Analyze the knowledge and Understanding of Science Teachers Regarding the use of Educational Technology in Teaching Learning Process

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Abstract
The teachers of today's technology enriched environment are encouraged to use ICT tools by the government, school management and parents for teaching learning process for better . In particular, the teaching of science classroom of 21st century requires the use of educational technology for its practical activities and hand on experiments. The purpose of this study was to analyse the knowledge and understanding of science teachers regarding the use of educational technology in teaching learning process. It was quantitative study. The nature of the study was descriptive and survey type. All the Heads of institutions, Science Students and Science Teachers of Secondary level (Grade-X) in Islamabad Model Colleges were the population of this study. Simple Random sampling technique was used to select the sample from the head of different institutions, Science teachers and Science students. The entire process of sampling was done in a single step with each subject selected independently of the other members of the population. The sample of this population included 10 Head of Institutions, 120 Science Teachers and360 Science Students (180 Male and 180 Female). Over all four questionnaires were developed, questionnaire for the science teacher, questionnaire for the science students. The Quantitative data were analyzed with the help of SPSS in the form of percentage, Mean, Frequency, Standard Deviation (SD) and Chi Square.
Keywords: Knowledge, Understanding, Science Teachers Educational Technology, Teaching Learning Process

Introduction

The universalization of contemporary age of 21st century has revolutionized all walks of life including the field of Education. In Education, the utilization of Educational Technology in the form of Information and Communication Technology has played leading role in growth and development to enhance the quality Education worldwide. Educational Technology is the set of tools that are developed b is the set of tools that are developed the human beings to monitor and improve the knowledge and changes in material environment. The educational technology methodologies changed from the initial use of merely instructional tools to the advanced devices of the modern world which includes: digital technologies, simulations, problem based learning, use of face book, twitter and Instagram as a social network, cloud computing, flipped classroom, animations. The use of these technologies have revolutionized the whole culture of the world especially the field of education (Tezci, 2018).

The understanding and mastering of basic skills of ICTs are regarded as the part of core education in addition to writing reading and numeracy. The Educational Technology helps to eradicate the cultural, social, economic and technical hurdles confronting the field of Education, by developing new models, ways and technologies so that the performance of

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teaching learning process can be improved (Galanouli & McNair, 2008).

Today, the use of technology has become unavoidable in teaching learning process for the enhancement of excellence of education and to prepare the generation of 21st century to play commendable role at his work place. Treacy (2011) with the advent of educational technology, its use started in the field of education to create positive attitude of the Now the technology is being students by their active participation in teaching learning process through exciting, collaborating technological practices. The positive attitude helps the science students in effective gaining of knowledge, skill enhancement activities and inspiration. According to Bryman (2017), If students have positive attitude towards science, they will not fall behind the times by using technology directly on education process, they might be more interested in this field and prefer professions related with science in the future A. George. Cross-Domain Analysis of Change in Students' Attitude.

The studies conducted by Mattern & Schau, Realizing the today's technological innovations and industrialized standing of education, it has now become quite indispensable to use educational technology to remove educational complications.in this way encouraging outcomes from the students having different ways of learning can be achieved through technological enriched teaching learning process successfully. For this purpose, inclusion of technologically competent teachers in teaching learning process is obligatory so that technological pedagogical content knowledge can be incorporated to solve difficulties of the students by creating new knowledge with the help of technology (Daniels, 2013).

The use of technology for science education helps the students to construct their knowledge with technology supported activities which creates active learning, improved student involvement and value added social interaction of the students Geer and Sweeney (2012). The use of technology in science teaching actually provides number of opportunities for the students like animation, visualization and vocalization which help in structuring of students' knowledge, creating stimulating interest and increasing motivational level. According to Ardac & Unal science concepts in the form of abstract notions can be effectively explained ensuring permanent learning by using educational technology in the form of audio-video presentation. The literature on the contribution of technology supported environment supporting science learning reveals that the technology supported teaching learning process helps in the development of positive attitude among the students in science learning process, effective participation of the students, martialing theoretical abstract knowledge supporting constructive learning and ultimately creating meaningful and lifelong learning.

