

ADOPTION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN TEACHING/LEARNING PROCESS AT SECONDARY SCHOOLS

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Abstract

In order to appraise the adoption of information and communication technology in teaching/learning process at secondary schools, the study was carried out using 40 secondary school teachers and Principals in and around Tandojam city, district Hyderabad. The instrument was administered into 35 teachers and 5 Principals/Head Masters selected at random from the schools of the study area. Internet facility for teaching was available with only 5% teachers, 97.5% of the respondents were even unaware of this device; 62.5% teachers indicated that internet facility is not even available at their school. It was noted that 82.5% teachers have no exposure of using ICT; 92.5% indicated lacking ICT material at the school; while 92.5% admitted that teaching/learning process becomes interesting by the use of ICT; 72.5% agreed that distant learning programs become effective by use of ICT; 87.5% agreed that the working quality of teachers and students enhances with use of ICT; and 82.5% teachers admitted that ICT makes the teachers up-to-date in their disciplines/subject knowledge. Lack of computers (87.5%), lack of computer literate teachers (82.5%), electricity problem (100%), availability of budget for purchasing computers (82.5%), lack of full facility of ICT (92.5%) were

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the main challenges facing ICT adoption in the secondary schools. The condition of the secondary schools is worst in regards to the use of information and communication technology in the study area compared to international schooling scenario. Concrete measures from the government are required to replace the existing/traditional methods of teaching and teachers may be well acquainted with the teaching aids related to information and communication technology. ICT may be included in the curriculum as major subject while teachers are trained at the teacher training institutions.

Keywords: *Information and Communication Technology, Adoption, learning process, Curriculum, Secondary Schools*

Introduction

Use of effective teaching methods is the key factor to influence and develop learning capabilities of the students. Innovating existing methods in view of the global changes and developments has been a continuous feature of the teachers, researchers, psychologists related to educational planning, teacher trainers as well as the education policy makers. Revolutionary changes and developments in the teaching/learning process have been observed in the last two decades; particularly because of invasion of information technology; and more importantly the nations have added to make their educational system more effective. Now-a-days, the information and communication technologies have not only made the teaching and learning process interesting, attractive and effective, but the learning process has been fasten manifold compared to the conventional teaching/learning (Ajayi and Haastrup, 2009).

The information technology has impacted the field of education significantly; and teaching/learning as well as the research has been affected undoubtedly (Yusuf, 2005). The quality of education and the benefits of quality education have proven by a great deal of research (Lemke and Coughlin, 1998; Al-Ansari, 2006). The effective utilization of information technology means can result in innovation and acceleration in the teaching/learning process, and have the potential to enrich and deepen skills, can fasten the motivation process among the students and stimulate the students to be engaged helping associate school experience to work practices, develop economic feasibility for workers of the tomorrow, as well as to strengthen teaching and help change in the schools (Davis and Tearle, 1999; Yusuf, 2005). Much has said about the use and effectiveness of computers in

teaching/learning process. In the beginning, the use of computers was only limited upto the teaching of computer programming; but with the advent of microprocessor, the affordable microcomputers were introduced in the schools rapidly (Jhurree, 2005). The computers and technology applications became invasive in the society that guided to the need for the development computer skills in everyday life. Hepp *et al.* (2004) claimed that information and communication technology has been employed in education ever since their commencement, but the technological means not always been present massively. Though, there was no entire integration of computers in learning of traditional subject matter at that time, but the people who engaged themselves earlier in information technologies and developed teaching/learning process based on the information technologies, not only are at the climax of development in this sphere, but they are symbolic for the future educationists in the field of education (Pelgrum and Law, 2003).

