

Effects of ICT on Student's Learning at Secondary Level in Private Schools of the Punjab

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Abstract

This research paper explores “Effects of ICT on student learning at the secondary level in private schools of Punjab”. The objectives were as: to find effects of obtain ability of ICT resources on students learning at the secondary level in private schools of Punjab (Pakistan), to identify effects of approachability of ICT resources on students learning at the secondary level in private schools Punjab (Pakistan), and to explore effects of user-ability of ICT resources on students learning at the secondary level in private schools of Punjab (Pakistan). In this research paper, the researcher used the quantitative method of the research which is descriptive in nature. The questionnaire was adapted from a research conducted at Makerere University by Opira Geoffrey (Geoffrey, 2010). The questionnaires were distributed among 250 participants and all participants filled the questionnaire out of which 150 were the male students and 100 were the female students. The sample of the study selected randomly from the private school of Punjab. A regression analysis was applied to identifying the effects of independent variables on student learning. The results indicate that there is a strong relationship between sufficiency and students learning, the results indicate that there is a strong relationship between approachability and students learning and the results indicate that there is a strong relationship between user ability and students learning if the user ability of ICT resources is positive in schools than the students learning is good and if the user ability of ICT resources is negative in schools than the students learning is not good. The future researchers can research the Effects of ICT on students learning at the secondary level in public schools of Punjab (Pakistan).

Keywords: *ICT, learning, technology, Learning, Sufficiency*

1. Introduction

In the current scenario, teaching is the most difficult profession in these days because knowledge is growing very quickly in the era of the demanding environment of computer technology. In the field of education, the modern technology is becoming most crucial besides the other educational resources (UNESCO, 2002).

In the formation of the modernized society, the communication technology is becoming basic formation material in the very short period. Most of the countries of the world now recognizing the importance of the communication technology in the education as well as other

fields of the life. Every institution is providing the crucial skills to their students in the education field to coop with the modern world in each and every field (UNESCO, 2002).In Pakistan, the Government of Punjab organized information and communication laboratories on apriority basis in public and private sector.

In our society, the use of information communication technologies is becoming highly complex and complicated. The qualification of communication technology is compulsory for every individual in the society for step forwarding in the society with the other individuals and groups of the society. ICT know-how is mandatory in our working places, social places, and personal matters. The ICT is rooted in our lives because the technological development growing rapidly in our modern society. In our educational organizations ICT students and scholars are living in the world of information and communication technology (Curriculum and Assessment Development the National Council of UK 2004).

This research explores the obtainability, approachability, sufficiency, and user-ability of ICT resources in private schools of Punjab and ultimately its effects on students learning.

1.1. Problem Statement

In the educational discussion, the learning of the students has vital worth and importance. In educational and other organizations ICT provides threshold in teaching and learning. ICT providesalot of opportunities in the learning processes in any type of institutions. However, in Pakistan particularly in Punjab still, there are many challenges in the transformation of the students learning processes with the aid of information and communication technology. Learning processes in public and private educational institution in Punjab are victimizing due to the lack of resources, skills staff, and cooperation of the Government. There is a need to develop a proper and effective system for the effective use of ICT resources in the educational institution of Punjab (Pakistan).

The concern in the selection of this problem is that investment to the ICT reference is going to waste and the teaching processes in the educational institutions are still slow and sluggish. The educational organizations fail to produce the students who can fulfill the market requirement after the completion of their degrees. There is need to examine the effect of obtainability, approachability and user ability of the resources of ICT on students learning at the secondary level in Private Schools of Punjab.

1.2. Objectives

The objectives of the current study were:-

1. To identify the effects of obtainability, approachability, sufficiency, and user-ability of ICT resources on students learning at the secondary level in private schools Punjab (Pakistan).
2. To find the relationship between obtainability, approachability, sufficiency, user-ability of ICT resources and students learning at the secondary level in private schools Punjab (Pakistan).

1.3. Hypotheses

The study was guided by the following hypotheses:

H₀₁: There is no significant relationship between *obtainability* and *student learning*.

H₀₂: There is no significant relationship between *sufficiency* and *student learning*.