The potential and experience of science teacher to integrate educational technology is considered as pre requisite for effective use of these resources. The experienced teacher can very easily save his time during integration of educational technology (Roblyer, 2016). All the stake holders related to the field of education have strongly emphasized on the importance and need to bring a change in the students' attitudes, to shift the student from rote memorization to true understanding of concepts by using educational technology. This allows the students to use technology in innovative ways to learn more about educational technology (Chandrasekhar, 2012).

The benefits of Technology in teaching learning process mainly depends upon the teacher's attitude of Teacher. The potential and experience of teacher to integrate educational technology particularly for Science teaching is considered as pre requisite for effective use of

these resources. The experienced teacher can very easily save his time during integration of Educational Technology to create productive teaching learning process (Roblyer, 2016). According to the Science Education Reforms of The American Association for the Advancement of Science, It is mandatory for the Science Teacher to have sufficient knowledge to integrate technology and inquiry based teaching learning process in to their instruction so that science students can be prepared for the 21st century demands. The National Science Education Standards (NSES) demand that teachers should apply "a variety of technologies, to support student inquiry based learning. This brings a change in the students' attitudes, to shift them from rote memorization to true understanding of concepts by using Educational Technology (Novak & Krajcik, 2015).

The power of using Educational Technology is an innovative and quick way to achieve better learning outcomes. One of the basic reason for using ICT tools in teaching learning process is to prepare the generation of 21st century for their work place. The Ministry of Federal Education and Professional Training intends to exploit the power of ICT tools for quick gains in access and quality in the field of Education in Pakistan. In fact this is not only the priority of the present Government but it also remained the preference of previous regimes during about last forty years. The formulation of National ICT strategy, the objectives of National Educational polices of 1998, 2009, 2017, 2018 Dakar declaration-2017, HEC-Vision 2025 about integration & effective use of ICT in teaching learning process at Alimentary level, Secondary level and in Teacher Education, are no doubt the continuity of this effort. What is the level of achievement of this objective in Pakistan after formulation of policies and taking necessary steps at National level to materialize this concept is yet to be answered, particularly the "Analysis of using Educational Technology for effective science teaching at secondary level in the light of National Professional Standard on ICT in Pakistan, is yet to be investigated. Rizvi and Khamis (2019) The National Professional Standards are the gadgets for the assessment of quality of education having three basic components: Knowledge& understanding, Disposition and skill level of Science teacher (21st century 4Cs skills: Collaboration, Communication, Critical thinking and Creativity).

This study was designed by taking public sector educational institutions of Islamabad working under the Federal Directorate of Education Islamabad. The analysis of this study has provided a thorough feedback showing the weak areas, the sigficance of the leading role of head of institution, the hurdles in the utilization of educational technology for effective science teaching learning process. This study has provided the foundation to take further initiatives by the Government for the implementation and effective use of Educational Technologies for Science teaching in Pakistan to prepare the present day learner for the 21st century work place and to keep up with the ever changing modern world of today.

Objective of the Study

The objective of the study was to evaluate the Knowledge and Understanding of Science Teachers regarding the use of Educational Technology in teaching learning process.

Research Methodology

It was quantitative study. The nature of the study was descriptive and survey type. All the Heads of institutions, Science Students and Science Teachers of Secondary level (Grade-X) in

Islamabad Model Colleges were the population of this study. Simple Random sampling technique was used to select the sample from the head of different institutions, Science teachers and Science students. The entire process of sampling was done in a single step with each subject selected independently of the other members of the population. The sample of this population included 10 Head of Institutions, 120 Science Teachers and360 Science Students (180 Male and 180 Female). Over all four questionnaires were developed, questionnaire for the science teacher, questionnaire for the science students. The Quantitative data were analyzed with the help of SPSS in the form of percentage, Mean, Frequency, Standard Deviation (SD) and Chi Square.

Results

Figure 1 shows the cumulative percentage responses of teachers for each statement. This shows that in 8 out of 13 statements, 50% or more teachers claim to use either always or usually. Whereas for statements S2 (Science teachers make group discussion for difficult concepts and problems using WhatsApp), S3 (Video conferencing is used for a debate during the teaching of Science (debating).), S4 (ICT tools are utilized for brainstorming of Science Students), S8 (Students' ideas are taken in to consideration by the Science Teacher through observation using electronic devices) and S11 (Science teachers can share notes of Science subjects with their students through google drive) this percentage is less than 50%.