ICT adoption rate in Teacher Education Institutions in South Asian countries is very limited (Gupeteo, 2014) and ICT status for adoption at relevant institutions is inadequate. The behavior and reasons of teachers in ICT adoption are also needs to be determined for identifying factors that best affect the rate of adoption (Gupeteo, 2014; Anderson and Dexter, 2005; Askar *et al.* 2006; Balanskat *et al.* 2007). In order to determine teachers' behavior for ICT rate of adoption, a contingent valuation method was introduced (Demirci, 2009; Gülbahar, 2007; Kay, 2006; Liaw *et al.* 2007; Samarawickrema and Stacey, 2007). The period of ICT in use, background in relation to education of teacher and their accessibility may be the factors that obstacle the effective involvement of teacher trainers in ICT based approaches. Generally, the age and experience to ICT are the significant factors of its adoption; while the accessibility of to ICT sources also possesses key factor to influence the adoption rate of the teachers (Teo, 2008; Abuhmaih, 2011; Afshari *et al.* 2009; Ajayi, 2009). It is common to say that more the years of ICT use, greater the rate of adoption by the teachers. Moreover, higher educational background also resulted in lesser ICT adoption rate. Hence, the people possessing higher education like PhD and having age more than 50 years, seldom they are habitual of ICT sources and among them the rate of ICT adoption is remarkably lower than those of younger age and having ordinary educational status (Smarkola, 2007; Tella *et al.* 2007; Yilmaz, 2011). The accessibility to teachers to ICT is another major factor; if the teacher education institutions provide well established ICT system and the teachers are given only access for lecture preparation, the rate of adoption can be increased at enhance rate (Bandura, 1997; Bordbar, 2010; Chen, 2010; Chigona and Chigona, 2010). There are several factors that are involved in the development of ICT skills in the individuals and groups mainly include age of teacher trainer, educational status,

gender, educational and computer use experiences, and interest of teachers for using computers can influence the rate of ICT adoption (Schiller, 2003) revealed that although barriers including lack of hardware and software, teachers attitudes were the key determinants for achieving success by integrated use of various sources of ICT during the course of teacher training. Teo (2008) reported that the teachers were although positive to use computers for their teaching processes and they were positive about the usefulness of such means but they were reluctant to control the computer systems. However, there was significant association of age with the computer use skills and teachers' attitude towards adoption of information technology means. Jones (2004) found that confidence of the teacher directly affects his competence and accordingly their perceptions related to their abilities are influenced in relation to computer based application in classroom. Bakir (2016) concluded that use ICT in teacher training or in any other educational activity is fundamental to develop trainees optimally. Makkonen *et al.* (2016) reported that the individuals working with computers and other information technology based equipment and sources are more effective in imparting knowledge and motivation compared to those working conventionally.

Conceptual framework

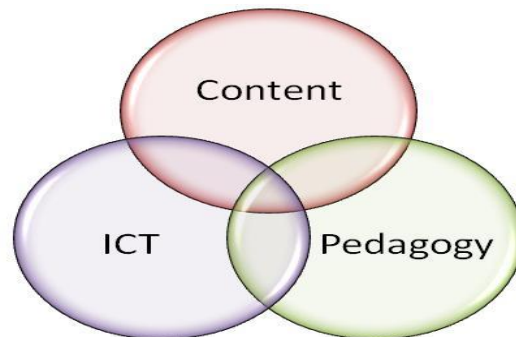
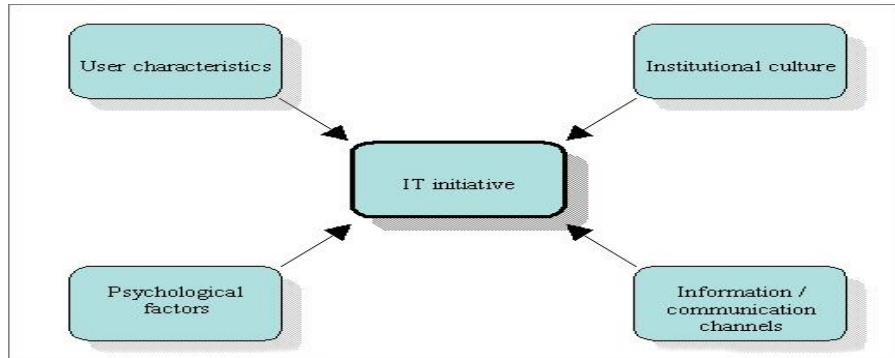


Fig. 1: Conceptual framework

In the modern age, the use of information and communication technology in all educational spheres is unavoidable for the enhancement of teaching and learning processes. The information technology pedagogy is an outline of the studies developed for knowledge enhancement, skills development in relation to professional development of effective teachers or all other stakeholders having programs with educational studies in their background. This specialty emphasizes the in depth development of students and scholars and to become critical for assessment of ICT induction in teaching process. The scholars learn about technologies used for educational and practical as well as for the evaluation of the programs related to educational development. The research component based on

the information and communication technology aspects introduces the methods of research specific to teaching ICT courses to new learners.



