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Quality cum Effectiveness of ICT Related disciplines in Teacher Education: Applying the Technology Acceptance Model

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Abstract

This study was designed to determine the effectiveness of ICT related disciplines being taught at teacher education institutions in Pakistan by applying technology acceptance model (TAM). Forty two (42) teacher educators and eighty four (84) prospective teachers served as a sample of the study drawn from university of Education and its affiliated colleges. The effectiveness of these disciplines was determined by administering questionnaires covering all aspects of TAM on the desired sample. The statistics like percentage, mean score and test of significance z were applied for the analyses of the data. The results of the study showed the ineffectiveness of the ICT related disciplines. Proper facility conditions, revamping of the curriculum and cooperative attitude of the teachers were recommended in this study.

Keywords: Quality, technology acceptance model, prospective teachers, information and communication technology

1. Introduction

Quality of education directly depends upon the quality of teachers, because as is the teacher so is the nation. A nation is built by its citizens, citizens are molded by teachers and teachers are made by the teacher educators which are the product of any teacher education institution. In fact the teacher is the top most academic and professional person in the education pyramid. She/he is the pilot around which all the educational programs rotate in so far as their implementation is concerned. He can either make or mar the nation and act as a mid-wife for the nation development [20].

Quality in teacher education can be defined in different terms but one depicted by [12] Harvey and Green, 1993 "The excellence attainment with zero defects and it goes often with the effectiveness of any program, personality and thing, so quality and effectiveness both are synonymous to each other". The position and significance of teacher education in the dissemination of quality knowledge using computer application is inevitable in the modern technological society. "The rapid growth in information and communication technologies have brought amazing changes in the 21st century, as well as affected the demands of modern societies. It is also the growing demand of the teacher education institutions to use ICT in the class room setting to increase quality knowledge and skills" [8].

According to [25] UNESCO, 2005, "ICT can play a vital role in the professional development of teacher educators, prospective teachers and administrators consequently in enhancing the quality of education. ICT can enhance teaching quality by supporting and

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reinforcing the use of innovative teaching practices. It can allow educators to access a wide array of materials reducing isolation and permitting peer exchanges".

Similarly the Higher Education Commission [13] HEC of Pakistan, 2005 revised the curricula of teacher education institutions and the ICT skills like MS office, e- mailing and internet browsing, and in page was considered indispensable for the teachers so that they may keep them at par with international standards and up to date with ongoing rapid advances in these technologies.

[21] Pawlowski, 2002 recommended that "the best way to encourage teachers to use ICT in the class room is to increase their level of competence in such disciplines. This can be advanced through appropriate training in ICT related courses in a cooperative way. The curriculum designed in this connection must be according to the individual's interest and having utility with respect to practical life. "By training prospective teachers to use ICT, it is expected that they will transfer the knowledge and skills to their future class rooms" [6].

In the Varsity of Education, two types of ICT related disciplines are being taught "ICT in Education" at B.Ed. level and "Instructional technology" (IT) at M.Ed. level. The first one is related to computer literacy, fundamentals of ICT, MS Office, use of Internet and Email, computer software and hardware, developing multimedia presentations and video conferencing, *etc.*, The main focus of this discipline is to brand the under trainee teachers knowledgeable in computer usage and application. While, the second one, focuses on the development of numerous instructional material on its own at local level that may enhance the utility and quality of the learning process in any educational set up. In this discipline the prospective teachers are provided a training regarding the use and development of low cost no cost material as audio visual (AV) aids used in the teaching learning process. This discipline emphasizes the students to integrate technology based methodologies in their particular teaching fields [13].

The positive utility of computer in the class room depends upon the teachers' competence in the computer related knowledge, skills and their cooperative attitude during the transfer of knowledge and expertise into the students' minds. As usage the expertness and effectiveness sets foundation towards the perceived ease to use & therefore the attitude automatically may set for the same. The co-operative attitude of the teacher while teaching ICT related disciplines enhances the effectiveness of these disciplines [14].

