

A Comparative Analysis And Impact Of Educational Technologies On Teaching Learning Process.



Dr. Rajinder Kour

*Associate Professor Department of Education, Govt. College of Education, Jammu, J&K, India

Abstract

The main objective of the study was to investigate the impact of Educational Technologies on Teaching-learning Process. For achieving the objectives of research, by purposive sampling technique was used to select N=100 students comprises of 02 control groups and 02 experimental groups. Both the groups, control groups were given one treatment and experiment groups were given another treatment by the investigator. The treatment consists of special teaching sessions of 45 days in Kendriya Vidyalaya, Sunjawan Jammu and Ranbir Higher Secondary school, Jammu simultaneously. During the teaching session, the Investigator had transacted 22 topics of science(x) from NCERT syllabus. The control group were taught in traditional classroom by traditional chalk and talk lecture method whereas the experiment group were exposed to taught in smart classes where teaching was done with the help of whiteboard by using digital content which includes videos, 3D images, presentation and educational software. This paper is brief about the need for educational technologies in education and discusses major applications and challenges in education.

Keywords: Education, Technology, sampling, teaching, etc.

Introduction:

One of the fundamental components of the United Nations' sustainable development 2030 agenda is quality education. It aims to ensure inclusive and equitable quality education for all. Educational technologies have emerged as an essential tool to achieve this goal. These technologies have shown a powerful impact on the Education system.

Educational technology, often referred to as Ed Tech. is the use of technological tools, resources, and methods to improve teaching, learning, and educational management. It involves the application of computers, the internet, multimedia, mobile devices, software, and digital platforms to make education more effective, accessible, and engaging. The COVID-19 Pandemic has further institutionalised the applications of Educational technologies in education. These Educational technologies have made a paradigm shift in the entire education system. It is not only a knowledge provider but also a co-creator of information, a mentor, and an assessor. Technological improvements in education have made life easier for students. Instead of using pen and paper, students nowadays use various software and tools to create presentations and projects. When compared to a stack of notebooks, an iPad is relatively light. When opposed to a weighty book, surfing an E-book is easier.

The primary goal of educational technology is to enhance the learning experience by providing innovative ways to deliver instruction, facilitate communication, and support student achievement. It enables teachers to create interactive lessons,

assess student performance efficiently, and personalize learning according to individual needs.

Educational technology has evolved from traditional audio-visual aids to advanced digital systems such as online learning platforms, virtual classrooms, artificial intelligence, and educational apps. These technologies help learner's access information anytime and anywhere, promoting lifelong learning and global connectivity.

In modern education, educational technology plays a vital role in improving the quality of instruction, encouraging collaboration, developing critical thinking skills, and preparing students for a technology-driven world. As educational needs continue to change, the integration of technology in teaching and learning remains essential for creating effective and inclusive learning environments.

NEP 2020: The National Education Policy (NEP) 2020 of India highlights the critical importance of integrating technology at all levels of education, aiming to support teacher preparation and development, enhance teaching-learning processes, improve assessment methods, broaden educational access for disadvantaged groups, and streamline educational planning, administration, and management. A key initiative of this policy is the establishment of the National Educational Technology Forum (NETF), designed to serve as a platform for the free exchange of ideas on how to use of technology to improve learning, assessment, planning, and administration in education.

Research objectives

The primary research objectives of this paper are as under:

- To study the need for Educational technologies in education.
- To brief about the importance of Smart classroom in education and identify the role of Educational technologies applications in education.
- To modernize learning methods and techniques according to the changing world.
- To bring desirable changes in the behaviour of teachers and pupils by improving teaching, learning and evaluation conditions.
- To make classroom teaching clear, effective, objective and scientific.
- To identify the significant challenges of digital technologies in education.

Need and Importance of Educational Technologies

Educational technology (EdTech) is critically needed in modern schooling because it transforms traditional classrooms into dynamic, accessible learning environments that prepare students for a digital workforce. Its primary importance lies in its ability to democratize knowledge by breaking down geographic barriers and providing equitable access to diverse learning resources. By integrating tools like interactive platforms and multimedia content, educators can design personalized learning paths that cater to varying student speeds, learning styles, and individual needs. This shift improves engagement, boosts academic performance, and automates administrative tasks, freeing up valuable classroom hours for meaningful, one-on-one mentorship. Ultimately, modern educational technology bridges the gap between passive learning and active problem-solving, making it an indispensable foundation for fostering computational thinking and global competitiveness in 21st-century learners.