Source: Pedagogy for information technology:

<http://elearning.amu.edu.et/course/info.php?id=171>

Fig. 2: Initiative of the information and communication technologies for institutional, individual and psychological factors

The information and communication technologies are considered as the basic building blocks in the modern society (Sanyal, 2001; Daniels, 2002). The developed nations regard understanding information technologies and leading the basic skills and concepts of information technology as part of the foundation of education, in addition of reading, writing and numeric subjects. In the societies, there is misperception that the information technologies only refer to the computers and its allied activities; while in fact this is not the case (Sharma, 2003). No doubt the computers and computer related applications has vital role to play in the management of modern information, other technologies advents are also regarded as information and communication technology (Daniels, 2002). The name ‘computer’ has been replaced by the word ‘information technology (Pelgrum and Law, 2003), signifying a move of focus from computing technology to retrieve information and capacity to store. Further, after introduction of the term information and communication technologies, the e-mail started for the general public (Pelgrum and Law, 2003). The information and communication technologies cover comprised of the internet service, telecommunications equipment and services, equipment used for the information technology and services, broadcasting and media, documentation centers and libraries (Bhattacharya and Sharma, 2007; Amin, 2012). In view of the facts stated above, and feeling the gravity of the information and communication technology in teaching/learning process at school level, the study was carried out to investigate the appraise the adoption of information and communication technology in teaching/learning process at secondary schools. Iqbal *et al.* (2015) showed that

ICT has proved to be effective in developing information seeking skills in prospective teachers in Pakistan; while on the other hand they found the lacking of information seeking skills in prospective teachers and adopted experimental research technique to develop these skills using ICT. The researchers had developed teaching modules by themselves and used them from training which shows that there is need of such valid and reliable teaching modules. These modules should be developed and validated on a large population of teachers. The Government has allocated Rs. 1.10 billion for Information Technology based projects in the federal budget 2016-17. Out of this, Rs. 1 billion will be utilized for establishment of computer labs and other institutions for IT based teaching, Prime Minister's ICT Scholarship and Prime Minister's National ICT Internship Program (GoP, 2016).

Methodology

The research includes figuring research plan, sample selection, collection and analysis of data and on the basis of analysis outcome results interpretation. For studies related to adoption of information and communication technology in teaching/learning process at secondary schools for the sake of assessment the survey method is more important rather than exploratory research. This method composes clear picture of situation related to ICT adoption in teaching/learning process at secondary schools.

A well worked interview schedule was used to complete this study and the questionnaire was considered as an appropriate tool for this study, because the contents of the questionnaire were discussed in depth with the colleagues and experts as well as pre-tested to improve according to the requirement.

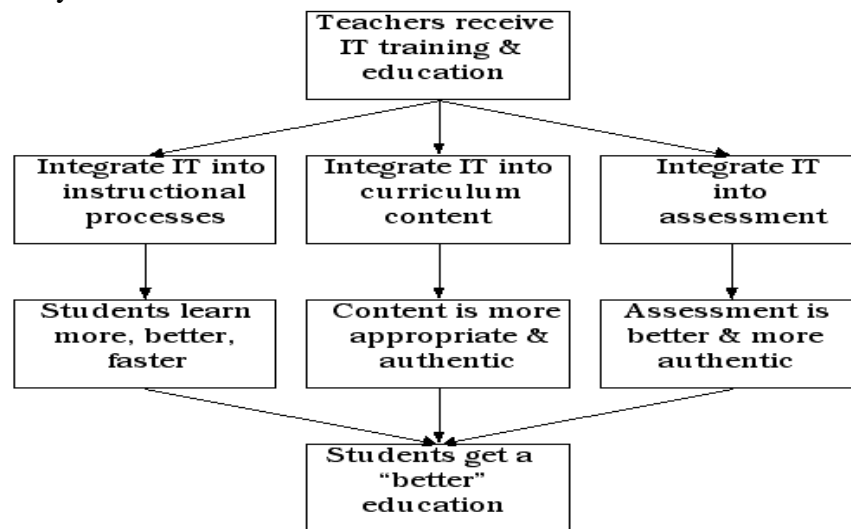
The teachers and Principals of secondary schools in and around Tandojam District Hyderabad were the sample of this study and in all 35 teachers and 5 Principals/Head Masters were selected at random from the schools of the study area. The validation of the instrument was made by consulting the experts in the educational research, management, test and measurement. The Cronbach Alpha was to establish instrument's reliability and the coefficient of reliability was at 0.85. After confirmation of the reliability, the questionnaire was administered personally and some of the questionnaires were filled at the spot, and some of the respondents kept these questionnaires for sending later by mail. The respondents were in personal contact, and some respondents who could not spare special time at home, were requested for filling the questionnaire through telephone call. However, most of the teachers and Principals gave enhanced and prompt response

in regards to the filling of the questionnaire. Data thus collected were analysed by counting the frequency and calculating the percentage scores.