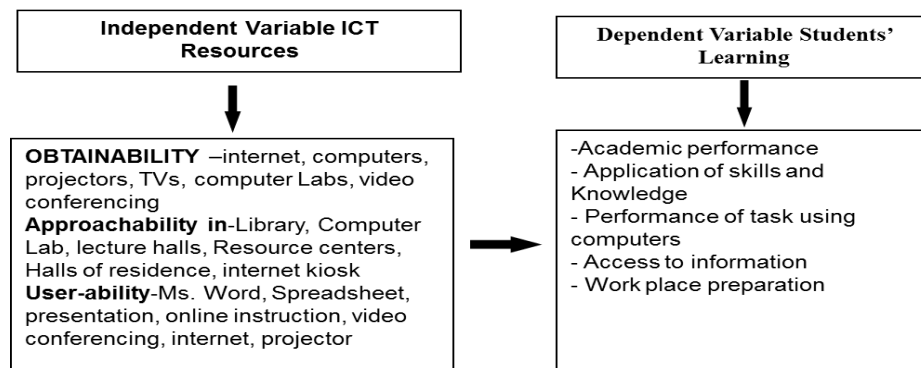
H₀₃: There is no significant relationship between *approachability* and *student learning*.

H04: There is no significant relationship between *user-ability* and *student learning*.

1.4. Conceptual Framework of the Study

Presence and use of ICT assets by students and teachers are to give a method for cooperation. These associations give criticism which goes about as strengthen towards the learning procedure. Sight and sound applications like games, drills, movement and other graphical applications gives practices that appear as inquiries (stimulus) and replies (reaction) outlines which opens the students to subject in continuous steps thus creating more enthusiasm for the topic which over the long haul influences their scholastic execution and gives them the yearning to attempt and utilize this obtained information in an alternate setting.

Conceptual framework:



Source: Adopt from (Geoffrey, 2010).

1.5. Significance

This study has importance for the policy makers and Government administrators of Punjab (Pakistan). The results, conclusion and the proposed recommendations should be helpful for the teachers in the learning processes in the educational institutions. The results obtained in this research is useful for the other research in future research with the interest in the examination of more effects of ICT on student learning. This study will lead to the exploration of new ideas for the use and implementation of the ICT resources in educational institutions.

2. Literature Review

2.1. Theoretical Review

The theory of Cognitive Flexibility was a base of this research, cognitive Flexibility means the ability to spontaneously restructure one's knowledge in many ways, in the adaptive response to radically changing situational demands (Goeze, 2014).

The Theory largely concerns with the transfer of knowledge and skills beyond their initial learning situation. Bauer, (2016) stated that focuses on the Kirkpatrick's "four levels of evaluation the author has focused on reactions, learning, transfer, and Results. While debating on these four areas Kirkpatrick's views' learning' as a tool to measure the reaction of the student during the training program. He added 'Learning' helps to elaborate answer the questions whether they like the material and was the material belong to their task (Silberman, 2015).

However, learner reactions have different impact ability on learning stage, such as negative reaction mostly decrease possibility (Winfrey, 2006). Moreover, Learning stage goes beyond the students satisfaction and provide the results whether student has gained new ways of learning methods such as enhancement of knowledge and contemporary skills (Winfrey,2006) (Spiro, 1992) explain further ‘Transfer’ stage of Cognitive Flexibility theory gives the almost finishing results of training program such as advancement in learners behavior because of the inducement of newly ICT program and also whether it could be possible for learner to employ the new skills and knowledge in everyday learning programs? For the detailed explanation of ‘Transfer’ stage (Yamnill & McLean, 2001) describe skills transfer can be termed as student ability to deploy the skills and knowledge learned during the training program. They also go further and state ‘Transfer’ stage consists of two stages; one is near transfer and other is far transfer. ‘Near transfer’ usually belong to give the same steps of ICT instructions to always applied in the same patterns; it helps the trainer to easier transform the knowledge and skills (Yamnill & McLean, 2001) Far transfer stage belongs to deploy knowledge in very different situation, this stage helps the student to test his knowledge according to changing situation (Allessi & Trollip, 2001).

2.1. Conceptual Review

According to The World Bank (2003), ICT is considered as a set of electronic tools for helping the analyzing, transmitting and presenting information in effective manners. Moreover, ICT refers to computer and internet related devices users utilize to develop distribute and communicate informative data (UNESCAP, 2001) in this research ICT is view as a tool to gather, processed and disseminate information in a productive manner.