The government of the Punjab (Pakistan) spent a huge amount 56.717 million USD to furnish the teacher education institutions with the Computer Labs for I.T cognizance, I.T proliferation, development of I.T skills and introduction of Computer Science among the students in these institutions. The main objective of the government in this connection was to help the country in identifying students with aptitude for I.T. learning. It will carry better prospects to the nation to choose the best aptitude among an enormous population base. [11]

Despite a huge investment on education, it has revealed minute evidence of ICT acceptance and execution in teaching learning in Pakistan [30]. Keeping in mind this alarming situation of the ICT adoption and usage in the Pakistani institutions of teacher education, this study was designed to determine the quality and effectiveness of the ICT related disciplines in the teacher training institutions at pre service level in Pakistan.

2. Review of the Related Literature

Several studies have been conducted about the usefulness of the ICT related courses. In a study by [24] Sutton, 2003 the trainee teachers were not pleased with the usefulness of ICT related subjects and they needed more assistance and training to get command over computer related skills. Another related study about the effective utilization of ICT related disciplines

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by [23] Safdar. M and Dr. Iqbal zafar 2010, the teacher educators and the prospective teachers do not seem satisfied with these disciplines regarding the proper usefulness. [15] James, 2001 pointed out that ICT related disciplines can play important roles in preparing prospective teachers to successfully integrate ICT into their teaching.

[2] Arshad M. and Asif M, 2010 in a parallel study found that in ICT related disciplines in Pakistani institutions of teacher education much time is wasted in theory rather than in practice (computer labs). The effectiveness of the ICT related courses may be enhanced by increasing the duration of practical work. In another related study by [19] Najam, 2010 in Pakistan, most of the trainee teachers were agreed about the usefulness of the ICT related programs taught at the teacher training institutions, but they were reluctant regarding the availability of hardware for proper practice.

[27] Tooker, 2004 studied the effectiveness of ICT related courses in Turkey. In his study he pointed out that "nearly sixty percent of the prospective teachers were of the opinion that ICT related disciplines may develop the competencies in them but 40% were mentioned that such courses do not develop competencies". As per the results of this study the teacher educator was the main factor in the utilization and non-utilization of these disciplines.

A key reason for studying the effectiveness of computer related disciplines in teacher education institutions in Pakistan is that the effectiveness reflects the better use and understanding of computer for effective use in teaching learning process that shows the teacher attitude towards computer usage. The attitude towards computer enhances the effectiveness of the Computer usage and its application. [32]

Research has shown that "a teacher attitude towards the computer is the major predictor for further computer use and there need for learning computing skills that in turn will lead to computer literacy". [25]

[31] Yaldirim, 2000 explained that teacher educators who often used hardware would have a tendency to cultivate the attitudes that promote further use of it in their daily teaching matters. In this study the extended technology acceptance model TAM by Legris was applied in order to determine the effectiveness of the ICT related disciplines in teacher education institutions in Pakistan.

3. Technology Acceptance Model (TAM)

The first one model was introduced and developed by [8] Davis, 1989, it explains that the effectiveness of a discipline is determined only by the two variables perceived usefulness (PU) and perceived ease of use (PE) of that subject. This model was tested in different studies, but most of the studies have empirically proven it successful in predicting about 40% effectiveness of a discipline [16].

This model was also extended by most of the researchers with a view that the effectiveness of an ICT related discipline cannot rely on only two external variables specified by Davis. The effectiveness determined by this model ranges from 30 to 40 percent of the total usefulness only. In such an extended model by [17] Legris, 2003, some other variables like the nature of the content of the discipline, teachers' competence, available facility conditions, teacher's commitment, pedagogical skills and cooperative attitude were also affirmed key determinants of the effectiveness. The effectiveness of this model has been accepted 65-75 percent by the experts relating to this area of ICT [26].