Results and Discussion

Diagramed view of information technology impact on teacher training

The use of information and communication technology in teacher preparation has shown a great deal of efficiency on part of the teachers' performance. An ICT trained teacher integrates IT into curriculum, instructional process and assessment. By integration IT into instructional process the students learn more, better and faster; while integrating IT into curriculum content increased the appropriateness and authenticity of content; and integration of IT into assessment results in better and more authentic assessment of the students (Fig. 3). The above elements has concrete impact on the learning process of the students and the students becomes more perceptive; and mentally as well as psychologically stronger as compared to the students getting education under conventional education system.

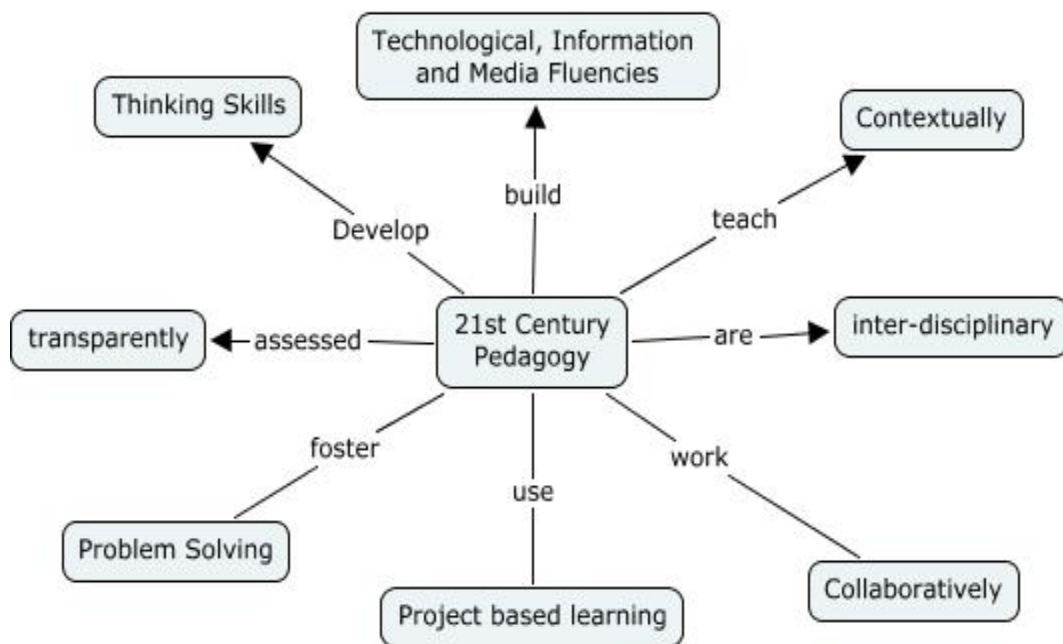


Source: Science of Teaching and Learning (SoTL)

<http://pages.uoregon.edu/moursund/Math/sotl.htm>

Fig. 3: Impact of integrating information technology based teacher training system on their teaching performance and learning capacity of students Impact of information technology on 21st century pedagogy

The 21st century pedagogy is entirely based on information and communication technologies. The diagram (Fig. 4) illustrates that technological information and media fluencies have been build in this modern era; significant development in thinking skills and conceptual and contextual teaching is observed. Transparent assessment of the students has become possible and the mostly the students are motivated for inter-disciplinary aspects. Collaborative work is seen under such atmosphere and the students foster the problem solving; while the learning has become mostly the project oriented. Such development in the 21st century in pedagogy is chiefly dependent on information and communication technologies. The diagrams capture an appropriate idea concerning ICT for the teacher in education and lead to feasible and effective education for students; and this is viewed as a conjecture. The research into this direction is nearly as strong as the time requires.