In detailed ICT is combined with hardware and software peripherals; such as hydraulic machine, radios, calculator, and tele fax, mobile and other robotic devices as well.

Bakkabulindi (2002; 2007) gives the details views about the ICT devices, as per his views ICT can categorize into two types: the first type of ICT combined the devices to convert data into information such as calculator, machine, typewriter, and computers, while other types of devices directly belong to distributing and delivering of information from one channel to another channel. Devices used for transferring data from one source to another source name as telephone, tele fax, telegraph and computer networks. Tools which use for delivering information call as interactive gadgets; interaction explains the link between devices and user.

Furthermore, in this study ICT is also term as obtainability, approachability, and user-capacity to these devices. These three parts of ICT have different importance and functionality for users. In the views of (Holmer, (2016) the presence of ICT resources known as ‘obtainability’ while ‘approachability’ term define the degree of up to what extent resources is available to users and last ‘user -ability’ function human capacity to use these resources for satisfying their needs.

2.2. Obtainability of ICT Resources and Student’s Learning

The usage of modern technology like computers, peripherals, networking and other range of technology has become an essential part of learning in last few decades for students and teachers. With the inducement of ICT, the student can understand the education in an effective manner which does not only increase the knowledge of student but also save the time period for the accomplishment of the task.

2.3. User Ability of ICT Resources

According to (Mbweza, 2002), ICT usage in present era has reduced the teacher responsibility toward student as well, such as a student from home can take the online lecture and could see the upcoming task of the education department virtual network.

Using ICT in instruction is a fundamental thing for its noteworthiness, innovation change the way that instructors and students oversee preparing by empowering them to examine more opportunities to enhance teaching, educators must know the clarifications for using innovation it could be to redesign, or make more specialists, or upgrade educating (Al Musawi, 2011).

Rosenberg (2006) claims that classroom will keep on serving a basic capacity in any learning system. It gives a place where students, teachers examine connect, collaborate, team up and make. It is significant that the objective of this study is to give indications and pieces of information to policymakers how they oversee the utilization of (ICT) in education.

2.4. Approachability of ICT Resources and Students Learning

Effective Compatibility of ICT tools in education institutions explain the complete setup which is included many routes of information such as networks must be installed perfectly to create a link between multimedia, learning resources via the local area network and school intranet; where students and teachers easily connect with each other off the line and online. Students must have sufficient numbers of the computer in the lab to satisfy their educational needs and as well must be held effective wiring system to avoid emergencies.

As per school net, Africa (2004) approachability of video conferencing tools creates better understanding between students and teachers. (Singh, 1993) independent research shows despite explaining the all essentials for ICT approachability at learning environment many schools in Africa heavily suffer from poor lab condition in terms of display units, internet accessible and very poor infrastructure to connect devices. Access information and presentation has greatly discussed by the majority of academic developers of educational multimedia (Singh, 1993).

3. Methodology

3.1. Research Design

In the study “Effects of ICT on student learning at the secondary level in private schools of Punjab (Pakistan)”, researcher used quantitative method of the research. Quantitative methods are the descriptive research. In quantitative research survey conducted for the execution of the research. The related data were collected from the private schools of district Lahore. A survey questionnaire was adopted for the collection of data. The survey questionnaire consisted of four parts, these parts were as obtainability, approachability, user ability and students learning. The questionnaire explored the effects of ICT on students learning. The present study was carried out by the secondary level students of district Lahore. In the population, there were 2150 students of private schools of district Lahore. In the overall population, there were 1100 male students of secondary level and 1050 female students of secondary level from district Lahore. All the students included in the population were belonging to the urban area of district Lahore. The students of the secondary level were the main representative of the population because there may or may not possess the effects of ICT on their learning. From the overall population 2150, in this study researcher randomly selected a sample of 350 male and female participants for the execution of data. In the sample, there were 260 were the male students of secondary level from the private

schools of district Lahore and 90 female students. Only 250 participants filled the questionnaire of which 150 were the male students and 100 were the female students.