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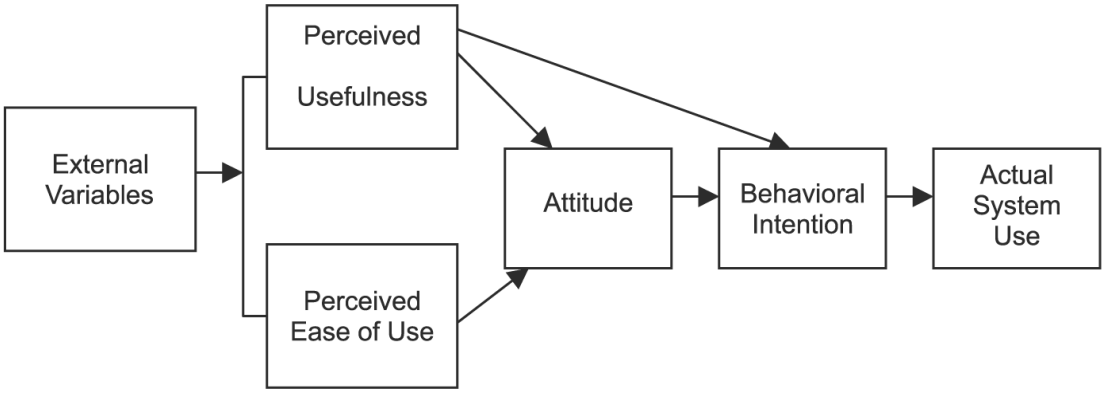

Figure 1. TAM by Davis (1989)

The extended TAM for this study is shown in Figure 2 below with a perception that the teacher educators with perceived usefulness of the discipline and perceived ease of use about the ICT related disciplines may tend to formulate better attitude towards teaching only with the presence of competence (command over subject matter), commitment (Quality of enthusiasm in teaching) and pedagogical skills in them. Similarly the PU and PE of the prospective teachers tend to formulate the attitude towards learning only with the availability of the proper facility conditions, useful and interesting nature of the content, cooperative attitude of the teachers may further result in the effectiveness and quality of that program or discipline" [17]. This model is very useful in class room setting in the learning of ICT related disciplines [17]. The researcher used this model with a view to generalize the results of the study on multi variables to maximally (75%) determine the quality and effectiveness of these disciplines as quoted by [26] Tinmaz, 2004.

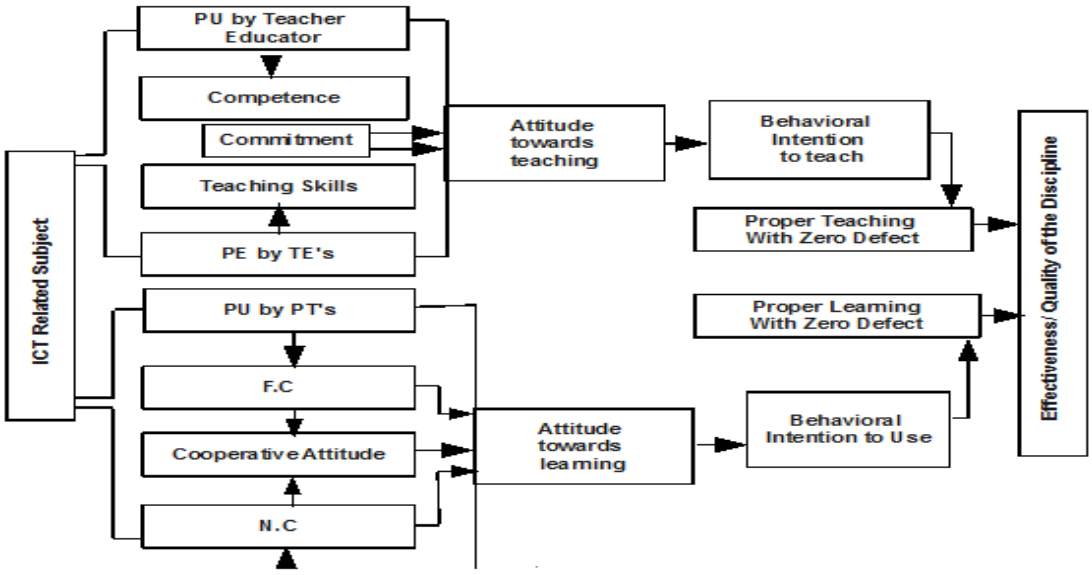

Figure 2. Extended "TAM" Model by Legris (2003)