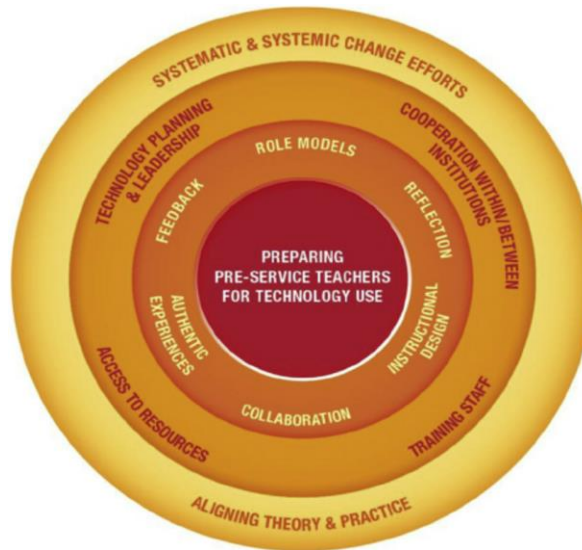
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Fig. 4: Impact of information and communication technology on 21st century pedagogy

Pre-service teacher preparation for technology use

The technological use has always been an issue and generally the teachers prepared

possess less or no skill of technological use. The fig. 5 describes the essentiality of preparing teacher for technological use before their induction in teaching force. The diagram clearly illustrates that for systematic and systemic change a few elements needs to be taken into consideration which include: technology planning and leadership, access to resources, training staff and cooperation within/between institutions. While an institutes becomes role model in technological development, their image and reflection upgrade the designs of institutions from conventional to advanced setup; and with their consistent feedback and collaboration authentic experiences can be achieved.



Source: SQD-model to prepare pre-service teachers for technology use (Tondeur *et al.*, 2016).

Fig. 5: Need of pre-service teacher preparation for technological use for institutional development in technological use

Availability of Information & Communication Technology materials for teaching

The teachers and the principals of the secondary schools of the study were enquired about the availability of information and communication technology materials for teaching and the responses (Table 1) show an adverse situation, where only 12.5 percent teachers have computers for teaching while 87.5 percent teachers have no computer facility for teaching. Similarly, internet facility for teaching purpose was available with only 5% teachers and 95% teachers have no internet facility for teaching. The teaching staff does not possess tape recorders, slide projectors, television, video recorders, slides and electronic boards. Only 2.5 percent of the teachers informed that they have disc players for meeting time to time teaching

requirements and 97.5% of the respondents were even unaware of this device can be used as teaching aid. In this era of information and communication technology, the condition of the secondary schools is worst compared to international schooling scenario. Revolutionary steps of the government are needed to replace the existing/traditional methods of teaching and teachers may be well acquainted with the teaching aids related to information and communication technology.

Table 1: Teaching materials related to information and communication technologies available with the teaching staff for teaching purpose

Items	Available	%	Not Available	%
Computer	5	12.5	35	87.5
Internet facility	2	5	38	95
Tape recorder	0	0	40	100
Slide Projectors	0	0	40	100
TV	0	0	40	100
Video Recorders	0	0	40	100
Slides	0	0	40	100
Electronic Board	0	0	40	100
Disc players	1	2.5	39	97.5

Library Status

The respondents were also asked to disclose about the status of the libraries at their school/college, nearby university and their responses are given in Table 2. The situation was extremely disappointing that 82.50 percent respondents stated that the libraries in their reach have no computer facility even and these libraries are being executed conventionally. Only fewer respondents told that the libraries either at their school, nearby college or university are computerized; while some of the respondents formally stated that the library authorities are planning to computerize the facility.

Table 2: Extent of computerization of libraries

Extent of computerization of libraries	Respondents Number	%
Partially computerized	2	5.00
Not computerized	33	82.50
About to be computerized	0	0
Planned to be computerized	5	12.50

Exposure of teachers and students to use of ICT

The teachers and the Principals of secondary schools were enquired about the exposure of teachers and students to use of ITC and the responses are given in Table 3. Majority (62.5%) teachers indicated that internet facility is not available at their school and 37.5% of the teachers indicated the availability of internet facility at their schools. The motivation problem was deeply existed in the educational institutions and 82.5% teachers have no exposure of using ICT; 92.5% teachers disclosed that ICT material at the school is not enough. About the knowledge of teachers and students on ICT, it was observed that 37.5% students have sufficient ICT knowledge while only 27.5% teachers possess sufficient knowledge of ICT, means the students without achieving ICT knowledge from their schools were better in using ICT technologies than their teachers. No trainings in use of ICT for teachers as well as students were reported by the respondents, which suggested that the concerned authorities are not attentive to provide these facilities at the secondary schools.