Uses in Biology Education: Students can use computers to visualize objects that are otherwise difficult or impossible to see directly. For instance, computers can represent human anatomy or the internal structure of human and animal cells. Specialized software has been developed to demonstrate the behaviours of viruses and bacteria, which would otherwise pose a health risk to both teachers and students if taught via traditional methods. These microbes cannot be fully understood without observing them in operation. In some regions, laws have been enacted that prohibit the dissection of animals for educational purposes. Instead, students can use models and computer animations to conduct life science experiments.

Many plants in botany, animals in zoology, and insects in entomology that are never found in India must still be studied by students. ICT makes it possible to present these organisms as though they were physically there. Information is collected, organized, analyzed, and transmitted using CAI (Computer-Assisted Instruction) tools such as word processors, spreadsheets, and databases. These tools also facilitate communication among students and between students and teachers, even when they are not physically in the same classroom.

DELIMITATION OF THE STUDY

The study was confined to the following delimitations:

- The study was delimited to Jammu District only.
- The study was also delimited the Govt. Ranbir Higher secondary school Jammu and Kendriya Vidyayala sunjwan, Jammu.
- The study was further delimited to the students of Govt. Ranbir Higher secondary school Jammu and KendriyaVediayala sunjwan, Jammu.

HYPOTHESIS

To get the proper direction of this research, on the researcher has formulated the following hypothesis:

- There is no significant difference in academic achievement of learners of Kendriya Vidyalaya of secondary level having traditional and the smart classes.
- There is no significant difference in academic achievement of learners of Ranbir Higher secondary schools having traditional and smart classes.
- There is no significant difference in academic achievement of learners of Kendriya Vidyalaya, and Government Ranbir Higher secondary school having traditional and smart classes.

Significance of study

- The study helps to understand the role of educational technologies in teaching learning process.
- The study will also helps to enhance the Teaching-learning experiences of students and teachers
- The study also helps the researcher for further research and will also add to the critical literature review.

METHODOLOGY

The research aimed to study the difference between the traditional teaching and modern/ smart classes teaching-learning process among the experimental groups and control groups.

In the experimental research, the research with pre-test and post-test was considered to be suitable

design for this study. The sample was selected by using purposive sampling from Kendriya Vidyalaya, Sunjuwan Jammu and Ranbir Higher Secondary school, Jammu. After selection of school two sections were selected in each school. One section was taken as control group and another as experimental group. For achieving the objectives of research, by purposive sampling technique was used to select N=100 students comprising of 02 control groups and 02 experimental groups. Both the groups, control groups were given one treatment and experimental groups were given another treatment by the investigator. The treatment consists of special teaching sessions of 45 days in Kendriya Vidyalaya, Sunjuwan Jammu and Ranbir Higher Secondary school, Jammu simultaneously. During the teaching session, the investigator had transacted 22 topics of science(x) from NCERT syllabus. The control group were taught in traditional classroom by traditional chalk and talk lecture method whereas the experimental group were exposed to teach in smart classes where teaching was done with the help of

whiteboard by using digital content which includes videos, 3D images, presentation and educational software.

The comparison was done within the school and between the schools. For collection of data, researcher prepared self-made achievement test with the consultation of experts and teachers of different schools. The tools were validated by experts from SCERT, NCERT, IGNOU and Jammu University. After the validation of the tool the reliability was calculated by using Cronbach alpha. The data were collected from the teachers of Ranbir higher secondary school Jammu and Kendriya vidyalaya Sunjuwan Jammu.

SAMPLE OF THE STUDY

The sample of the study for the experimental research comprised of 100 students, out of which 50 students from Kendriya Vidyalaya, 50 from Ranbir Higher secondary school Jammu. The division of various groups into sub groups

Table-01 Sample of the study for Experimental research

Groups	Kendriya Vidyalaya	Ranbir Higher Secondary	Total
Experimental groups	25	25	50
Control groups	25	25	50

METHODS AND PROCEDURE

Development and Administration of Tools: In an attempt to achieve the objectives of present study total four tools were developed.