PU = Perceived Usefulness, FC = Facility Condition, TE's = Teacher Educators, PE = Perceived Ease of Use, NC = Nature of Content, PT's = Prospective Teachers

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4. Objectives of the Study

The objectives of the study were as under:

1. To determine the effectiveness of the ICT related disciplines being taught at B.Ed. level by applying extended TAM.
2. To find out the usefulness of the discipline IT (instructional technology) being taught at M.Ed. level.
3. To compare the effectiveness of the ICT related disciplines in both the programs.
4. To compare the quality of the disciplines in between the sample of the study.
5. To give suggestions for improvement.

5. Delimitations

In Pakistan "two hundred and seventy (270) teacher training institutions exist of which 217 are run by the government sector and 53 are operated by the private sector". In the Punjab Province "total numbers of teacher training institutes are 82 out of which 75 are in the public sector" including University of education Lahore Punjab and seven institutes are in private sector [1].

This study was delimited to eight campuses of the University of Education situated in Punjab, the most popular university in the area of teacher education, and thirty four affiliated elementary colleges GCETs. Only those teacher educators teaching ICT related courses at B.Ed. and M.Ed. level and the prospective teachers who have completed the two semesters of their B.Ed. and M.Ed. programs during session 2010-2011 were included in this study.

6. Hypotheses

The following null hypotheses were formulated in this study:

Ho: 1.No difference exists between the opinions of Teacher Educators and Prospective Teachers regarding the effectiveness of subject (1) "ICT in Education".

Ho: 2.No difference exists between the opinions of Teacher Educators and Prospective Teachers regarding the effectiveness of subject (2) "Instructional Technology".

Ho: 3.There is no significance difference in the quality of subject (1) and subject (2) as per opinions of the teacher educators.

Ho: 4.There is no significance difference in the quality of subject (1) and subject (2) as per opinions of the Prospective Teachers

7. Procedure of the Study

This study was descriptive in nature. The researcher used quantitative research approaches both during data collection and analysis processes. All the teachers teaching ICT related disciplines in these Campuses and GCETs and all the prospective teachers who have completed their B.Ed. and M.Ed. during the session 2011-12 served as the population of this study. One teacher educator and two prospective teachers from B.Ed. and M.Ed. programs were selected through simple random sampling technique. So, forty two (42) teacher educators and (84) prospective teachers were selected as a sample from both the programs. In the sampled institutions, the discipline "ICT in Education" is taught at B.Ed. level in first semester, while the discipline IT (instructional technology) is taught at M.Ed. level in the second semester.

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8. Instruments for the Study

After a thorough review of the literature [28] Top, Mortensen1995; [18] MirandaNet, 2000; Goldman, 1994; [26] Tinmaz, 2004; [2] Arshad M and Asif M, (2010); [19] Najam, (2007), four questionnaires on five point rating scale were developed, two for the teacher educators and the prospective teachers at B.Ed. level and two for the same at M.Ed. level. Each questionnaire was consisted of 20 statements covering all the aspects of extended TAM.

After the development of questionnaires, each instrument was checked by senior faculty members, and in the light of their comments, the tools were modified. The face and content validity of the tools were also examined by six experts, and based on the feedback gathered from them, tools were revised again. After that the tools were checked by the language experts available at the English department of the Bahauddin Zakariya University Multan and Sargodha University (Pakistan).

The Questionnaires regarding teacher educators' were piloted with twelve (12) teachers and (24) prospective teachers for a reliability check by using Cronbach's alpha Coefficient, which was found as 0.86 and 0.84 respectively. The values of Alpha Coefficient for the questionnaires regarding prospective teachers were found 0.87 and .85 respectively. At the end of the data collection process, each set of item was retested which returned the reliability coefficient of 0.92 and 0.94 for teacher educators and 0.96 and 0.95 for the prospective teachers. [9].DeVellis, 2003, argued that alpha values between 0.80 and 0.90 are considered good.