Table 3: Teachers and Students' exposure to use of information & Communication technology

Items	Agree	%	Disagree	%
Internet facility at school	15	37.5	25	62.5
Exposure of teachers to use ICT	7	17.5	33	82.5
Enough ICT materials at school	3	7.5	37	92.5
Sufficient knowledge of teachers to use ICT	11	27.5	29	72.5
Sufficient knowledge of students to use ICT	15	37.5	25	62.5
Trainings in use of ICT for teachers	0	0	40	100
Trainings in use of ICT for students	0	0	40	100

Benefits of information and communication technology

The perceived benefits of information and communication technology at secondary schools were recorded and the data (Table 4) indicated that the high majority of teachers (92.5%) admitted that teaching/learning process becomes interesting by the use of ICT; while 72.5% agreed that distant learning programs become effective by use of ICT. Some 87.5% of the teachers agreed that the working quality of teachers and students enhances with use of ICT; while 82.5% teachers agreed that ICT makes the teachers up-to-date in their disciplines/subject knowledge. Majority (92.5%) of the teachers were positive and agreed that teachers' communication to colleagues is easier by ICT and 92.5% teachers admitted that working efficiency of the teachers and students is enhanced by use of ICT. When the teachers were asked whether bureaucracy in administration is reduced by use

of ICT, they were half minded but yet 52.5% agreed this statement and 77.5% agreed that ICT makes the decision making in education easier. The statement “school management records are enhanced by ITC” was agreed by 97.5% teachers and 100% teachers and Principals agreed that financial school records are effective maintained by the use of ICT. It was noted that the teachers are positive and eager to learn on ICT but the poor management at all government levels constraining the ICT development at secondary schools.

Table 4: Benefits of information and communication technology as perceived by the respondents teachers and principals of secondary schools

Items	Agree	%	Disagree	%
Teaching/learning process becomes interesting by use of ICT	37	92.5	3	7.5
Distant learning programs become effective by use of ICT	29	72.5	11	27.5
Working quality of teachers and students enhances with ITC use	35	87.5	5	12.5
The ICT makes the teachers up-to-date in their disciplines	33	82.5	7	17.5
The teachers communication to colleagues is easier by ICT	37	92.5	3	7.5
Working efficiency is enhanced by use of ICT	37	92.5	3	7.5
Bureaucracy in administration is reduced by use of ICT	21	52.5	19	47.5
ICT makes the decision making in education easier	31	77.5	9	22.5
School management records are enhanced by ITC	39	97.5	1	2.5
Financial school records are effective by use of ICT	40	100	0	0

Challenges in adoption of ICT at secondary schools

A set of possible challenges was developed and included in the questionnaire and the teachers/principals were asked to perceive on these challenges faced by ICT in the study area of Hyderabad district. The data (Table 5) indicated that a high majority of 87.5% teachers indicated lack of computer literate teachers at their schools and 82.5% indicated the challenge of lacking computer based information technology at their schools. Electricity problem was indicated by 100% respondents at their school and they complained that most of the schooling time is lapsed due to electricity failure and due to non-availability of electricity the students do not take interest in learning. Some 40% teachers and principals complained high computer prices while 60% indicated that this is not a problem, the computers can be purchased on cheaper prices. The availability of budget for

purchasing computers was considered by 82.5% respondents; while lack of full facility of ICT was reported by 92.5% teachers and Principals. A high majority of teachers complained the non-inclusion of ICT in the teacher training curriculum and they stated that the teachers are not being trained in ICT by the teacher training institutions. While asked about the reluctance of teachers to use ICT in teaching process, 57.5% agreed with the reasons that they are not fully trained and have no confidence in using ICT devices and presentations. It was also found that 60% teachers were feel ICT adoption as a burden on teachers and teaching, while 40% were against this statement and they stated that if they are trained in ICT they will surely adopt this advanced technology set for their future generations at secondary school level.

Table 5: Challenges facing ICT at Secondary schools in the study area of Hyderabad district

Items	Agree	%	Disagree	%
Lack of computer literate teachers	35	87.5	5	12.5
Lack of computer based information technology	33	82.5	7	17.5
Electricity/Power supply	40	100	0	0
Cost of Computers is high	16	40	24	60
Availability of Budget for purchasing computers	33	82.5	7	17.5
Lacking facility of full application of ICT	37	92.5	3	7.5
Non-inclusion of ICT in the teacher training curriculum	39	97.5	1	2.5
Teachers are reluctant to use ICT in teaching process	23	57.5	17	42.5
Teachers feel ICT an extra burden	24	60	16	40

Conclusions

1. The condition of the secondary schools is worst in regards to the use of information and communication technology in the study area compared to international schooling scenario.
1. No equipments related to information and communication technology was found at the secondary schools for teaching/learning purpose.
2. The students without achieving ICT knowledge from their schools were better in using ICT technologies than their teachers.
3. No trainings in use of ICT for teachers as well as students were reported by the respondents, which suggested that the concerned authorities are not attentive to provide these facilities at the secondary schools.

