an experienced mechanic or artisan is the best way to absorb tacit knowledge. Tacit information is mostly passed down from one person to the next (Venkitachalam & Busch, 2012). Perrin (1990) stated that operational information remains tacit mostly because it cannot be conveyed rapidly enough, because it is challenging to describe everything needed for a successful

performance, and because an incoherent message is produced by paying obsessive attention to details.

Levels of Technological Knowledge

While embracing the categories of knowledge outlined by Vincenti (1984) and Frey (1991), the authors draw attention to the various degrees of technical knowledge and notes that as technological knowledge becomes more sophisticated, the quantity of discursive knowledge also becomes more complicated. The lowest level of abilities are artisan or craft skills, which are mostly tacit and entail prescriptive knowledge and to a lesser extent descriptive knowledge. The greatest way to teach artisan skills is through observation, imitation, and trial and error rather than conversation due to the high degree of tacit knowledge.

The next level of technological knowledge was technical maxims, which are generalizations regarding the abilities used in manufacturing or using technology. Technical maxims, on the other hand, are frequently inadequate without the less recognized tacit knowledge that comes with doing (Carpenter, 1995). As a result, technical maxims, rules, recipes, and processes are typically best learnt in connection with ongoing action, which is often on the job.

The next step is descriptive laws, which are clear, generalized formulations developed directly from experience. They are known as empirical laws because they are developed from experience and are mostly established via trial and error (Mitcham, 2000). Although very complex and employing formula and mathematical equations in addition to verbal explanation, descriptive laws are not yet scientific since they lack appropriate explanatory theory. Laws that are descriptive lend themselves well to organized training (Gimbert & Cristol, 2004).

The highest degree of technical theories is those that systematically connect a number of rules or offer a comprehensive justification. Scientific knowledge is applied to actual conditions in technological theories. Modern technology makes more use of theoretical knowledge, which is one feature that makes it resemble a discipline (Yücel & Koçak, 2010). Although theories are a growing part of technological knowledge, this does not lessen the importance of prescriptive and tacit knowledge that has been gained through actual experience, nor does it change the fact that the context in which technological theories are significant is determined by their use.

Therefore, there is a loose but significant relationship between the complexity of technological knowledge, potential degrees of employment, and formal education. Craft and artisan activities heavily rely on tacit knowledge related to manual or procedural skills that are best acquired via practical experience. The highest level are technological conceptions and descriptive principles that are ingrained in work activity. At this level of employment, engineers and technicians are trained mostly via formal education. Technical positions fall somewhere in the middle and heavily rely on prescriptive and descriptive information acquired both on and off the job. However, tacit knowledge is used in every work.

Research Methodology

Research Design

The quantitative survey research design was employed in this study. The data was gathered using a survey approach.

Sampling Technique and Sample Size

For the current study, stratified random sampling technique was used to select the appropriate sample as the population consisted of different strata's (University, Department, Male and Female). A sample of 123 teachers consisting 79 male teachers and 44 female teachers was chosen by following the stratified random sampling technique from the six social sciences departments (Education, Psychology, Political Science, Economics, Sociology, Management sciences) of Bahauddin Zakariya University, Multan, Pakistan.

Development of Data Collection Instrument

In this research, a questionnaire was adapted from the research studies conducted by (Afari & Achampong, 2010; Mollaei & Riasati, 2013). The questionnaire was comprised of 2 factors including perceptions of teachers about using technology and technological knowledge of teachers. The items of standardized questionnaires were slightly modified in the light of pilot testing results as well as in the light of expert opinion. The questionnaire was based on the five point Likert scale having options of strongly disagree, disagree, neutral, agree and strongly agree and consisted of 16 items to analyse the perceptions

of teachers about using technology and technological knowledge at higher education level.

Analysis of Data

The collected data from the teachers through a questionnaire was analyzed by using the SPSS-25. The data was analysed by applying frequency distribution, descriptive statistical tools to determine the teachers' perceptions about using technology and technological knowledge at higher education level.

Results

Frequency Distribution of Demographic Information of Teachers

Table 1: Frequency Distribution of Demographic Information of Teachers

Variable	Frequency	Percentage (%)
Gender		
Male	79	64.22%
Female	44	35.78%
Total	123	100%
Academic Qualifications of Teachers		
M. Phil	41	33.34%
Ph.D	82	66.66%
Total	123	100%
Department Wise Teachers		
Education	18	14.63%
Psychology	17	13.82%
Management Sciences	46	37.39%
Economics	15	12.19%
Sociology	13	10.56%
Political Science	14	11.41%
Total	123	100%

