Meta-analytic Approach towards Financial Limitation in Using Educational Technology

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Abstract The purpose of this study is to examine the relationship between financial limitation and using Educational technology by Iranian teachers through meta-analysis. This paper will contribute to the body of knowledge regarding to the studies on Obstacles in Using Educational Technology in the process of teaching and learning in the Education Systems of Iran. An extensive search for relevant published and unpublished studies found 51 studies from 1993 to 2009. 8 research studies with inferential statistics were chosen. The results indicated that financial limitation had a lot of influences on not using educational technology and it was a big obstacle for using it. The findings suggest that the use of educational technology should be given greater consideration than it currently receives in the teaching and learning process.
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1. Introduction

Resnick (1989) explains constructivists believe that learning is constructing knowledge from one's experiences rather than directly receiving information from the outside world. Constructivism emphasizes the importance of active involvement of learners in constructing knowledge for themselves: top-down processing- begin with complex problems and teach basic skills while solving these problems (Yount, 1996). The constructivist approach considers learning as authentic and learner centred. ICT is a great help in the constructivist approach, where one can design simulated and individualized learning environments to students. ICT makes the learning less abstract and more relevant to their life situations. ICT-enhanced learning promotes increased learner engagement. ICT-supported learning encourages interaction and cooperation among students, teachers, and experts regardless of where they are. ICT-enhanced learning recognizes the presence of different learning pathways to explore and discover rather than merely listen and remember. ICT is becoming more appropriate in the realization and implementation of the emerging pedagogy of constructivism that gives greater responsibility of learning for students.

From the point of systematic approach, an educational system such as school can be considered as a system with input, process, output and environment. This paper intended to look at school as this aspect as a conceptual framework and specifically to pay attention to ICT in this approach. The best advantage of systematic view is that we can describe all of the systems without considering nature, measure or complexity with just four parameters of a system. These four parameters are field, input, process and the output (Bula, 1997). Considering this view of funding in educational technology and the influences of it on different elements and factors of educational system has been shown in figure 1.

One of essential inputs to educational system and particularly at school is the financing in it, so each government such as Iran must consider it seriously. ICTs in education programs require large capital investment. Potential sources of money and resources for ICT use programs suggested are grants, public subsidies, fund-raising events, in kind support from volunteers, community support, revenues earned from core business, and revenues earned from ancillary activities (Tinio, 2002). Osei-Bryson et al. (2003) believes modern organizations have increased investing on IT, because they believe that IT has a positive effect on the organizational performance.

ICT use in education systems of developed countries has comparatively advanced than ICT use in education systems of developing countries. Investing on ICT infrastructure for schools and creating networks among educational institutes, improving overall standard of education by reducing the gaps in quality of education to foster self-paced, self-assessed, and self-directed learning through the applications of ICTs, and developing ICT policy for education and training. Schools in the Western World invested a lot for ICT infrastructures over the last 20 years, and students use computers more often and for a much larger range of applications (Volman, 2005). Usun (2009) claims that more than half of all European countries highlight ICT training as a required section in teacher education curricula for primary and secondary sectors. For instance, in the UK, the New Opportunities Fund (NOF) training, a

significant investment from the state government, provided funding for training teachers in ICT from 1998-2002. In Australia, the Digital Strategy for Teachers and School Leaders provides a significant amount of funding to help pre-service and in-service teachers and school leaders to develop ICT proficiency and embed these skills across the curriculum and teaching practices (UNESCO, 2010). According to Thomas (2003), Britain has been able to keep such pace as a result of government funding through the local Education Authorities and the Education Reforms Act of 1988 that compelled the central government to make budgetary provision for education technology. The Federal Government of Nigeria (Federal Republic of Nigeria, 2006) provides basic infrastructure and training at the primary school like IWBs, mobile Internet unit (MIU), etc.