4. The teachers are positive and eager to learn on ICT but the poor management at all government levels constraining the ICT development at secondary schools.
5. High majority of teachers complained the non-inclusion of ICT in the teacher training curriculum and they stated that the teachers are not being trained in ICT by the teacher training institutions.
6. If the teachers are trained in ICT they will surely adopt this advanced technology set for their future generations at secondary schools.

Suggestions

1. Concrete measures from the government are required to replace the existing/traditional methods of teaching and teachers may be well acquainted with the teaching aids related to information and communication technology.
2. ICT may be included in the curriculum as major subject while teachers are trained at the teacher training institutions.
3. Periodic refresher courses for ICT may be launched by the teacher training institutions.
4. Strict evaluation of the trained teachers is suggested.
5. The students may be considered a party for evaluating their teaching performance.

References

- Abuhmaih, A. (2011). ICT training courses for teacher professional development in Jordan. *Turkish Online Journal of Educational Technology*, 10 (4): 195-210.
- Afshari, M., K.A. Bakar, W.S. Luan, B.A. Samah and F.S. Fooi. 2009. Factors affecting teachers' use of Information and Communication Technology. *International Journal of Instruction*, 2 (1): 78-98.
- Ajayi, I.A. and E.T. Haastrup. 2009. The application of information and communication technology in Nigerian secondary schools. *International NGO Journal*, 4 (5): 281-286.
- Ajayi, L. (2009). An exploration of pre-service teachers' perceptions of learning to teach while using asynchronous discussion board. *Educational Technology & Society*, 12 (2): 86-100.

- Al-Ansari, H. (2006). Internet use by the faculty members of Kuwait University. *The Electronic Library* Vol.24, No. (6), Pp; 791-803.
- Amin, S.N.U. 2012. An Effective use of ICT for Education and Learning by Drawing on Worldwide Knowledge, Research, and Experience: ICT as a Change Agent for Education (A Literature Review). Ph.D. Thesis submitted to Department of Education, University of Kashmir.
- Anderson, R. E. S. Dexter. (2005). School technology leadership: An empirical investigation of prevalence and effect. *Educational Administration Quarterly*, 41 (1): 49-82.
- Askar, P., Y.K. Usluel, F.K. Mumcu. (2006). Logistic Regression Modeling for Predicting Task Related ICT Use in Teaching. *Educational Technology & Society*, 9 (2): 141-151.
- Bakir, N. 2016. Technology and Teacher Education: A Brief Glimpse of the Research and Practice that Have Shaped the Field. *TechTrends*, 60 (1): 21–29.
- Balanskat, A., R. Blamire S. Kafal. (2007). A review of studies of ICT impact on schools in Europe European Schoolnet . *Computers and Education*, 50 (8): 224-234.
- Bandura, A. (1997). Self-efficacy: The exercise of control. New York: Freeman. Factors influencing teachers' adoption and integration of ICT. *Journal of Technology and Teacher Education*, 13 (4): 519–546.
- Bhattacharya, I. & Sharma, K. (2007), 'India in the knowledge economy – an electronic paradigm', *International Journal of Educational Management* Vol. 21 No. 6, Pp. 543- 568.
- Bordbar, F. (2010). English teachers' attitudes toward computer-assisted language learning. *International Journal of Language Studies*, 4 (3): 27-54.
- Bottino, R. M. (2003), 'ICT, national policies, and impact on schools and teachers' development' 'CRPIT '03: Proceedings of the 3.1 and 3.3 working groups conference on International federation for information processing', Australian Computer Society, Inc., Darlinghurst, Australia, Australia, 3-6.