Table 1 shows the frequency distribution of the teachers' demographic information. Table shows that from the total sample of 123 teachers, 78 were male teachers and 44 were female teachers. The percentage of male teachers was 64.22% and it was 35.78% for female teachers. The frequency distribution regarding academic qualifications of teachers showed from the total sample of 123 teachers, 41 teachers were M. Phil qualified and 82 teachers were Ph. D qualified. The percentage of M.Phil. qualified teachers was 33.34% and the percentage of Ph. D qualified teachers was 66.66%. The frequency distribution regarding the department shows that from the total sample size of 123 teachers, 18 teachers were from the education department, 17 teachers were from the psychology department, 46 teachers were from the management sciences department, 15 teachers were from the economics department, 13 teachers were from the sociology department and 14 teachers were from the political science department. The percentage of teachers from the education department was 14.63%, from the psychology department 13.82%, from the management sciences department 37.39%, from the economics department 12.19%, from the sociology department 10.56%, and the percentage of teachers from the political science department was 11.41%.

Teachers' Perceptions

The first objective of this research study was "To determine the perceptions of teachers about using technology at the higher education level" and the research question regarding this objective was "What are the perceptions of the teachers about using technology?". To determine the perception of teachers about using technology descriptive statistical analysis was done. The results of descriptive statistical analysis are presented in Table 2.

Table 2: Perceptions of Teachers About Using Technology

Sr. No	Statement	M	SD
1	I think technology makes me more professional in teaching	3.21	0.862
2	I believe that using technology changes the learning climate of the classroom	3.42	0.791
3	Efficient use of technology creates a positive relationship between teachers and students	3.19	0.721
4	I feel that using technology makes my teaching more effective	3.37	0.740
5	Technology satisfies the learning requirements of the learners	3.51	0.729
6	Using technology helps me in preparation of my teaching materials	3.61	0.634
7	I feel more confident in using technology in teaching	3.22	0.880
8	I think that the integration of technology greatly influences teaching styles	3.29	0.651
	Overall	3.29	0.751

Table 2 shows the results of the descriptive statistical analysis of perceptions of teachers about using technology at higher education level for each statement and overall. The mean value (M) for the statement that I think technology makes me more professional in teaching was 3.21 and the standard deviation (SD) was 0.862 for this statement. As the value of the mean for this statement is more than 3 So, most teachers think that technology makes them more professional in teaching. The M value for the statement that I believe that using technology changes the learning climate of the classroom was 3.42 and the value of SD was 0.791. As the mean value for this statement is more than 3 so, most of the teachers believe that using technology changes the learning climate of the classroom. The mean value for the statement that efficient use of technology creates a positive relationship between teachers and students was 3.19 and the value of SD was 0.721. As the mean value for this statement is more than 3 so, most of the teachers think that efficient use of technology creates a positive relationship between teachers and students. The M value for the statement that I feel that using technology makes my teaching more effective was 3.37 and the value of SD was 0.740. As the mean value is more than 3 so, most of the teachers think that technology makes their teaching more effective. The M value for the statement that technology satisfies the learning requirements of the learners was 3.51 and the value of SD was 0.729. As the mean value is more than 3 so, most of the teachers think that technology satisfies the learning requirements of the learners. The M value for the statement that Using technology helps me in the preparation of my teaching materials was 3.61 and the value of SD was 0.634. As the mean value is more than 3 so, most of the teachers think that using technology helps them in the preparation of their teaching materials. The M value for the statement that I feel more confident by using technology in teaching was 3.22 and the value of SD was 0.880. As the mean value is more than 3 so, most of the teachers feel more confident by using technology in teaching. The M value for the statement that I think that integration of technology greatly influences teaching styles was 3.29 and the value of SD was 0.651. As the mean value is more than 3 so, most of the teachers think that integration of technology greatly influences their teaching styles. The overall mean value of the perceptions of teachers about using technology in higher education was 3.29 and the SD value was 0.751. As the overall mean value is more than 3 so, most of the teachers have positive perceptions about the use of technology in higher education.

Technological Knowledge

The second objective of this research study was "To identify the technological knowledge of teachers at higher education level and the research question regarding this objective was "Do the teachers have technological knowledge at higher education level?" The results of the descriptive analysis of the technological knowledge of teachers are shown in Table 3.

