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Implementation of Information and Communication Technologies (ICTs) in Education Course: A Case from Teacher Education Institutions in Pakistan

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Abstract

This research was aimed to explore the implementation of Information and Communication Technologies (ICTs) in education in teacher training programs in the Khyber Pakthunkhwa and Punjab provinces in Pakistan. It was the first time that the course "ICTs in Education" was implemented for ADE/B. Ed (Elementary) programs in session 2010-11. In this situation, it was vital to explore how successfully this course was implemented in the pioneer institutions, so as to have baseline information for further improvement in the implementation process. This study was focused to explore: i) How the course "ICTs in Education" was implemented? ii) How did the teacher educators follow the course guide and to what extent the course guide was helpful in implementing this course? Seven teacher training institutions (three from the Punjab and four from KP provinces) were selected as target population. The total sample was 40 teacher educators and 200 students from seven institutions. Mixed method research design was adopted to conduct this study. The data was drawn from the surveys for heads and prospective teachers, and semi-structured interviews with teacher educators. Analysis revealed that only in a few classrooms, different activities/ experiences as suggested in the unit were properly implemented, while in most that was not the case due to issues such as shortage of electric power supply, scarcity of ICTs tools and lack of training and skills in ICTs application. The extent to which teachers followed the course guide was another factor contributing to the implementation process.

Key words: Implementation of ICTs, ICTs in Education, Teacher Education Programs, ICTs Course Guide.

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Introduction

Information and Communication Technologies (ICTs) are a set of different technological tools and resources that are used to communicate, produce, distribute, store, and manage information. Computer, Internet, broadcasting technologies (radio and television), telephones, and wireless communication are examples of these technologies (Blurton, 2002).

The use of information and communication technology in teacher education has received great attention for quality learning and teaching (Wee & Bakar, 2006). Information and communication technologies are preferred in situations when teacher wants to display 3-dimensional visuals in a better way which is not possible with the traditional 2-dimensional resources. For myriads of tools ranging from radio, television, mobile phones, cameras, computer hardware and software systems, internet, video conferencing etc. the composite term of ICTs is used. Generally it may be categorized as a collection of technology used to access, store and distribute a wide variety and amount of information (Goktas,Yildirim & Yildirim, 2009).

Information and communications technologies (ICT) have been included as an essential part of teaching learning process by a large body of learning institutions around the world (Juang, Liu & Chan, 2008; Friedman, Bolick, Berson, & Porfeli, 2009; Ismail, Almekhlafi,. & Al-Mekhlafy, 2010).Because of the emergence of new technologies and new challenges to education students teacher education has passed through rapid development and transformation (Moon, 2004), resulting in the reorganization and restructuring in teaching methodology to prepare the students for future challenges by educational institutions (Auerswald & Magambo, 2006). It is very important to provide continuous need-based assistance to teachers in the form of training, encouragement, access, and resources. It will help them in adjusting with these new technologies and using them efficiently to improve the teaching learning in the classroom (McDougald, 2009).In any instructional program a range of ICTs devices can be used by a teacher to support his/her teaching. Through the use of different tools of ICTs ranging from video conferencing to multimedia delivery to web sites, teachers can face the challenges in today's world (Jung, 2005).

According to Khirwadkar (2007), ICTs are a blend of modern technologies (computer, internet, digital video etc.) and traditional technologies (overhead projectors, blackboards, and books). In addition to other pieces of equipment encompassing computer hardware, software, networks, ICTs, in general, involves the use of a computer connected to the World Wide Web to translate or convert

information in the form of text, images, sounds and video to a standard digital format (Lever-Duffy, McDonald, & Mizell, 2003; USDE, 2000; ISTE, 1999). Any form of ICT tools like Web based information sources, Multimedia based CD ROMs etc. to improve the learner's understanding of what is being taught is one of the examples of integration of ICTs (Williams, 2003). Other interactive learning opportunities available in the form of social networks like Facebook, Wikis, chat software, emails are being used through ICT based teaching (Meisalo, Lavonen, Sormunen &Vesisenahoet, 2010).

According to Haddad (2003), the research shows that ICT aided teaching methods result in the promotion of collaborative activities and development of higher order thinking skills along with a more student-centred approach to instruction. ICTs promoted as a platform provides learners with opportunities in any field (King, Bond & Blandford, 2002; Rovai, 2002). Innumerable studies are available on the integration of ICTs into classroom teaching to support and improve the pedagogical practices (Hennessy, Ruthren & Brindley, 2005). Many countries consider ICTs as a potential tool for the achievement of transformation and innovation and have invested in its integration in education (Eurydice, 2001; Papanastasiou & Angeli, 2008).