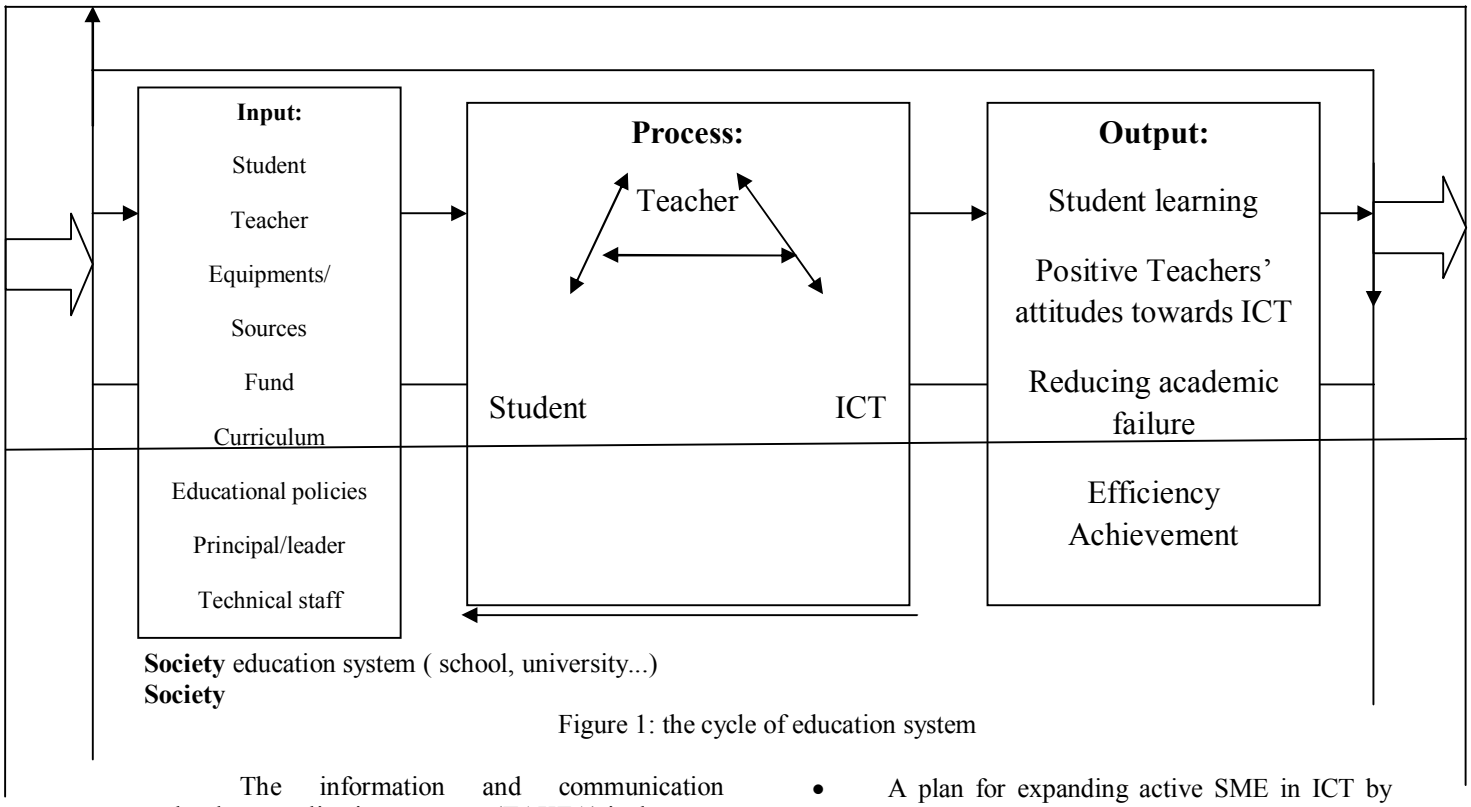

Figure 1: the cycle of education system

The information and communication technology application program (TAKFA) is the most important policy initiative for Iran. A number of plans are to be developed to guide the pursuit of these objectives:

- A plan for electronic government (system, virtual network, law and security).
- A plan for promoting ICT application in education and expanding digital skills in Iran's manpower.
- A plan for expending ICT in higher education.
- A plan for expanding ICT in health, treatment and medical education.
- A plan for expanding ICT in economy, commerce and trade.
- A plan for expanding the culture and knowledge of ICT, and for strengthening the Persian script and language in the computer environment.
- A plan for expanding active SME in ICT by creating growth centres and ICT parks (Sadeghnezhad , 2003).