1. Achievement test

- a) Pre-test
- b) Post-test

Tools for experimental research.

Achievement test:

A set of 2 achievement tests were prepared by the investigator. Both the tests were of objective types

based upon the Biology content given according to NCERT syllabus.

Initially a pre-test of 50 items of 50 marks was prepared from the chapter Cell and reviewed by the experts and science teachers of various schools. After implementing the suggestion given by the experts, 5 questions were dropped and 5 questions were modified. Pre-test of 45 marks were administered on 30 students of X class. By using Cronbach alpha reliability coefficient value was found i.e. .85, which is reliable. On doing item analysis further 15 questions were dropped. So final draft of pre-test consists of 30 items of 30 marks.

Objective wise distribution in the table given below.

Table02 Blue Print of the pre-test for students

	One word	Fill up	Match the following	True& False	MCQ	Labeling	Total
Knowledge	(3)1	(5)1		(2)1			10
Understanding			(5)1	(2)1	(3)1		10
Application	(3)1				(2)1		5
Skill						(5)1	5
Total	6	5	5	4	5	5	30

A post-test of 120 marks was prepared by the investigator based on all the 5 chapters taught by the investigator. After consulting with experts and science teachers, 7 items were reframed and on

doing item analysis 30 items were dropped. Final draft of post-test consists of 90 items of 100 marks with reliability coefficient .80.

Chapter wise distribution of items are given in the table below

Table3.BluePrintofthepost-testforstudents

Content	Objectives	Types of Questions						Total
		One word	Fill up	Match the following	True &False	MCQ	Diagram	
Life Processes	Knowledge	(5)1			(3)1	(1)1		9
	Understanding				(1)1			1
	Application					(3)1		3
	Skill						7	7
Control and Coordination	Knowledge	(2)1				(4)1		6
	Understanding		(9)1					9
	Application	(5)1				(1)1		6
	Skill							
How do Organisms Reproduce	Knowledge	(7)1	(1)1		(3)1			11
	Understanding			(4)1	(1)1			5
	Application	(1)1			(1)1	(2)1		4
	Skill							
Heredity and Evolution	Knowledge	(3)1	(1)1		(2)1	(3)1		9
	Understanding	(2)1	(3)1		(2)1	(1)1		8
	Application		(1)1		(1)1	(1)1		3
	Skill							
Natural Resources	Knowledge	(3)1			(1)1	(1)1		5
	Understanding	(1)1		(6)1				7
	Application					(4)1		4
	Skill						3	3
Total		29	15	10	15	21	10	100

Execution of Tool

Intervention with Control as well as Experimental Groups of Students.

Investigator prepared total 50 lesson plan 25 for the control group and 25 lesson plans for the experimental groups. These 25 lesson plans were prepared from 5 chapters of Biology of IX class. The chapters are

1. Life processes
2. Control and Coordination
3. How do organism reproduce
4. Heredity
5. Natural Resources.

To avoid experimenter's effect, investigator herself transacted all the lesson plans related to biology of X class to both control and experimental groups of selected schools. By doing this experimenter's effect would be almost same for both the groups which

must influence the outcome of the experiment for both groups equally. The control group was taught in traditional classroom by traditional lecture method using chalk and talk method. Experimental group was taught in smart class by using interactive white board and e-content. E-content consist of videos, 2D, 3D images, PPT by taking help from Kendriya Vidyalaya Sangathan e-content, cbsemyguide.com,, You-tube , Online labs.

Intervention with Control as well as Experimental Groups of Students.

Statistical Analysis

The data collected were subjected to following statistical techniques i.e. computation of mean, standard deviation, t-test and Analysis of Variance ANOVA, Analysis of covariance ANCOVA by using SPSS.

Interpretation and Results

KENDRIYAVIDYALAYA

Table 04. Comparison of pre-test scores of learners of Kendriya Vidyalaya of smart classes and traditional classes.