ICT has principal role in fuelling the development in the current century. This fact being recognized by Government of Pakistan has emphasized the inclusion of ICTs in higher education sector. Medium-Term Development Framework 2005–2010 and Vision 2030 Approach Paper reflect the realization of these goals to convert Pakistan into a knowledge-based economy by policymakers (Shaikh & Khoja, 2011). However, the implementation of such policies or reforms is a great challenge for many countries of the world. Despite the sharp increase in the use of ICTs, many research findings have proven their use unproductive (Alben, 2006; Okojie, Olinzock, Okojie, & Tinukwa, 2006).Sometimes teachers are not much aware of the need of bringing in internet as an essential part of curriculum and day to day class activities and resultantly students don't become effective users of internet (Iding, Crosby, & Speitel, 2002; Jonassenn, Marra, & Moore, 2003).

Sahin and Thompson (2006) declared in their study that in the field of research and administration, there is frequent use of technology but in teaching the frequency of its use is not that consistent. One of the reasons for that might be that its use sometimes is against the old established beliefs and practices of students. Schrum, Skeele, and Grant (2002) stated in their study that a large number of teachers are not well aware about effective use of technology in their teaching methods in spite of the very fast development of technology. There can be various reasons for this including the lack of proper training to use technology, deficiency in skills to incorporate

technology in day to day activities and lack of funds (Pelgrum, 2001). There is not sufficient access to computer, programming and internet to integrate ICTs completely in educational process (Afshari, Abu Bakar, Su Luan, Abu Samah, . & Fooi, 2009). Mumtaz (2000) states that one of the greatest reasons for teachers not using and integrating technology in their classes is non-availability of financial resources to have access to hardware and software.

World Economic Forum (2009) declared the use of ICTs to be very poor in Pakistan. This has to be a very serious concern to people concerned. So it was suggested in the report of that survey to increase funding and finances in developing ICTs infrastructure. Different trainings like pre-service and in-service trainings were also suggested to integrate technology with teaching methodology and doing all this was declared as major responsibility of the quarters concerned (Jung, 2005).

In modern times teachers find many new technological tools to be available to them which may prove to be a great help in solving many teaching learning problems but on the other side the teachers have also got an added responsibility to learn to use and integrate this technology in their instruction (Robinson &Latchem, 2003). Nowadays teachers will not only have to take the responsibility of their routine activities in their jobs but they will have to update themselves with new technology and new skills to use these technologies in their teaching (Carlson & Gadio, 2002).

In spite of a lot of investment in the field of pre-service trainings, the trainee teachers are not imparted the real competence, expertise and skills in integrating ICTs in their teaching positively, professionally and efficiently (Duran, 2000; Bullock, 2004; Mehlinger & Powers, 2002; Evans & Hazelman, 2006). One of the basic weaknesses in the infrastructure of using ICTs in Pakistan is the ever increasing problem of the shortfall of electricity. Scarce budgetary provisions and low priority for ICTs equipments at the part of academic leaders are the common issues of teacher training institutions. Not only the present ICTs resources are poor, their distribution is even poorer which intensifies the problem. The policies about using ICTs are also inconsistent due to non-stability in politics. The teachers' deficiency in using ICTs is also worsening the matter even further (Shaikh & Khoja, 2011). Hew and Brush (2007) declared one of the greatest hindrances in using ICTs is insufficient resources.

The effectiveness of educational process is augmented, because of ICTs and policy makers are obliged to make policies regarding the use of ICTs (Nisar, Munir & Shad, 2011). The possibility of integrating technology in teacher education is progressively being accepted in Pakistan as reflected by the most recent National Education Policy (MoE, 2009). As a consequence, two (2) credit course on "ICTs in Education" was introduced in the revised B.Ed. (Hons.) and ADE degrees curricula.

The major objective of the course is train the teacher to understand, use, and apply different technologies in teaching and learning. This course is for using the technology for making teaching of particular subjects more effective. For better understanding and implementation of the course, comprehensive course guides and lesson plans are provided to the teacher educators.

Research has proved that the pedagogy gets positively affected by the use of ICTs. Through the use of ICTs, the teachers are made to adopt student-centred as against the teacher-centred approaches. The use of ICTs encourages team work and promotes higher order thinking in students (Haddad, 2003). Only those teachers are more motivated to use ICTs in their teaching that had the experience of ICTs in their students' life (Collis & Jung, 2003). The role of teachers is very important in making sure the proper use of ICTs. If they remain successful in the effective use of ICTs, they can convert teacher-centred methods into more useful student-centred methods (Carlson & Gadio, 2002).