Table 3: Technological Knowledge of Teachers

Sr. No	Statement	M	SD
1	I know how to solve my technical problems	2.78	0.887
2	I have enough knowledge about how to use the technological tools in teaching	2.67	0.782
3	I know the recent developments in technology used in teaching and learning	2.92	0.887
4	I have enough knowledge about technology to get my teaching job done	2.97	0.714
5	I have enough knowledge to teach technology-related courses proficiently	2.73	0.792
6	I have enough knowledge about how to deliver online lectures by using different technological tools	3.11	0.872
7	I know how to use different websites for preparing teaching materials	2.99	0.654
	Overall	2.79	0.798

Table 3 shows the results of the descriptive statistical analysis of the technological knowledge of teachers for each statement and overall. The mean value (M) for the statement that I know how to solve my technical problems was 2.78 and the value of standard deviation (SD) was 0.887. As the mean value was less than 3 so, most of the teachers didn't know how to solve their technical problems. The M value for the statement that I have enough knowledge about how to use the technological tools in teaching was 2.67 and the value of SD was 0.782. As the mean value is less than 3 so, most of the teachers don't have enough knowledge about how to use the technological tools in teaching. The M value for the statement that I know the recent developments of technology used in teaching and learning was 2.82 and the value of SD was 0.887. As the mean value is less than 3 so, most of the teachers don't know the recent developments in technology used in teaching and learning. The M value for the statement that I have enough knowledge about technology to get my teaching job done was 2.97 and the value of SD was 0.714. As the mean value is less than 3 so, most of the teachers don't have enough knowledge about technology to get their teaching job done. The M value for the statement that I have enough knowledge to teach technology-related courses proficiently was 2.73 and the value of SD was 0.792. As the mean value is less than 3 so, most of the teachers don't have enough knowledge to teach technology-related courses proficiently. The mean value for the statement that I have enough knowledge about how to deliver online lectures by using different technological tools was 3.11 and the value of SD was 0.872. As the mean value is more than 3 so, most of the teachers have enough knowledge about how to deliver online lectures by using different technological tools. The value of M for the statement that I know how to use different websites for preparing teaching materials was 2.99 and the value of SD was 0.654. As the value of the mean is less than 3 so, most of the teachers don't know how to use different websites for preparing teaching materials. The overall mean value was 2.79 and the value of SD was 0.798. As the overall mean value is less than 3 so, the results of the descriptive statistical analysis showed that most of the teachers don't have technological knowledge in social sciences departments of BZU at the higher education level.

Discussion

The teachers' perceptions are regarded as an important element for technology adoption in the classroom. Teachers' perceptions are essential because they influence how teachers use or do not use technology in their classrooms. More than 60 years of research on teacher's perceptions has provided good evidence for the premise that perceptions play a key role in determining teacher's behavior in the classroom. Teachers' perceptions are a prominent focus of research in the context of technology integration since they are assumed to impact how and why teachers may or may not modify their teaching to embrace a new curriculum, accept new instructional techniques, and implement new projects. Teachers perceptions seem to be a strong forecaster of technology integration (Baek et al., 2018). Buabeng-Andoh (2012) pointed out that teachers' decisions on using technology in teaching are influenced by their perceptions. Similarly, Sailer et al. (2021) stated that important aspects of successful technology integration in the classroom are related to teachers themselves, such as teachers' perceptions, technological knowledge, and skills.

The findings of this study related to perceptions of teachers about using technology showed that most of the teachers have positive perceptions about technology usage in teaching. The mean value for the perceptions of teachers about using technology in teaching was 3.29 showing that most of the teachers of social sciences departments of BZU perceived technology as a useful helping phenomenon to be used during the teaching and learning process. So, the findings of this study the evidence that perception is the most crucial element for the successful integration of technology in teaching as stated by the findings of many studies (Redmond & Lock, 2019). Koyuncuoglu (2022) stated that technology integration in the teaching and learning process heavily depends on technological knowledge. It demonstrates how a teacher uses technical expertise according to the subject matter and requirements of the students. A teacher who has more technological knowledge can create a conducive learning environment according to the requirements of the learners and subject matter and can use technological tools more effectively resulting in useful learning. Technological knowledge is more than just a collection of facts, rules, theories, and general information that is imparted to pupils; it is more than that. Individuals struggle with the application of knowledge, whether it be conceptual, analytical, or manipulative, and technical knowledge is dynamic, with meaning being formed and reconstructed as they do so. When used in real-world situations, generalizations, ideas, principles, technical maxims, and processes gain significance. The findings of the current study related to the technological knowledge of teachers showed that most of the teachers don't have the technological knowledge to be used in teaching. The mean value for the technological knowledge of teachers was 2.79 showing that most of the teachers of the social sciences departments of BZU don't have technological knowledge to be used in teaching at the higher education level. These findings are closely related to the studies conducted by (Adedokun-Shittu & Shittu, 2015; Singhavi & Basargekar, 2019).

Conclusion

It was concluded that most of the teachers of the social sciences departments of Bahauddin Zakariya University of south Punjab don't have technological knowledge though they have positive perceptions about using technology at higher education level. So, on the basis of the results of the study, it is recommended that trainings and workshops must be conducted to improve the technological knowledge at higher education level.

Conflict of Interest

The authors declared that they have no conflict of interest.

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