The questionnaire was adapted from a research conducted at Makerere University by Opira Geoffrey (Geoffrey, 2010) and all the item in the questionnaire were related to the research topic. In the questionnaire, closed-ended questions were used. Five points Likert scale was used for the agreement and for the disagreement of the participants. In the five-point Likert scale in obtainability, extremely not Obtainable represents one, moderately not Obtainable represents two, no idea represents three, Extremely Obtainable represents four and Moderately Obtainable represents five. Insufficiency of the resources, Insufficient represents one, fairly sufficient represents two, sufficient represents three, moderately sufficient represents four, and highly sufficient represents five. In approachability, never at all represents one, not sure represents two, sometimes represents three, Always represents four, and Sure represents five. In user ability, very poor represents one, Poor represents two, Fair represents three, Good represents four, very good represents five. In student learning, Strongly Disagree indicates one, disagree indicates two, not decided indicates three, agree indicates four and strongly agree indicates five.

1.1. Data Collection Techniques

The questionnaire was filled by the students in their classrooms in the school. Proper permission was taken from the Headteachers of the private schools. The students who can fill the questionnaire welcomed who cannot fill the questionnaire extra time of one week is given to those students. After filling the questionnaire, the questionnaires were collected from the students.

2. Data Analysis

SPSS was used for the analysis of data related to the effects of ICT on students learning at the secondary level in private schools of district Lahore. From the data, statistical mean and standard deviation were calculated. A regression analysis was applied for identifying the effects of independent variables on student learning. Regression test applied for checking the relationship between different variables such as Obtainability, Sufficiency, Approachability and User ability of ICT resources.

Table 1. Reliability and validity of the instrument

N of Items	Cronbach's Alpha
37	.947

The data collected from the students was reliable

because reliability is .947. It was indicated that student's data was highly consistent (reliable).

2.1. Validity

The instrument was validated by three Ph.D. doctors and two Ph.D. scholars related to the subjects.

2.2. Analysis and Findings

Table 2. Responses of students about obtainability (sufficiency), approachability and user ability of ICT resources in private schools at secondary level

Obtainability	Sufficiency	Approachability	User-ability	Student learning
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3.1343	3.1840	3.3216	3.3750	3.4476
.83859	.76355	.80636	.76998	.89941

This table shows the mean and standard deviation of all the dependent and independent variables. The mean and standard deviation value of the obtainability of the ICT resources is (M=3.1343) (SD=.83859) respectively. The mean and standard deviation value of the sufficiency of the ICT resources is (M=3.1840) (SD=.76355) respectively. The mean and standard deviation value of the approachability of the ICT resources is (M=3.3216) (SD=.80636) respectively. The mean and standard deviation value of the user ability of the ICT resources is (M=3.3750) (SD=.76998) respectively. The mean and standard deviation value of the students learning regarding the ICT resources is (M=3.4476) (SD=.89941) respectively.

2.3. Responses of Students about Obtainability

Most of the students (27.2%) think moderately obtainable computers in classrooms and schools. Most of the students (28.8%) think extremely obtainable internet in classrooms and schools. Most of the students (41.2%) no idea about television in classroomand schools. Most of the students (35.6%) no idea about the multimedia projector in classrooms and schools. Most of the students (28%) think moderately obtainable software in classrooms and schools. Most of the students (51.6%) think extremely obtainable computer labs in schools. Most of the students (51.6%) no idea about conferencing equipment in schools.

2.4. Responses of Students about the Sufficiency

Most of the students (29.2%) think highly sufficient computers in classrooms and schools. Most of the students (52.4%) think moderately sufficient internet in classrooms and schools. Most of the students (41.6%) think sufficient televisions in classrooms and schools. Most of the students (31.6%) think moderately sufficient multimedia projectors in classrooms and schools. Most of the students (33.6%) think moderately sufficient software in classrooms and schools. Most of the students (32.4%) think moderately sufficient computer labs in classrooms and schools. Most of the students (25.6%) think sufficient conferencing equipment in classrooms and schools.

2.5. Responses of Students about Approachability

Most of the students (28.4%) think that always library in schools. Most of the students (38.4%) think that always computer lab in schools. Most of the students (36%) were sure about lecture rooms in schools. Most of the students (38.4%) think that sometimes resource centers in schools. Most of the students (30%) were not sure about the hall of residence in schools.