Figure 1. Percentage Teachers' Responses for Knowledge and Understanding of Science Teacher regarding the Use of Educational Technology in teaching learning process

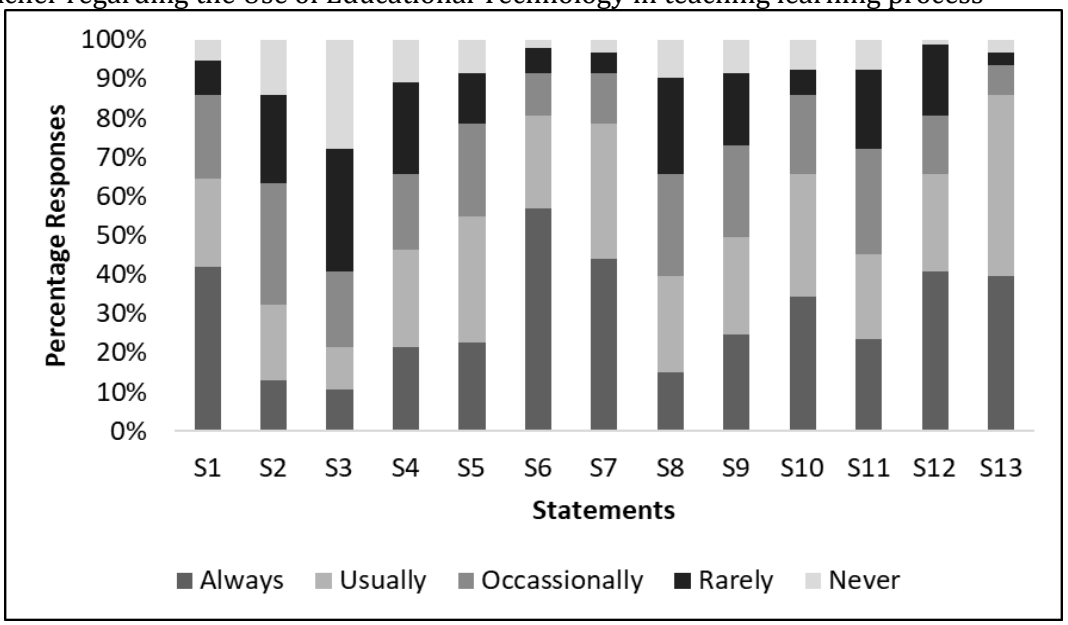
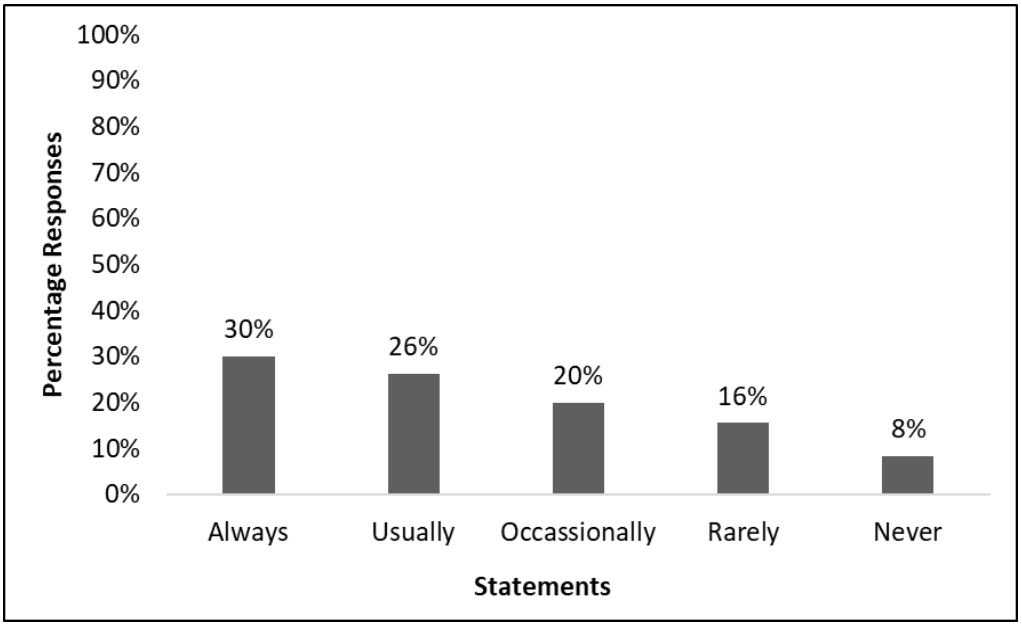