The knowledge of ICTs has become the need of the hour, as Pakistan is entering the 21st century in a world fast striding in the development of technology. Since 1980s the use of ICTs, is being recognised by the governments as an effective tool for the development and improvement in the teaching learning process (Plump, Anderson, Law, & Qualex, 2009). Now various devices of technology like as white boards, net books, smart phones, digital and audio recorders have become more economical and are easily available. The role of computer in education is also very important. More research work in the field of using ICTs to make learning easier has become possible (Lebaron, Robinson, & McDonough, 2009).

Teachers are facilitated through the combination of ICTs tools to adopt a more suitable collaborative approach for learners (Newhouse, Trinidad, & Clarkson, 2002). Teachers have also been helped by the proper use of ICTs in organizing, storing and presentation of information (Bailey et. al., 2004). Stressing the importance of ICTs in teaching and learning Bowes (2003) is of the view that teachers need training in the use of technology, know about new tools, opportunities to avail them and support from the institutions. Through this way the teachers would be more equipped with new knowledge and new technologies.

Statement of the Problem

As far as pedagogical practices of teachers are concerned, ICTs have their own significance and role to play. The rapid development of technology particularly the internet and the availability of other resources at easy cost has made students less dependent on the teachers as the only sources of information and knowledge in the

classrooms. Now the teacher is no longer a sage but a guide, contributor, and facilitator who needs to foster himself/herself with new technology (Heinich et. al., 2002). Keeping this in consideration, the present study was conducted on the topic 'Implementation of Information and Communication Technologies (ICTs) in Education Course: A case from Teacher Education Institutions in Pakistan.'

Research Questions

i) How the course "ICTs in Education" was implemented?
ii) How did the teacher educators follow the course guide and to what extent the course guide was helpful in implementing this course?

Method

This study probed the implementation of course "ICTs in Education" specifically the particular unit "ICTs Integrated into Curriculum and Instruction", and use of course guide in ADE and B. Ed (Elementary) programs in seven institutions. This study used a multiple case study method of inquiry (Stake, 2006). Yin (1995) proposes the "multiple-cases studies" as the most probable research design.

Seven institutions of Khyber Pakhtunkhwa and Punjab (Four from KP and three from Punjab) , where the subject 'ICTs in Education' had been taught in the preceding semester were taken as population. The 40 teacher educators and 200 students were respondents of this study.

For collecting multiple facet data about the implementation of "ICTs in Education" course, two instruments: a questionnaire students, and a semi-structured interview for ICTs teachers, were developed. All these instruments were piloted in Regional Institute for Teacher Education (RITE), Abbottabad for refinement. These instruments were validated using judgemental validation. Cronbach alpha was calculated for prospective teachers' (students) survey form. The value of reliability coefficient was found to be 0.97 (n=170).

The members of research team were trained to administer research instruments which were going to be used for data collection. The sample institutions were visited twice. The first visit focused on obtaining consent from participants and familiarizing the participants about the process involved in data collection. The following visit involved distributing the students' survey forms and interviewing the teachers who had been involved in teaching the course "ICTs in Education".

On students' survey forms, the response ranging from 'Not at all' to 'Always' on five point likert scale were assigned scores ranging from 1 to 5 for each statement respectively. For each response, mean score was calculated using formula for simple arithmetic mean through SPSS software. The data collected through students' survey forms was interpreted on the basis mean value for each response. Qualitative data collected through interviews from ICTs teachers was transcribed in to plan text. Question by question text was categorized and coded. Themes and pattern emerging across data were presented in table showing a cross comparison among cases (tables 4 & 5).

Data Analysis and Results

The teacher training programs ADE and B.Ed. Elementary (E) were going on in the seven institutions under study. The emphasis of the study was to examine the implementation process of specific unit 'use of ICTs in curriculum and instruction'. Moreover, it also explored the utility and benefit of course guides for ICTs in education for the ICT teachers. Through cross-case analysis the commonalities and difference were carried out regarding the implementation of the course "ICTs in Education" through course guide. The 'whole cases as a single case' analysis was done to examine the process of implementation of specific unit of "ICTs in Education" in ADE and B. Ed (E) programs.

Following tables explain the analysis and interpretation of data in this study.