2.6. Responses of Students about User Ability

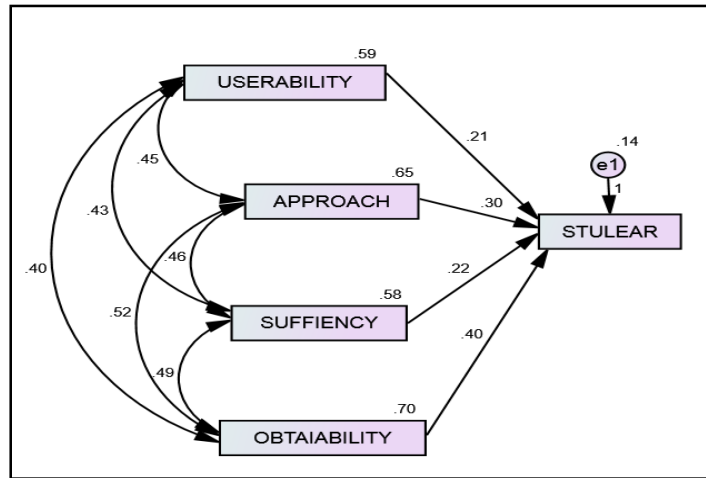
Most of the students (29.6%) fair about knowledge of word processing. Most of the students (52.4%) are good about knowledge of spreadsheets. Most of the students (36.8%) fair about knowledge of presentation. Most of the students (28%) are good about knowledge of online blackboard. Most of the students (23.6%) fair about knowledge of video conferencing. Most of the students (26%) are very good about knowledge of software. Most of the students (24.4%) are poor knowledge projector. Most of the students (46%) are very good about knowledge of the internet.

2.7. Effects of Obtainability, Sufficiency, Approachability and User ability on Students Learning

Most of the students (26.8%) strongly agree about I use the computer to complete the projects. Most of the students (37.6%) agree about I learn on my own using computers. Most of the students (33.6%) agree about I use the computer to type my assignments. Most of the students (35.6%) agree about ICT helped me apply what have learned to the actual world situation. Most of the students (36.4%) agree about ICT has enhanced my organizational skills. Most of the students (25.2%) disagree about ICT made me advance interest in the learning content. Most of the students (35.2%) agree about I use the internet to look for information. Most of the students (31.6%) strongly agree about I use the internet to work together with others. Most of the students (38.8%) agree about I have attained some of the essential skills for workplace readiness. Most of the students (40.8%) strongly agree about Technology can help me association with subjects.

2.8. Relationship Between ICT Related Components and Students Learning

The relationship between user ability, approachability, sufficiency, obtainability and student learning find through structural equation modeling shown in figure



			Estimate	S.E.	C.R.	P
Student learning --	<-	Obtainability	.402	.050	7.992	***
Student learning --	<-	Sufficiency	.222	.057	3.887	***
Student learning --	<-	Approachability	.296	.055	5.372	***
Student learning --	<-	User-ability	.214	.050	4.314	***

Table and figure show significant paths between ICT related components obtainability, sufficiency, and approachability and user ability on students learning. The detail ICT related components and their relationship with students learning is given as follows;

2.8.1. Obtainability and Students Learning

1. There is no significant relationship between ‘obtainability’ and student learning.

The hypothesis was rejected (at a significance level <0.5 at standard error $=.050$ and estimate $=.402$). And the alternative hypothesis “There is a significant relationship between obtainability and student learning” was accepted. It means that there is a strong relationship between obtainability and student learning. So the results indicate that there is a strong

relationship between obtainability and students learning if the obtainability of ICT resources is positive in schools then the students learning is good and if the obtainability of ICT resources is negative in schools then the students learning is not good.

2.8.2. Sufficiency and Students Learning

2. There is no significant relationship between ‘sufficiency’ and student learning.

The hypothesis was rejected (at a significance level <0.5 at standard error $=.057$ and estimate $=.222$). And the alternative hypothesis “There is a significant relationship between sufficiency and student learning” was accepted. It means that there is a strong relationship between sufficiency and student learning. So the results indicate that there is a strong relationship between sufficiency and students learning if the sufficiency of ICT resources is positive in schools then the students learning is good and if the sufficiency of ICT resources is negative in schools then the students learning is not good.

2.8.3. Approachability and Students Learning

3. There is no significant relationship between ‘approachability’ and student learning.

The hypothesis was rejected (at a significance level <0.5 at standard error $=.055$ and estimate $=.296$). And the alternative hypothesis “There is a significant relationship between approachability and student learning” was accepted. It means that there is a strong relationship between approachability and student learning. So the results indicate that there is a strong relationship between approachability and students learning if the approachability of ICT resources is positive in schools then the students learning is good and if the approachability of ICT resources is negative in schools then the students learning is not good.