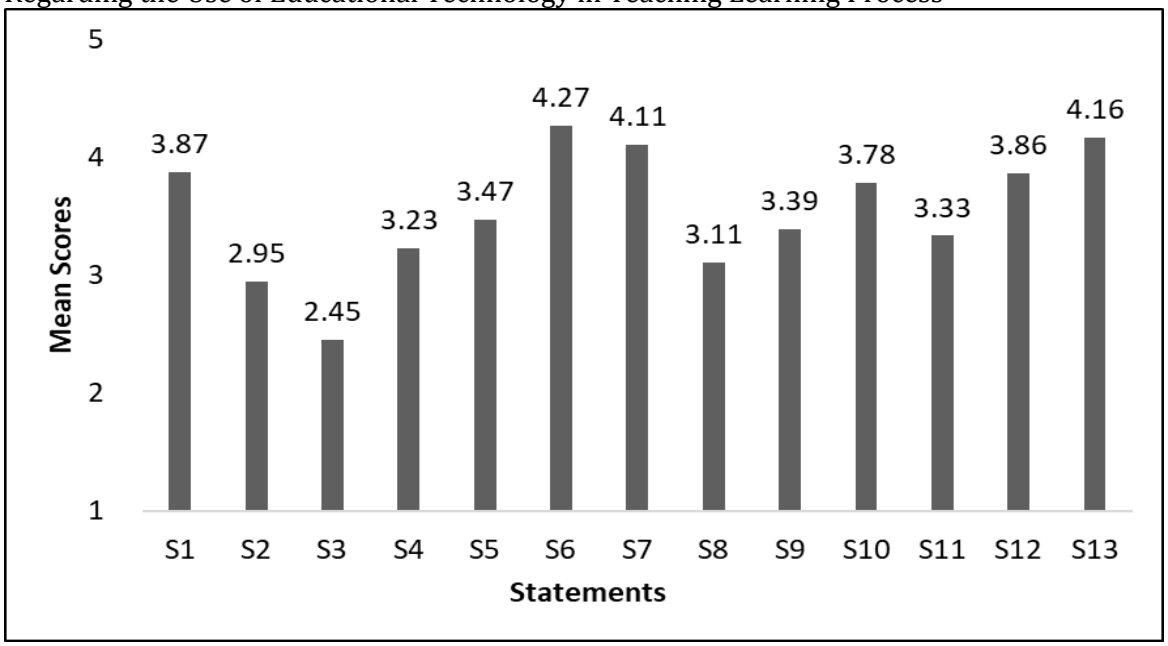
Figure 2 shows the cumulative percentage average of teachers' responses for all the thirteen (13) statements. This shows 30% teachers claims to have sufficient "Knowledge and Understanding regarding the Use of Educational Technology in teaching learning process", 26% teachers use usually, 20% uses occasionally, 16% rarely and 8% never use.

Figure 2. Cumulative Average Percentage Teachers Responses for Knowledge and Understanding of Science Teacher regarding the use of Educational Technology in teaching learning process