Table 1: Response of students and their practical experience regarding use of ICTs

Sr. No	Sub-Construct	Mean
1.	I was taught in the classroom which was equipped with computers.	3.58
	I was taught in the classroom which was equipped with internet connection.	3.50
	I was taught in the classroom which was equipped with multimedia.	3.52
	I was taught in the classroom which was equipped with DVD player and learning CD's.	2.50
	I was taught in the classroom which was equipped with digital camera.	2.32
	I have access to computer at home.	4.14
	I use internet at home.	3.68
	I use facebook and other social network tools.	3.54
2.	Clarity of objectives	3.76
	Actual Classroom experience	3.01
	Support for using ICT in class	3.39
	Use of ICT with examples	3.23
	Use of video for professional development	2.36

Table 1 depicts the picture of experiences provided to prospective teachers regarding use of ICTs in education. They were often taught with computers, multimedia and internet connection available at classroom but it was sometime that DVDs and learning CDs were available in classrooms, while the availability of digital cameras in ICTs classroom was rare. The students (prospective teachers) were of the opinion that they had computers facility with internet connection at home and they were quite familiar and use face book and other social networks. The objectives of the course were often clearly described in the class as whole case (in every institution) but it was rare in almost every institute that video recording was played for their professional development.

Table 2: Teaching strategies, preparation, implementation and integration of ICTs

Sr. No	Sub-Construct	Mean
1.	Team work	3.66
	Group discussion	3.70
	Linkage with previous knowledge	3.60
	Question/answer	4.08
2.	Use of ICTs at schools	1.80
	Planning lesson for integrating ICT's	3.03
	Exploring custom (DVD/CD), Multimedia resources	2.84
	Developing a technology plan	2.58
	Barrier for effective ICT's use	3.36

Table 2 depicts that group work, discussion, connection with previous knowledge and question answer techniques were mostly used in institutions where teachers get training. While the practical application of ICTs tools are minimum in teaching practice schools. There are difficulties, confronting the proper use of these tools.

Table 3: Various aspects in implementation of ICTs

Sr. No	Constructs	Sub-Constructs	Mean
1.	Learning through readymade applications	Use of CD "History of Pakistan" at elementary level.	2.07
		Lesson planning using ICTs readymade applications	2.98
		Use of video prompt in ICTs classroom	2.64
		Lesson planning using video resources	2.70
		Using video commercials in education	2.88
		Using split video techniques	2.51
		Use of documentaries and video/movies discussions	3.24
2.	ICTs tools/resources for teaching multiple subjects	Use of different ICTs tools, (DVD/CD's) for teaching a variety of subjects	3.25
		Using video animations, movies and TV broadcast for teaching and learning	2.94
3.	Internet usage and online resources	Notion of globalization through internet	2.97
		Online tutorials for teaching different contents	2.99
		Browsing information from internet	3.95
		Communication and cooperation through online resources	3.32
		Use of digital libraries, archive and e-books	2.40
		Use of interactive online applications like google earth, google maps	2.95
		Use of online video resources and video channels	3.36
4.	Usage of digital camera	Introduction with the power of pictures/photographs	3.39
		Using digital camera	2.46
		Use of digital camera for sharing experiences	2.56
5.	Usage of educational (games/puzzles)	Investigate and use games and puzzles for teaching different subjects	2.91
		Design a story board on an educational game	2.01
		Design a puzzle online	1.82
6.	Usage of interactive radio and broadcast Television	Comprehending power of audio/radio as educational tool	3.93
		Use audio/radio/IRI resources for teaching various subjects	3.11
		Case studies to improve learning through radio broadcast	2.12
		TV broadcast in education	2.87

Table 3 gives the picture that in ADE and BEd programs the students were provided the experience of forming lesson plans with readymade applications. The prospective teachers were sometimes provided the experience of using DVDs, CDs for teaching different subjects. The prospective teachers were sometimes provided the opportunity to use online applications like Google or Google map, online tutorials, communicate through online resources and to be aware of concept of globalization. But they were

not trained to capture the power of photography through digital cameras in teaching. In the classroom activities, they had not got any experience of doing or designing puzzle game.

On the whole, prospective teachers were not trained to use interactive radio and broadcast TV in their "ICT's in education" course, though they had understanding about radio broadcast.