9. Analyses of Data

The data were collected after administering four questionnaires on the selected sample. The collected data were analyzed by applying descriptive and inferential statistics. Statement wise analysis of the questionnaires was also made in order to determine the mean score. To obtain mean score for each statement, the following formula was applied:

$$\text{Mean Score} = \frac{F_A \times 5 + F_M \times 4 + F_S \times 3 + F_R \times 2 + F_N \times 1}{N}$$

The minimum standard score set to observe quality and effectiveness of the ICT related subjects was (3) also known as norm score. The mean score (3) shows the slightly low level of quality, (4) shows the moderate and mean score (5) indicates the high level of effectiveness.

The questionnaire wise analysis was also done. As each questionnaire comprising twenty statements, the maximum score per questionnaire becomes 100 on a five point rating scale and the norm score (minimum standard score set for quality) set was 60. The score above 60 shows positive level of acceptance and the score below 60 shows negative level of acceptance. Questionnaire wise mean score of the desired sample was also computed by arranging the total score in descending order first and then making the class intervals of the score with the help of the following formula.

$$\text{Mean} = \text{M.P} + \frac{\Sigma fx}{N} \times i$$

Where M.P = Mid-Point
N= Total number of the respondents.

Inferential statistics, like test of significance (z test) was also applied in order to compare the effectiveness of the two disciplines.

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$$z = \frac{M_1 - M_2}{\sqrt{\frac{(SD_1^2)}{N_1} + \frac{(SD_2^2)}{N_2}}}$$

Where z = Critical ratio

$$SD = i \times \sqrt{\frac{\Sigma fx^2}{N} - (\frac{\Sigma fx}{N})^2}$$

SD= Standard Deviation

10. Results and Discussions

In the "statement wise" analysis of the questionnaire of the teacher educators comprising twenty (20) statements about subject (1) "ICT in Education," the following results were drawn:

The statements ranging from (1-5) were about the perceived usefulness (PU), perceived ease of use (PE), commitment, competence and pedagogical skills in teaching this discipline. The average mean score obtained from the statements (1-5) remained equal to the norm score (3), showing slightly satisfactory level of acceptance on behalf of the teacher educators. This level of acceptance does not reveal the effectiveness of the discipline as per quality standards and this result is in parallel with the results of the study conducted by [23] Safdar, 2010.

The statements extending from (6-10) were about the contents of the discipline, the utility of the content in everyday life, proportion between theory and practice in the subject matter, worth and usability of the content as per interest of the students. On statements

(6-10), the average mean score remained below the norm score which shows that the curriculum of the discipline does not fulfill the standards of quality. This result also favors the results of the study conducted by [24] Sutton, 2003.

The statements spreading from (11-15) were about the facilities available at the institute, total number of PCs available in the computer lab, space and seating arrangement, compulsory treatment of computer lab, time duration provided for practice, proper time provided for the dissemination of the content knowledge and practical skills. The average mean score on statements (11-15) was too much below the norm score. This reveals that the facility condition is very poor, proper time for practice and teaching is also in scarcity. The results drawn from these statements are in parallel with the results of the study conducted by [19] Najam, 2010.

The last statements from (16-20) were about the nature of the attitude of the teacher educators (cooperative or non-cooperative, gender discrimination in teaching) and the arrangements made by the institute regarding trainings of the teacher educators and the provision of other facilities. On these statements (16-20), the average mean score also found below the norm score (3) which shows the non-cooperative attitude of the teachers towards teaching, gender discrimination, lack of trainings/refresher courses and other facilities provided by the institute.

Each questionnaire of the teacher educators teaching subject (1) at B.Ed. level was quantified. The data obtained on the desired sample were arranged in descending order, after that class intervals were made in order to calculate the Mean Score and Standard Deviation by applying the formulae mentioned above under the heading "Data Analysis". The mean score calculated in this connection was (51) which is below the norm score (60) showing ineffectiveness of the discipline (1). The value of SD was 14.78. Similarly, there were twenty

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(20) statements in the questionnaire of the prospective teachers about discipline (1). The results obtained from these statements are given as under:

The statements ranging from (1-5) were about the perceived ease of use and perceived usefulness of the discipline. Statements (6-10) were about the nature of the content and 11-15 about the facilities available for the students and the proper utility of this ICT related discipline.