In Iran as well as other developing countries, financial limitation and the cost for ICT is one of important parameter in not using it. In Africa, the cost of computers is too high for many to afford. Monthly Internet rates are exorbitant and the charges for satellite television are unaffordable for most people (Brakel and Chiseuga, 2003). Evoh (2007) observes that despite of the recognized role of ICTs in improving education, ICTs remain a low financial priority in most educational systems in Africa. He further observed that most countries in the region lack resources for a sustainable integration of ICTs in education. Cost has been reported as one of the factors which influence provision and use of ICT services (Adomi, 2006). Wims and Lawler (2007) who discovered that insufficient numbers of computers and peripheral devices inhibit deployment

of ICT by teachers. The high cost of the technology and maintenance of the facilities, high cost of spare parts, virus attack of software and the computer, interruptions of internet connections, and poor supply of electric power , inadequacy of existing infrastructures have limited ICT usage in education. The infrastructure challenges can be named are absence of appropriate buildings and rooms to house the technology, shortage of electric supply and telephone lines, physical equipment, technical equipment /materials such as ruler, map, laboratory equipment, computer, internet, data projector, writer, scanner, telephone, fax, smart board, presentation preparing program, website designing programs, network , width of band, flash discs, overhead projectors, text-based and other different types of ICTs. Because of this, each government should deal with infrastructure related challenges before the planning of ICTs integration to educational systems to improve overall standard of quality of education.

Another factor for this is management and service staff that must have knowledgeable, skilful, and open-minded managers in order to apply ICT at school. Also, adequate, qualified service staff is needed to create learning environment. Teaching staff, is another factor for improvement of a school in ICT. Hence, there is the need to link the school budget, pedagogical needs and school activities. Yee (1999) found that the principals of ICT-enriched schools (across three nations) played a vital role in managing the school budget. Consequently, support for maintenance equipment and technology is important for ICT embedding success.

In the teaching-learning process phase, there are three main elements- teacher, student, ICT. A teacher will have access to the required sources through ICT. The teacher acts as a facilitator who encourages students to discover principles for themselves and to construct knowledge by working to solve realistic problems. Such a system is made of recipient part and reaction part for responding to the people and the management system. These systems record all the students' responses and provide a complete report from the students' class performance and feed backs. Internet provides the students with access to their necessary sources for accomplishment of their projects and also the students are allowed to have communication with other students and teachers from other countries for getting their required information (Ebadi, 2003). Information and communication technology provides the opportunity to the students with the ability to copy the information easily and have access to the information much faster, doing the usual homework faster .The use of information and communication technology (ICT) creates a powerful learning environment and it transforms the learning and teaching process in which students deal with knowledge in an active, self directed and constructive way (Volman & Van Eck, 2001).

The output of this process are students who control the timing, location and pace of their studies; supporting educators in providing high-quality instruction; tailoring the learning environment to the learning needs of individual students; supporting increased communications among educators and learners; providing frequent and timely individual feedback and assessment; and supporting reuse of high-quality learning resources (Canadian Council on Learning, 2009 cited in Borokhovski et al.2011). And they are well-qualified for job markets. Also the education system can gain the positive teachers' attitude towards education system and ICT as well as reducing academic failure and efficiency achievement that all of these have feedback to society.

Integrating ICTs to educational system has some barriers. Bingimlas (2009) identifies two main categories of barriers: teacher-level barriers and school-level barriers. The basic school-level barriers are lack of time, lack of effective training, lack of accessibility to ICT-based resources and lack of technical support in classroom. There are multifaceted relationships between the barriers and for a successful integration of ICT into teaching and learning environments, all of these components must be taken into account in the process. Yalin, Karadeniz and Sahin(2007), Aypay and Ozbasi (2008), Karal, Aydin and Ursavas (2009), Tasci, Yaman& Soran (2010) found that the inadequacy of ICT equipment at schools and particularly in classrooms is the most important of these obstacles . Also the study of Qablan, Abuloum and Al-Ruz (2009) indicated where there is not enough ICT equipment in classrooms and where teachers only have access to shared ICT classrooms or laboratories, they cannot use ICT facilities as much as they want and there are even conflicts among teachers. The lack of innovative and quality teaching resources is a very important obstacle against the effective and productive integration of ICT into teachers' classroom practices. The presence of adequate ICT equipment in the classroom environment is a determining factor in teachers' practices. Cavucci (2009) studied an analysis of barriers and possible solutions in integrating computer technology into middle school curriculum: Findings from a mixed-method approach. The barriers included technology equipment that did not function properly or did not function at all, the students' familiarity with computer technology and/or lack of computer technology in students' homes, and the cost associated with computer technology classes at a university or college. Unal and Ozturk (2012)