Table 4: Practical application of ICTs Course Guide

Usage of Course Guide	Similarities	Differences
How the course guide was used/adopted?	ICTs teachers in four institutions (2,4,6,7 cases)followed the course guide to a great extent. The ICTs teachers of five institutions (cases 1,2,4,6,7) used planned lessons and activities as suggested in course guide or adopted these lessons and activities according to their context.	One institute (case 1) partially followed the course guide, while another institution (case 5) did not use this course guide. Similarly, the teacher in case 3 was unaware about this guide because he/she had not been provided ICTs course guide. The ICTs teacher in case 1 used laptop for depicting the use of different ICTs tools and students were made to prepare lesson plans on audio/ video based materials. The ICTs teacher in case 6 did not follow the lesson plans and activities traced in ICTs course guide used, due to the scarcity of resources.
To what extent it was found useful?	The ICTs teachers in five institutions (cases 1,2,3,4, 7) found the course guide helpful for the effective implementation of course "ICTs in education".	The ICTs teacher in case 5 did not get benefit from this course guide, while the teacher in case 6 remarked that**"** the user of this guide should be professionally sound"

Table 4 depicts various aspects of course guide, used by the ICTs teachers in different cases. It depicts that for majority of cases (institutions), the course guide was practically useful and the ICTs teachers used/adopted it for teaching the course in "ICTs in education".

Table 5: Problems and Challenges faced in following the Course Guide

Problems/ challenges	Cases							Total
	1	2	3	4	5	6	7	
Shortage of power supply	✓	✓	✓	✓	-	✓	✓	6/7
Unavailability of ICTs tools/ resources	✓	✓	✓	✓	-	✓	✓	6/7
Shortage of times	✓	-	✓	✓	-	-	-	3/7
Work load	✓	-	-	-	-	-	-	1/7
Lack of training and skills	✓	-	-	-	-	✓	-	2/7
Less space in the class	-	-	✓	-	-	-	-	1/7

Table 5 shows the major problems faced by ICT teachers in implementing the course guide were absence of commercial power supply and scarcity of ICTs tools/ resources (6/7). Three institutions (cases 1,3 and 4) pointed out the shortage of time to follow the lesson plans as one of the hurdles, whereas two institutions (cases 1 and 6) reported lack of skills and training by ICTs teachers. The problems affecting the least institutes were workload and lack of space in classrooms, which were reported by ICTs teacher in case 1 and 3 respectively.

Discussions

Through investigating the research question: "How the course 'ICTs in Education' was implemented?" it was found that when the teachers used laptops to overcome load shedding, it was convenient to follow and implement the course "ICTs in Education". These findings are consistent with previous studies by Moses, Khambari, and Su Luan (2008), where they have described about laptop as an effective ICTs tool for teacher educators as well as students for the integration of ICTs. They have also reported meaningful role of skilled and knowledge able teachers of ICTs. Sandholtz and Reilly (2004) are also of the opinion that skillful teachers can effectively integrate ICTs in education.

The investigation of the research question: "How did the teacher educators follow the course guide and to what extent the course guide was helpful in implementing this course?", depicted that the teacher educators who used course guide, proved to be more effective than the teachers who did not follow it. On the other hand, the teachers who integrated ICTs, following course guide found it difficult to follow lessons in respect of time management. However, majority of ICTs teachers partially followed the course guide due to non availability of ICTs tools/resources and shortage of electric power supply. Few teachers uttered the importance of training in use of ICTs tools. Plomp, Anderson, Law, and Quale (2009) have considered the ICTs tools and resources as requirement for the implementation

and integration of ICTs in education. Technology implementation and integration has often been hindered by non access to computer, network, infrastructure and resouces (Mikre 2011 ;Afshari et. al., 2009;Pelgrum, 2001). Balanskat, Blamire and Kafal (2007), Sahin and Thompson (2006) have employed that negligence of skills and reluctance of teachers to use ICTs are important factors that contribute to hold teachers back from integrating ICTs in teacher training programs.

Teacher is main driving force for the success or failure of educational policy, project or intervention. Therefore, it is imperative that teacher must be provided rigorous training for the improvement of educational system. This training should not limited to those teacher educators who are assumed to teach the course "ICTs in Education" but all the teacher educators be equipped with skills to integrate ICTs in their teaching learning activities. Higher Education Commission can conduct a necessary training/workshop for teacher educators throughout the country. The ICTs labs must be enriched and equipped with latest ICTs tools. The schools attached with each institution for teaching practice should be also developed for ICTs infrastructure and resources so that prospective teachers may practice the use ICTs in real classroom situation. The ICTs course guide should be reviewed in order to develop correspondence between lessons/activities and specified time these lessons and activities.

In order to overcome the problem of shortage of electricity, generators or any other substitute for electricity must be provided in teacher training institutions. For future purposes, the trained staff should be employed and existing faculty with leadership in Teacher Education Institutions be also trained and strengthened through workshops and refresher courses for the effective implementation and integration of ICTs in education.

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