S.No	Group	Treatment	Mean	N	Std. Deviation	t	df	Sig.(2-tailed)
1	Traditional class learners	Pre-test	49	43	13.54	- 1.135	42	0.263
2	Smart class learners	Pre-test	45.81	43	15.06			

The p value (.263) in the above indicates that the performance of the two groups is not statistically significant. The computed 't' value (-1.135) is also

non-significant at 0.05 level. Thus the statistical analysis of the pre-test scores of control and experimental groups indicates that both the groups

were at equivalence in the beginning of the treatment.

Table 05 Comparison of post-test scores of learners of Kendriya Vidyalaya of smart classes and traditional classes.

S.No	Group	Treatment	Mean	N	Std. Deviation	t	df	Sig.(2-tailed)
1	Traditional class learners	Post-test	55.12	43	10.25	2	42	0.05
2	Smart class learners	Post-test	60.26	43	13.26			

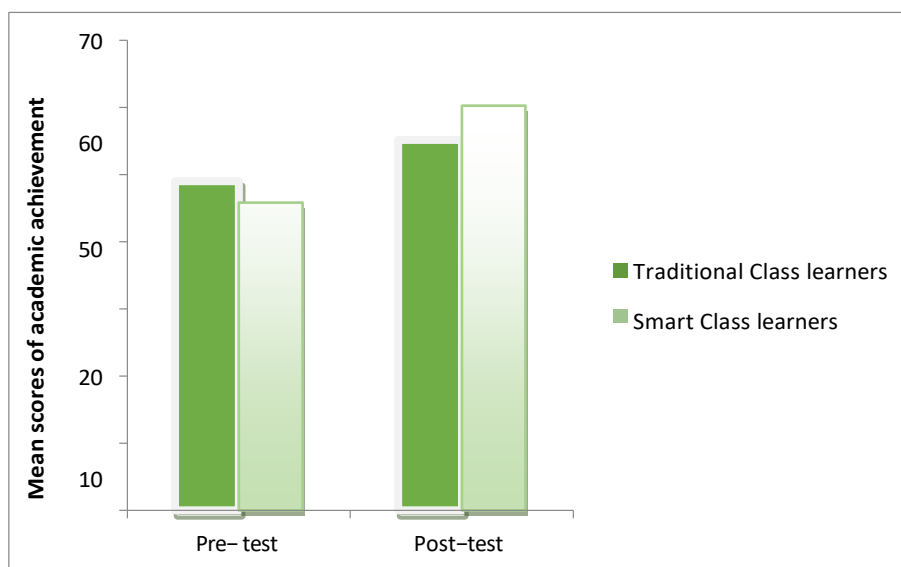


Figure 01: Mean scores of academic achievement of smart class and traditional class learners of Kendriya Vidyalaya.

The above data and the graph indicate that the mean score of the experimental group was higher than that of control group. The p value (0.05) indicates that there the performance of the two groups is extremely significant. The computed 't' value is significant at 0.05 level which suggest that the effectiveness of treatment of teaching through smart

classes and digital content over traditional chalk and talk method. On the basis of the above analysis of data, **It was found that, "There is no significant difference in academic achievement of secondary school learners of traditional class and smart classes in Kendriya Vidyalaya"** is not accepted.

GOVERNMENT RANBIR HIGHER SECONDARY SCHOOL

Table 06: Comparison of pre-test scores of smart classes and traditional classes learners of Government aided school.

S.No	Group	Treatment	Mean	N	Std. Deviation	T	df	Sig.(2-tailed)
1	Traditional class learners	Pre-test	27.33	41	3.9212	1.109	40	0.274
2	Smart class learners	Pre-test	24.53	41	3.5620			

The two-tailed 'p' value (0.27) is considered to be not statistically significant. The 't' value (1.10) is also non-significant at 0.05 level. Thus on the basis

of that it was clear that both the groups (control as well as experimental) were equivalent in terms of their academic performance before the treatment.

Table 07: Comparison of post-test scores of smart class and traditional class learners of Government aided school.