investigated barriers to ICT integration into teachers' classroom practices: Lessons from a case study on social studies teachers in Turkey. Lack of ICT equipment in classrooms, lack of ICT-based teaching resources, and the effect of traditional approaches on teachers' practices were some of obstacles. Kwacha (2007) also noted that the most common problems associated with the effective implementation of ICT are lack of qualified ICT personnel, cost of equipment, management attitudes, inconsistent electric power supply, inadequate telephone lines, particularly in rural areas and non inclusion of ICT programmes in teacher's training curricula and at the basic levels of education. Moradi (2010) analyzed the barriers to entrepreneurial desire in computer students in Tehran University and financial limitations were one of barriers. Sheikh Sadeghi (2007) observed the barriers of using educational technology, the amount of using it & examining the available facilities in Special school in Isfahan city. The results showed the lack of necessary and appropriate training facilities and financial limitations as obstacles. Samiee (2006) evaluated the barriers of establishing e-learning education system in perspective of teachers & principals in Tehran. Financial limitations were one of obstacles. Taghvaee (2005) examined the barriers to the use of virtual learning in Tehran high schools in view of the principals. In view of them equipment factors (the weakness of structure and not having the necessary facilities to connect to the Internet) with the most deterrent were considered the first barrier to use educational technology. Financial limitations, from the perspective of principals, second barrier for the use of virtual education was considered.

In spite of efficiency of educational technology and the affirmation of research studies in the past decades that have shown educational technology increases educational opportunities and achievements and the efforts of different organizations in Iran in this case but there are many studies on using educational technology that they showed the financial limitations as obstacles in using educational technology by most of teachers in Iran. For getting the main and general result from these individual studies, this paper has designed through meta-analysis to find the relationship between the financial limitations and using educational technology by school and university teachers in their classes. This paper gets main information of lots of studies and according to Resnick (1989) believes that learning of other studies is constructing knowledge from one's experiences rather than directly receiving information from the outside world.

2. Objective of the Study

To analyze the relationship between financial limitations and the use of Educational Technology by teachers and university professors in Iran.

3. Hypothesis

There is no significant relationship between a) financial limitations and b) the use of Educational Technology by teachers and university professors.

4. Method

The method employed to carry out this study was meta-analysis, which derives and tests overall factors from the empirical results of individual studies, to obtain a quantitative estimate of the overall effect for the purpose of integrating the findings (Glass, McGaw, & Smith, 1981). Meta-analysis is the statistical analysis of a large collection of analysis results for the purpose of integrating the findings (Glass, 1976). The basic purpose of meta-analysis is to provide the same methodological rigor to a literature review that we require from experimental research. The effect size is the unit of currency in a meta-analysis. It is a value which reflects the magnitude of the treatment effect or (more generally) the strength of a relationship between two variables. And largely for practical reasons, the most convenient measure of effect size is the Pearson correlation coefficient (r) between the two variables. It is used the test of significance reported in the original analysis to calculate the effect size r.

5. Population and Sampling

The population of the present study is all theses, articles and research works available during 1993-2009 on Obstacles in Using Educational Technology in Educational System in Iran. After reviewing about 51 articles, researches, and theses, 8 research studies with inferential statistics are chosen because they are suitable according to methodological issues. That is statistical population. The sample of study is the same as statistical population.

6. Design of the Study

The present study is carried out based on Howitt and Cramer's meta- analysis (2000) steps and processes:

*a) Preparing of preliminary list of researches related to the topic through the available resources.*The researcher went to the following sources andprepared the preliminary List of 51 studies reported during 1993- 2009 related to the selected topic "Obstacles in using Educational Technology in Iran":visited Research centers like the Institute of Education Ministry of Education, studying Journal of Organization and National Libraries.visited to a number of universities including Tehran, Isfahan, Allameh Tabatabai, Tarbiat Modarres, Khorasgan Islamic Azad, Najaf Abad Islamic Azad University, Teacher Training centers, etc.

- went to different websites like www.irandoc, www.magiran.com, www.roshdmag.ir,

http://en.wikipedia.org/wiki. www.google.com. http:/trc.isfedu.org, namamatn.ir.