- Chen, R.J. (2010). Investigating models for preservice teachers' use of technology to support student-centered learning. *Computers & Education in Press. The Journal of Educational Research*, 102 (1): 65-75.
- Chigona, A., and W. Chigona. (2010). An investigation of factors affecting the use of ICT for teaching in the Western Cape schools. 18th European Conference on Information Systems. *Computers in the schools*, 23 (3/4): 1-21.
- Daniels J.S. (2002) "Foreword" in *Information and Communication Technology in Education—A Curriculum for Schools and Programme for Teacher Development*. Paris: UNESCO.
- Davis, N.E., & Tearle, P. (Eds.). (1999). *A core curriculum for telematics in teacher training*. Available: www.ex.ac.uk/telematics.T3/corecurr/tteach98.htm
- Demirci, A. (2009). How do Teachers Approach New Technologies: Geography Teachers' Attitudes towards Geographic Information Systems (GIS). *European Journal of Educational Studies*, 1 (1) 334–346.
- GoP (2016). Telecom & Information Technology: Federal Budget 2016-17 announced on 03.06.2016. <http://www.finance.gov.pk/>
- Gülbahar, Y. (2007). Technology planning: A roadmap to successful technology integration in schools. *Computers & Education*, 49 (4): 943-956.
- Gupeteo, E.D. (2014). Adoption of Information and Communications Technology: An Evidence of Teacher Education Institutions in Davao City. *Journal of Modern Education Review*, 4 (10): 830–836.
- Hepp, K. P., Hinostroza, S.E., Laval, M.E., Rehbein, L. F. (2004) "Technology in Schools: Education, ICT and the Knowledge Society" OECD. Available: www1.worldbank.org/education/pdf/ICT_report_oct04a.pdf. 11.
- Iqbal, M.Z., J.A. Shams and M.Z. Iqbal. 2015. Developing Information Seeking Skills in the Prospective Teachers in Pakistan through ICT. *Educational Research International*, 4(4): 46-51.

- Jhurreev, V. (2005)"Technology Integration in Education in Developing Countries: Guidelines to Policy Makers". International Education Journal [Electronic], 6(4):467-483.Available:
- Kay, R. (2006). Addressing gender differences in computer ability, attitudes and use: The laptop effect. Journal of Educational Computing Research, 34 (2): 187-211.
- Lemke, C., & Coughlin, E.C. (1998). Technology in American schools. Available: www.mff.org/pnbs/ME158.pdf.
- Liaw, S., H. Huang and G. Chen. (2007). Surveying instructor and learner attitudes toward Elearning. Computers & Education, 49 (4): 1066-1080.
- Makkonen, P., Georgiadou, E., Rahanu, H. & Siakas, K. (2016). Adoption of social media in the teaching of IS/ICT: Comparing students to faculty members. In G. Chamblee & L. Langub (Eds.), Proceedings of Society for Information Technology & Teacher Education International Conference 2016 (Pp. 2179-2184).
- Obakhume, A.S.A. 2012. Assessment of secondary school teachers' use of information and communication technology (ICT) in Oyo metropolis of Oyo state. Proc. 1st Int. Tech. Edu. and Envir. Conf. African Society for Scientific Research (ASSR) South Africa, Pp. 780-789.
- Pelgrum, W. J., Law, N. (2003) "ICT in Education around the World: Trends, Problems and Prospects"UNESCO-International Institute for Educational Planning. Available: www.worldcatlibraries.org/wcpa/ow/02d077080fcf3210a19afeb4da09e526.html.
- Samarawickrema, G. and E. Stacey. (2007). Web-based learning and teaching: A case study in higher education Distance Education, 28 (3) : 313-333.
- Sanyal, B. C. (2001), 'New functions of higher education and ICT to achieve education for all', Paper prepared for the Expert Roundtable on University and Technology-for- Literacy and Education Partnership in Developing Countries, International Institute for Educational Planning, UNESCO, September 10 to 12, Paris.

- Sharma, R. (2003), 'Barriers in Using Technology for Education in Developing Countries', IEEE0-7803-7724-9103.Singapore schools', Computers & Education Vol .41, No. (1), Pp; 49--63.
- Smarkola, C. (2007). Technology acceptance predictors among student teachers and experienced classroom teachers. Journal of Educational Computing Research, 37 (1): 65-82.
- Tella, A., A. Tella, O.M. Toyobo, L.O. Adika and A.A. Adeyinka. (2007). An assessment of secondary school teachers uses of ict's: Implications for further development of ICT's use in Nigerian secondary schools. Turkish Online Journal of Educational Technology, 6 (3): 85-89...
- Teo, T. (2008). Pre-service teachers' attitudes towards computer use: ASingapore survey. Australasian Journal of Educational Technology, vol. 24, no.4, pp. 413-424.
- Tondeur, J., J. Braak, F. Siddiq and R. Scherer. 2016. Time for a new approach to prepare future teachers for educational technology use: Its meaning and measurement. Computers & Eduation, 94 (2016) : 134-150.
- Yilmaz, N.P. (2011). Evaluation of the Technology Integration Process in the Turkish Education System. Contemporary Educational Technology, 2 (1)
- Yusuf, M.O. (2005). Information and communication education: Analyzing the Nigerian national policy for information technology. International Education Journal Vol. 6 No. (3), Pp; 316-321.