2.8.4. User-ability and students learning

4. There is no significant relationship between ‘user ability’ and student learning.

The hypothesis was rejected (at a significance level <0.5 at standard error $=.050$ and estimate $=.214$). And the alternative hypothesis “There is a significant relationship between user ability and student learning” was accepted. It means that there is a strong relationship between user ability and student learning. So the results indicate that there is a strong relationship between user ability and students learning if the user ability of ICT resources is positive in schools then the students learning is good and if the user ability of ICT resources is negative in schools then the students learning is not good.

5. Conclusion

The conclusion was drawn on the basis of findings. It is concluded that Obtainability of the ICT resources, the sufficiency of the ICT resources, approachability of ICT resources, and user ability of the ICT resources play a vital role in students learning.

The results indicate that there is a strong relationship between obtainability and students learning if the obtainability of ICT resources is positive in schools then the students learning is good and if the obtainability of ICT resources is negative in schools then the students learning is not good. According to first research objective, obtainability of ICT resources has effects on students learning.

The results indicate that there is a strong relationship between sufficiency and students learning if the sufficiency of ICT resources is positive in schools then the students learning is good

and if the sufficiency of ICT resources is negative in schools then the students learning is not good. According to first research objective sufficiency of ICT resources has effects on students learning.

The results indicate that there is a strong relationship between approachability and students learning if the approachability of ICT resources is positive in schools then the students learning is good and if the approachability of ICT resources is negative in schools then the students learning is not good. According to second research objective approachability of ICT resources has effects on students learning.

The access to the ICT resources in the schools of Punjab for both the teachers and the students was not according to the standards. The major challenge for teachers and students still upsetting to easy access to ICT resources in the private schools of Punjab still limited which cannot meet the needs of the ever-changing population of the students in the private schools of Punjab.

5.1. Discussion

Jung (2005) describes where technological innovation opens up new doors of innovation also have created more demands for teacher and student to work in a collaborative environment. Drawing from the above there is a popular trend across the globe to exploit the ICT technology in an effective way. Among the contemporary researchers, British Education Communication and Technology Agency (BECTA) finding shows user ability to use ICT technology is considered one of the strongest elements to the successful integration of ICT in schools (National Council for Curriculum and Assessment UK, 2004).

The developed nation teachers are implementing the ICT in every phase of teaching to improve the learning experience of their students (Davis, 2000). Moreover, ICT inducement in teaching professional has built up the teacher knowledge through knowledge sharing with other colleagues. Students and teacher have created knowledge groups to discuss the education projects in detailed (UNESCO, 2002a). Student ability to generate new knowledge through knowledge communities has opened up a new horizon in the education sector (Davis, 2000).

In addition to the previous views about the functionality of user ability to use ICT (Bitner & Bitner, 2002) share their knowledge state that personal interest and expertise of teachers and student create a positive role in effective implementation of ICT in the education department. They added further and describe once the teacher and students become aware of their responsibilities make clearer to use ICT technology, also ICT technology inducement has changed the traditional teaching model where student use to completely dependent on teachers. Now students can make individual research to see the broadened views of their topics.

5.2. Recommendations

- Measures should be taken to regulate the obtainability of ICT resources.
- Radical steps should be taken to control the approachability of ICT resources.
- Measures should be taken to control the accessibility of ICT resources.
- Measures should be taken to formalize the user-ability of ICT resources.

In the private sector, the Government should spend on technological equipment, and the arrangement for trained personnel's to handle the accessibility of the computers in the computer labs of the private schools of Punjab. The Government should provide the facilities for the projectors, printers and the computers in both public and private schools.

It is the needs of the public and private schools of Punjab that there should be the facility of internet connections. The schools should liberalize the facility of internet and e-mail services in the schools and build ICT resource centers in the schools for the students.

The training of the computer skills in schools should not be limited to Microsoft Office: the school should integrate the other computer-based software's recommended by (UNESCO, 2000).

5.3. Further Research Areas for Future Researchers

ICT comparatively new in education more and more researchers are required to carry. The present research uncovered many aspects but not covered all the aspects of ICT. The researcher provides some possible area for future research.