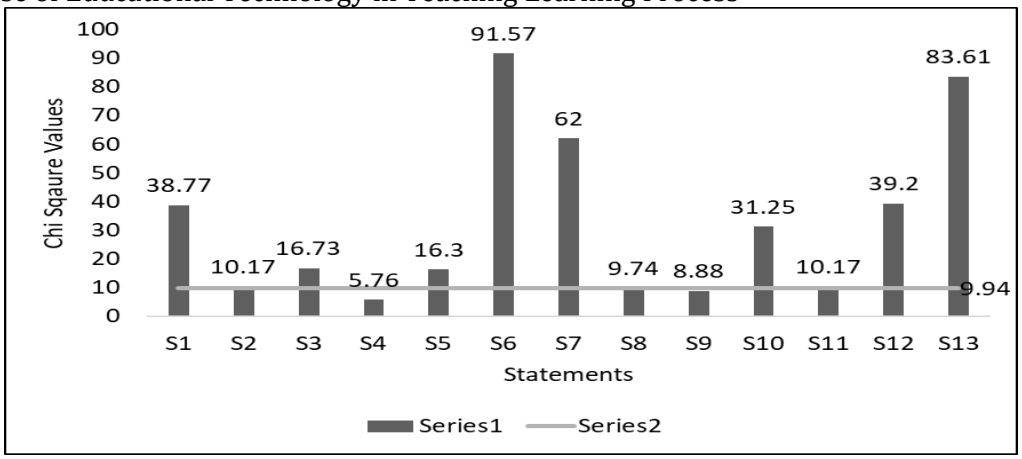
Similarly, Figure 3 shows the comparison of all thirteen (13) statement. This shows that teachers, "Knowledge and Understanding regarding the Use of Educational Technology in teaching learning process" for 3 out of 13 (S6, S7 and S13) lies between Always and Usually, for 8 out of 13 (S1, S4, S5, S8, S9, S10, S11 and S12) lies between Usually and Occasionally, whereas for 2 out of 13 (S2 - Science teachers make group discussion for difficult concepts and problems using WhatsApp and S3 - Video conferencing is used for a debate during the teaching of Science (debating)) it lies between Occasionally and Rarely.

Figure 3. Comparison of Mean Scores for Knowledge and Understanding of Science Teacher Regarding the Use of Educational Technology in Teaching Learning Process



The Chi square values as given in Figure 4 shows that science teacher's knowledge and understanding regarding the use of educational technology in teaching learning process is positive for 11 out of 13 statements against critical value of 9.94 at 0.05 confidence level and 4 degree of freedom. Therefore, all 11 statements are accepted. On the other hand, statement S4 (The two areas ICT tools are utilized for brainstorming of Science Students) and S9 (Teacher facilitates discussion about difficult concepts using videos) have low chi square values as compared to critical value of 9.94. This shows that teachers don't have positive attitude towards these two statements. Therefore, both are rejected.

Figure 4. Chi Square values for Knowledge and Understanding of Science Teacher Regarding the Use of Educational Technology in Teaching Learning Process



Findings

The Chi square values as given in Figure 4 shows that science teacher's knowledge and understanding regarding the use of educational technology in teaching learning process is positive for 11 out of 13 statements against the critical value of 9.94 at 0.05 confidence level with 4 degrees of freedom. Therefore, all 11 statements are accepted. Whereas two statements i.e., "ICT tools are utilized for brainstorming of Science Students" and "teacher facilitates discussion about difficult concepts using videos" have low chi square values as compared to critical value of 9.94. Therefore, both the statements were rejected. This shows that science teachers have lesser knowledge in these two areas i.e. knowledge and understanding of science teacher for using ICT tools for brain storming of his students and use of videos to explain the difficult topics of science is very weak.

Conclusion

Data shows that there is scarcity of ICT tools in majority Islamabad Model Colleges and only few tools are available in some of the institutions. Classroom observation also revealed that available tools in Islamabad model colleges are not being properly used by majority science teachers. However, there are only few teachers, who use these available tools properly and few others could use these ICT tools partially. Teachers, students and Head of institutions strongly agree/agree to use of ICT tools in teaching science. They all believe that use of ICT in teaching science will help to increase motivation, confidence and conceptual clarity specially in understanding scientific phenomenon. Most of the Islamabad model colleges lack ICT tools and infrastructure to facilitate science teaching learning process, in spite of having relatively better human and physical resources as compared to the other educational institutions in the country. Provision of tools and equipment is needed to increase use of ICT for effective teaching of all the science subjects including biology, chemistry and physics.

Recommendations

Firstly, the policy makers and educational leaders should increase the availability of funds for the establishment of technology enriched classrooms for the effective science teaching. Secondly, there should training programs organized by the FDE or Ministry of Federal Education and Professional training needed for the improvement of knowledge and understanding of all the science teachers so that pedagogy of science teaching and theory of using educational technology can be integrated for the enhancement of quality education.

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