S.No	Group	Treatment	Mean	N	Std. Deviation	t	df	Sig.(2-tailed)
1	Traditional class learners	Post-test	39.439	41	11.5001	-4.619	40	0.01
2	Smart class learners	Post-test	50.634	41	13.4550			

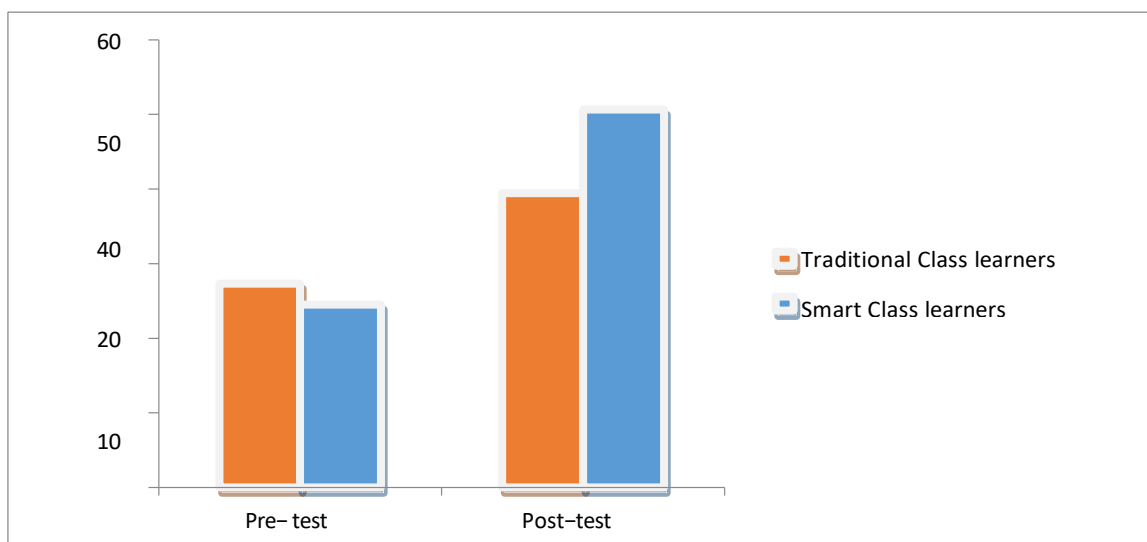


Figure 02: Mean scores of academic achievement of smart class and Traditional class learners of government aided school.

There is improvement in the academic performance of experimental group over control as indicated by the data and the graph above. The 't' value (-4.619) which is significant both at .05 and .01 level indicates that smart class teaching is better than traditional method of teaching among government

Ranbir Higher secondary school learners. Thus on the basis on the basis of analysis of data it was found that, "There is no significant difference in academic achievement of secondary school learners of traditional classes and smart classes in Government Ranbir Higher secondary school."

Table 08: ANOVA analysis between school post test scores of achievement test of both schools.

School	Mean	Std. Deviation	N	df	F	Sig
Kendriya Vidyalaya	59.10	12.51	50	2	1.75	0.19
Govt.Ranbir Higher secondary school jammu.	55.97	11.10	50	98		

Table 08 shows analysis of variance of post-test scores of achievement of schools, Kendriya Vidyalaya, and Govt. Ranbir Higher secondary

School. There is no significant difference between post-test score of both the schools. $F(2) = 1.75, p = 0.19, p < 0.05$.

Table09: ANOVA between Type of school and type of class

School	Type of class	Mean	Std. Deviation	N	df	F	Sig
Kendriya Vidyalaya	Traditional class	55.12	10.254	25	1	102.05	0.01
	Experimental Class	63.09	13.377	25			
Ranbir higher secondary	Traditional Class	52.33	12.488	25			
	Experimental Class	59.60	8.224	25			

Table 09 shows analysis of variance of post-test of type of school, traditional classes and smart classes. There is significant difference between pre-test and

post-test scores of achievement towards using of different types of class in the different school classroom. $F(1) = 102.5, p = 0.01, p < 0.05$.

Table10: Interaction Effect of School and Type

Type of Class	Mean	Std. Deviation	N	df	F	Sig
Traditional Class	48.75	13.274	50	2	0.78	0.46
Smart Class	57.69	13.345	50			

Table10: shows analysis of variance of interaction effect of school and type of school. There is no significant difference between impact of type of school and school. $F(2) = 0.78, p = 0.46, p < 0.05$.

significant difference between the post-test scores of traditional class and smart class with in the school but no significant difference between the post-test scores of both the school. Although from the table it can be said the learners of Kendriya

From the above discussion it is clear that there is

Vidyalaya is better than Government Ranbir Higher secondary. Achievement level is highest in K.V. then Ranbir Higher secondary.