- referred the list of studies conducted in other province research centers.
- referred of the journals related to the topic like Journal of Literacy Research, Asian Journal of Communication, Journal of Organizational Computing and Electronic Commerce, Journal of Criminal Justice Education.
- used the site of Training Institute, databases, indexed list and CDs like database of university of Mysore, database of different countries.

b) Reviewing the studies listed on related topic and selecting the studies for analysis.

The researcher reviewed all the listed 51 studies in detail and selected 8 studies with inferential statistics (required condition for meta-analysis) for analysis of data.

c) Calculating effect size and z (fisher) for each of the relationship between the variables for each study reviewed (Pearson r).

A standard measure of effect size in terms of Pearson correlation coefficient (r) was calculated using appropriate formula and z (fisher) using the table 32.3 (Howitt & Cramer , 2000, p.384) for each of the relationship between the variables for each of the studies selected for this research. The list of all the 8 studies with the details of the year of research, name of researcher, sample size, effect size and z (fisher) was prepared in chronological order. Then the combined effect size of all the 8 studies was calculated. For this, the average of al the z (fisher) was calculated and the corresponding effect size for this average value is considered.

Table1: The characteristics of the done researches on obstacles in using educational technology in educational system in Iran

Research code	*Name of researcher*	*The title of research*	*The year of research*	*The sample size*	*Effect size formula*	*Effect size*	z_r *(Z fisher)*
1	*Ashraf Mirheidari*	*Obstacles of using Educational technology in the learning-teaching process from the perspective of teachers of Educational new system of high school in Isfahan in the year 1996-97*	*1997*	*300*	$r = \sqrt{\frac{t^2}{t^2+df}}$	*0/133*	*0/131*
2	*Ghodrate Hajihosseinlo*	*The survey of obstacles for using of educational technology in teaching- learning process from the perspective of Khoy city Elementary teachers*	*1999*	*170*	$r = \sqrt{\frac{x^2}{n}}$	*0/99*	*3/80*
3	Hassan Abdolahi Mehr	The survey of obstacles for using of educational technology in the process of teaching-learning process in perspective of teachers in Qom ,1 district	2001	648	$r = \sqrt{\frac{x^2}{n}}$	*0/24*	*0/24*
4	Fatemeh Soghra Dadpour	The survey of obstacles in the use of educational technology in teaching and learning process from the perspective of high school teachers in Ghaemshahr city	2004	240	$r = \sqrt{\frac{x^2}{n}}$	*0/62*	*0/72*
5	Marzieh Taghvaee	The survey of obstacles for using of educational technology in the process of virtual teaching in perspective of high school teachers in Tehran	2005	335	$r = \sqrt{\frac{x^2}{n}}$	*0/08*	*1/40*
6	Masood Samiee	The survey of obstacles of establishing the virtual teaching system in view of teachers	2005	239	$r = \sqrt{\frac{x^2}{n}}$	*0/72*	*0/90*
7	*Yazden Moradi*	*The survey of obstacles of entrepreneurial attitudes of computer students in Tehran applications University*	*2007*	*319*	$r = \sqrt{\frac{x^2}{n}}$	*0/194*	*0/19*
8	*Daryosh Bahadori*	*The survey of obstacles in the use of educational technology in teaching and learning process from the perspective of the professors of Rodhen Azad university*	*Not reported*	*285*	$r = \sqrt{\frac{x^2}{n}}$	*0/43*	*0/46*
Average						*0/75*	*0/98*

d) *Testing of hypothesis*:

Hypothesis: There is no significant relationship between a) the between financial limitations and b) the use of Educational Technology by teachers and university professors in Iran.

Hypothesis was tested by considering the probability value for the combined effect size for all the 8 studies considered for the research. For this purpose, the corresponding z score for the given probability (p) value of each study considered for the

research was taken from the table 32.4 (Howitt & Cramer, 2000, p.386). Then, the average of all the 8 z score was calculated using the formula $z = \frac{\sum z}{\sqrt{n}}$ and the corresponding p value for this average was noted as the significance level .The corresponding details are presented in table 2.

Table 2: Calculation of the significance level of all the8 studies considered for the research

Research code	*p*	*z*
1	*0/01*	*2/32*
2	*0/03*	*1/88*
3	*0/0001*	*3/719*
4	*0/01*	*2/32*
5	*0/05*	*1/64*
6	*0/05*	*1/64*
7	*0/05*	*1/64*
8	*0/01*	*2/32*
Average		*6/195*

This table shows that the average of Z score is 6/195 that it's corresponding to p = 0/00001.