The last statements (16-20) were showing the teachers' attitude in teaching, background knowledge of the discipline and the aptitude (interest and enthusiasm) of the prospective teachers towards learning discipline (1). The statement wise analysis of the discipline "ICT in Education" depicts that the overall mean score remained below the norm score. The students were strongly disagreed with the statement that the attitude of their teachers during the teaching learning process is cooperative.

The mean score and SD of the total sample of the prospective teachers of B.Ed. program were also calculated that were (48) and (16.83) respectively. This shows the ineffectiveness of the discipline. The results of the study are in parallel with the results of the study conducted by [31] Yildirim, 2008; [5] Brinkerhoff, 2006, Glazewski, 2001, [2]. Arshad M and Asif M, 2010. The subject IT (instructional technology) is offered in semester second of the M.Ed. program. The results of the "Statement wise Analysis" of the questionnaire of the teacher educators in this subject are given below:

On statements (1-5) covering PU, PE, competence and commitment, the average mean score remained much below the norm score. The statements from 6-10 were about the nature of the content while 11-15 were about the facility condition, availability of IT material, portfolios, IT rooms, Trainings occasions regarding development of handmade low cost no cost material and proper utilization of these materials during the teaching learning and teaching practice.

Lastly, the statements ranging from16-20 were about the attitude of the teachers during the learning process and other arrangements by the institution. The average mean score on total statements (20) was too much below the norm score (3). The mean score and standard deviation of the total sample of the teacher educators on their respective questionnaires were also calculated. The calculated mean and standard deviation in this regard were (49) and 19.28 respectively showing the ineffectiveness of the subject.

The statement wise analysis of the questionnaire of the prospective teachers about discipline (2) "Instructional Technology" under the same variables gave the same results as found in the analysis of the teacher educators. The mean score and SD of the total sample of the prospective teachers of M.Ed. program were also calculated that were 46 and 22.35 respectively. This value of mean score shows the ineffectiveness of the discipline. . The results of this study do not support the results of the study conducted by [24] Toker, 2004, who studied the effectiveness of such disciplines in Turkey but the results of the said study are in line with the study conducted by[23] Safdar, M, 2010 in Pakistan. The null hypotheses of the study were also tested by applying the test of significance:

Ho: 1. No difference exists between the opinions of Teacher Educators and Prospective Teachers regarding the effectiveness of subject (1) "ICT in Education".

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Table 1

Groups	Statistics			
	N	$\overline{X}$	**SD**	**Z**
Teacher Educators	42	51	14.78	**1.02**
Prospective teachers	84	48	16.83	

z – Test

$M_1 = 51$ $SD_1 = 14.78$, $N_1 = 42$
$M_2 = 48$ $SD_2 = 16.83$, $N_2 = 84$
$Z = 1.02$
Calculated value (CV) = 1.02
Table value (TV) at 0.05 level of significance = 1.96
CV < TV

Null hypothesis accepted. There exists no real difference between the means of two samples. The teacher educators and the prospective teachers showed the ineffectiveness of the discipline "ICT in Education" being taught at B.Ed. level.

Ho2. No difference exists between the opinions of Teacher Educators and Prospective Teachers regarding the effectiveness of subject (2) "Instructional Technology".

Table 2

Groups	Statistics			
	N	$\overline{X}$	**SD**	**Z**
Teacher Educators	42	49	19.28	**0.78**
Prospective teachers	84	46	22.35	

CV = 0.78, CV < TV

Null hypothesis accepted. There exists no real difference between the means of two samples. The teacher educators and the prospective teachers showed the ineffectiveness of the discipline "Instructional Technology" being taught at B.Ed. level.

Ho: 3.There is no significance difference in the quality of subject (1) and subject (2) as per opinions of the teacher educators.