1. Effects of ICT on students learning at the secondary level in public schools of Punjab (Pakistan).
2. Impact of currently used technology both in public and private educational institutions on students' achievements in Punjab.
3. Impact of ICT on students' achievements in higher education.

References

- Alessi, S.M. & Trollip S.R. (2016). Computer-based instruction, methods, and development. New York: *Englewood Cliffs*, Prentice Hall.
- Bakkabulindi, F.E.K, (2007). Social Correlation of innovation adaption in Education Organization: *A case study of ICT in Makerere University*. A Ph.D. thesis.
- Bitner, N. & Bitner, J. (2002). Integrating technology into the classroom: eight keys to success. *Journal of Technology and Teacher Education*, 10(1), 95-100.
- Byrne, B. M. (1994). Structural equation modeling with EQS and EQS/Windows: Basic concepts, applications, and programming: Sage.
- Bauer, K. N., Orvis, K. A., Ely, K., & Surface, E. A. (2016). Re-examination of motivation in learning contexts: investigating the role type of motivation plays in the prediction of key training outcomes. *Journal of Business and Psychology*, 31(1), 33-50.
- Committee on Developments in the Science of Learning. (1999). Technology to support Learning. In J. Bransford, A. Brown, & R. Cocking (Eds.), *how people learn: Brain, mind, experience, and school*.
- Davis, N. (2000). International contrasts of information technology in teacher education: Multiple perspectives on change. *Journal of Information Technology for Teacher Education*, Vol. 9, No. 2, 2000 Available at <http://www.triangle.co.uk>. *Learning to Teach Using ICT in the Secondary School*. London: Routledge.
- Geoffrey, O. (2010). Effects of information and communication technology on students' learning: a case of Gulu University (Dissertation, Makerere University).
- Goeze, A., Zottmann, J. M., Vogel, F., Fischer, F., & Schrader, J. (2014). Getting immersed in teacher and student perspectives? Facilitating analytical competence using video cases in teacher education. *Instructional Science*, 42(1), 91-114.

- Holmer, L. E. (2016). Assessment Report Physical Sciences University of Tartu Tallinn The University of Technology.
- Jung, I. S. (2005). A comparative study on the cost-effectiveness of three approaches to ICT Teacher training. *Journal of Korean Association of Educational Information and Broadcasting*, 9 (2). 39-70.
- Laurillard, D. (1993). *Rethinking University Teaching: A Framework for the Effective Use of Educational Technology*. New York and London
- Mbwesa, J. (2002). A Survey of students' perception and utilization of the web as a learning Resource: A case study of the department of extramural studies, an unpublished master 71 dissertations, University of Nairobi, Kenya. Downloaded on 16th July 2008. Available at <http://www.interaction.nu.ac.za>.
- Mumtaz, S. (2000). Factors affecting teachers' use of information and communications Technology: a review of the literature. *Journal of Information Technology for Teacher Education*, 9(3), 319-342.
- Newhouse, C.P. (2002). A framework to articulate the impact of ICT on learning in schools. *Western Australian Journal of Education* 10(2), 200-215 London: Routledge Flamer.
- Rodriguez, F. and Wilson, E. (2000). *Are Poor Countries Losing the Information Revolution?* MfoDev Working Paper. Washington D.C World Bank.
- Swedish National Agency for School Improvement (2008). Teachers' ICT skills and knowledge Needs, Available at <http://www.sweden.gov>.
- Silberman, M. L., & Biech, E. (2015). *Active training: A handbook of techniques, designs, case examples, and tips*. John Wiley & Sons.
- Swedish National Agency for School Improvement (2008). Teachers' ICT skills and knowledge Needs, Available at <http://www.sweden.gov>.
- UNESCO. (2002b). *Information and communication technology in education: a curriculum Guide for schools and programs of teacher development*. Division of Higher Education.
- Winfrey, E.C. (2008). Kirkpatrick's Four Levels of Evaluation. In B. Hoffman (Ed.), *Encyclopedia of Educational Technology*. Retrieved June 27, 2008.
- Warschauer, M. (2006) Computer-assisted language learning. Introductions. In S. Fotos (Ed) *Multimedia language teaching*. Tokyo: Logos International, pp. 3 – 20.
- Yamhill, S. & Mclean, G. N. (2001). Theories supporting the transfer of learning. *Human Resource Development Quarterly*, 12(2), summer 2001. Available at <http://www.fsu.edu/>.