The combined effect size (0/75) of all the 8 studies was found to be significant at 0.00001level as per Cohen's interpretation table. So this hypothesis was rejected (table 3) and concluded that the use of Educational Technology in teaching-learning process is significantly related to the financial limitations in Educational Technology. In other words, it is said that, based on this meta-analysis, the financial limitations had a lot of influences on not using educational technology and it was a big obstacle for applying it.

Table 3: Analyzing the effect size of forth hypothesis

Statistic Indicator / Independent Hypothesis	*N The number of hypothesis*	*The average of effect size (E Zr)*	*P*
the financial limitations	*8*	*0/75*	*0/00001*

According to table 3, the best estimate of effect size of the relationship between independent variable (the financial limitations) and dependent variable (using educational technology) in population at significant level 0/00001 is 0/75. As Cohen's interpretation table, it is so high. So the hypothesis has been rejected. It is said through this meta-analysis, the financial limitations had a high influence on not using educational technology and it could be considered as a big obstacle for using it.

7. Conclusion

The result of this study shows that there is a direct correlation between the financial limitations and not using educational technology or ICT. The studies show that when there are financial limitations from any kind - personal limitation or problems related to schools, university and society, lack of appropriate facilities or etc, those affect on the teachers and professors not to use educational technology (ICT) in their classes. This result is in the line with the results of studies of Mirheidari (1997), Hajihosseinlo (1999), Abdolahi Mehr(2001), Dadpour (2004), Taghvaee (2005), Samiee (2006), Moradi (2007), Sheikh Sadeghi (2007), Kwacha (2007), Aypay and Ozbasi (2008), Qablan, Abuloum and Al-Ruz (2009), Cavucci (2009), Unal and Ozturk (2012), and Bahadori (n.d).

Potashnik and Capper (2002) also indicated that the use of computers and the Internet is still in its infancy in developing countries, if these are used at all, due to limited infrastructure and the attendant high costs of access. By ICTs, developing countries can increase access to and progress the quality of education. According to systematic approach, the results of ICT profits return to society and education system again and cause their improvement. ICTs significantly facilitate the learning and gain the knowledge. It offers to developing countries the golden opportunities to increase education systems and prosper the level of their knowledge. ICT can improve the flexibility and quality of learning by providing access to a high-quality, multimedia resources. Tinio (2002) notes that ICTs are powerful enabling tools for educational change and reform. When used appropriately, different ICTs help expand access to education, strengthen the relevance of education to the workplace, and raise educational quality by creating an active process connected to real life. ICTs have the potential to accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (cited in Yusuf, 2005). Hence, developing countries such as Iran need to apply the benefits of ICT use and balance the cost relative to the existing alternatives. For the effectiveness of ICT integration, government must be competent and have an explicit understanding of the technical, financial, curricular, executive, and social dimensions of ICT use in education. Having facilities and funding for innovative and effective use of ICT integration in education system, it will motivate teachers and professors to use ICT in teaching-learning process.

8. Suggestions

After proving the profits of educational technology in education system, it deserves more attention. For this, the government needs to plan, invest, administer and supervise it.

ICTs must be included in 1 or 5 year plans by government seriously. The government should plan for educational technology definitely and invest for this purpose. If it has financial problem as the most of developing countries have, it can request and utilize the private sector.

In the curriculum, using different ICTs tools should be considered. Enough time should be measured for teaching a subject integrated with educational technology and the content of books integrated with it. For integrating ICT into curriculum, each education system can have digital libraries and internet-based information for enrichment of curriculum content and process, share and interchange leanings and experiences among education systems -university, school, etc.

The government should set pre-service and in-service classes to familiarize and update university and school teachers, with new knowledge, theories, skills related to educational technology and computer, internet, etc and proper curriculum according to it and their usefulness in teaching-learning process.

The funds and needed facilities, technical support should be provided for this purpose by the government and its support and managerial staff is a very important factor to use ICT at schools and universities.

The teachers and professors must be supported in any aspects –personal , social, financial, etc- for applying educational technology in their classes.

Researches can help the developing countries to evaluate and follow their plans to integrate technologies into teaching-learning process.

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