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Table 3

Groups	Statistics			
	N	$\overline{X}$	**SD**	**Z**
Teacher Educators in subject (1)	42	51	14.78	**0.53**
Teacher Educators in subject (2)	42	49	19.28	

CV< TV

There exists no significant difference between the opinions of teacher educators regarding the effectiveness of discipline1 and 2.

H: 4.There is no significance difference in the quality of subject (1) and subject (2) as per opinions of the Prospective Teachers.

Table 4

Groups	Statistics			
	N	$\overline{X}$	**SD**	**Z**
Prospective Teachers in subject (1)	84	48	16.83	**0.65**
Prospective Teachers in subject (2)	84	46	22.35	

z – Test

CV = 0.65
CV < TV
Therefore the difference is insignificant. Null hypothesis accepted.
There exists no significant difference between the opinions of prospective teachers regarding the effectiveness of discipline1 and 2.

11. Conclusion

As discussion shows that the discipline (1) "ICT in Education" was perceived rather useful due to the nature of content as compared to the subject (2) by both the teacher educators and the prospective teachers. The contents of subject (1) were found slightly compatible with the demands and nature of the society. Due to the future utility of this subject, it was perceived easy in teaching learning process.

The utility of the discipline 2 (IT) perceived by the prospective teachers (PTs) and teacher educators (TEs) was not satisfactory due to its outdated contents and limited utility in practical life. Therefore, the attitude of both PTs and TEs was not serious towards this discipline. The imbalance between theory and practice was also found in both the disciplines.

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The discipline (1) does not meet the standards of quality despite its slight utility. Therefore, the curriculum of discipline (1) should be partially revised and the subject (2) totally revised.

In so far as the competency of the teacher educators is concern in teaching discipline (1), it seems satisfactory because of their perceived ease to use this subject. The teaching methodology adopted by the teacher educators was not found feasible by the prospective teachers. The faculties do not inculcate the knowledge and skills in a cooperative manner. They take the classes in the general class rooms despite in the labs. Their focus is on theory rather practice. Sufficient time and proper attention is not paid by the teachers to the students for quality learning. The teachers should take the classes in the computer labs as per nature of the subject and proper time be devoted to the prospective teachers.

The prospective teachers having some background knowledge about discipline (1) show their interest in learning it while the others having zero background knowledge do not show there interest in learning. This situation may be controlled by differentiating the students into two groups. The teacher educators teach the students as per their own level of knowledge and skills despite keeping in view the level of the students. The institute should arrange trainings of the teacher educators to improve their methodology and attitude.

The facility condition (FC) in the institutions of teacher education regarding ICT related disciplines (ICT in Education and IT) were found very poor. The scarcity of hardware, IT related materials and the over strength of the students are the major hurdles in the way of achieving quality/ effectiveness. More labs and IT rooms should be set up along with the appropriate numbers of equipment**.** Proper training should be given to both the teacher educators and the prospective teachers for the development of low cost instructional materials for effective teaching learning process.

The students totally do not have background knowledge of the discipline (2) and that is why they do not take interest in the learning of the discipline. The teacher educators while teaching this discipline use lecture method which shows their indifferent attitude. Therefore the students feel boredom while learning this subject. During the teaching practice days, the inclusion of IT is not considered compulsory. The teachers should adopt suitable methods keeping in view the nature of the content by using instructional aides. During practicum, the use of IT should be made compulsory.

Lastly, the opinions of the teacher educators and the prospective teachers were also compared by applying the test of significance in order to check the effectiveness and ineffectiveness of these disciplines. For discipline (1) and (2), the opinions of the TEs and PTs were resulted in low quality of both the disciplines. Subject wise comparisons of the opinions of the TEs and PTs have also shown the ineffectiveness of the disciplines. The mean scores of the questionnaires of TEs and PTs regarding discipline (1) is slightly better than discipline (2). But, overall both the disciplines were found ineffective as per quality standards. The Teachers and the students from the teacher education institutions and other departments like computer sciences from the various varsities in Pakistan may utilize the results of this study to best set their attitudes towards teaching and learning in ICT related disciplines.

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