Findings and Conclusion

The present study had explored the impact of smart class on the academic achievement of student of X class in the biology subject.

1. The data indicates that mean scores of both the group were as same at pre-test.
2. The 'p' and the 't' value indicates that the performance of the two groups were same at the initial stage of the intervention.
3. The post-test data indicates that the mean score of the experimental group i.e. smart classes is higher than the mean score of the control group i.e. traditional classes. The 'p' value indicates that the performance of the two groups were statistically significant. The 't' value is also significant at 0.05 level.
4. The significant difference could be attributed to the treatment given to the learners where they are taught by smart classes' technology. This indicates that teaching with smart classes' technology has increased their conceptual understanding/comprehension.
5. The mean score of the pre-test of learners of traditional classes and smart classes were almost same statistically no significant difference was found thus both the groups before the treatment were equivalent in terms of their academic achievement.
6. The mean score in the post test results was found higher of the learners of smart classes than the mean score of learners of traditional classes. The 'p' value (01) shows that there is a statistically significant difference between the performances of the two groups. The 't' value is also significant at 0.05 level and 0.01 level
7. The 't' value indicates that teaching with smart classes technology is better than the traditional classes room method i.e. lecture method.

Suggestion

1. Use of smart classes and transaction of lesson using this technology should become the part of all teacher education programmes. It should be included in the curriculum of the teacher education programme.
2. Infrastructure of the school as well as Teacher Education Institute should be according to need of the technology and equipment should be maintained properly.
3. For effective learning outcomes, teachers should integrate the educational technology during teaching by adapting TPACK (Technological Pedagogical and Content Knowledge) model.
4. Educational institute should organise in service

and pre-service training in short interval of time to maintain teacher with technological advancement in education.

5. Educational institute and school should appoint a full time technical person in school who can assist teacher regarding the problem they face while using smart classes technology in their classes.
6. How to deal with technical problem while teaching in smart classes should become the part of training, given to teachers.

Conclusion:

It has been observed and result also showed that teaching by using smart board has a positive impact on academic achievement of learners as in the both schools, classes taught by using smart classes. Educational technology has better performed than classes taught by traditional lecture method. Teaching science subject as it has made the teaching learning process enjoyable, broaden the knowledge of students as well teachers. The educational technology has made the classes lively and student get motivated, interested, become curious and their attention span has increased. Overall it has enhanced the teaching learning process but along with positive effect it has certain limitations up to some extent, it has reduced the creativity of teacher, more time needed for preparation of lesson, explanation become more rigid and mechanical, it has reduced the emotional bonding of teacher and student. Most important finding come out of this research is that smart classes technology is effective when proper infrastructure is maintained and proper training is given to teachers so that they become competent related to consist of competency of teachers towards smart classes technology and it has been found that teachers are aware about this technology and its feature but are not competent enough to use these features because of lack of training and lack of time for teachers to practice this before they enter the classes. From the findings of this research work it has been suggested that for effective use of smart class technology, work is needed to done be at infrastructure level, training level and this should be implemented at teacher training institute so that the teachers become competent and use the educational technology effectively.

References

1. A. Tufan (2013). Interactive Whiteboard factor in Education: Students' points of view and their problems. *Educational Research and Reviews*. Vol. 8(20), pp. 1907-1915
2. Abraham Jessy (2016). E- Learning: Trends & Challenges in Educational Scenario in India, *Jamia Journal of Education*. Vol.3 (1), pp.92-102.

3. Agarwal, V.K. & Verma P.S, (2014), Biology, Science for Ninth Class (Part 3), New Delhi, S. Chand Publication.
4. Aduke A.F. 2008. Usage & challenges of Information Communication Technology (ICT) in Teaching and learning in Nigerian Universities. *Asian Journal of Information Technology* 7(7), pp.290-295.
5. Amani K. Gashan¹ & Yousif A. Alshumaimeri (2015). Teachers' Attitudes toward Using Interactive Whiteboards in English Language Classrooms. *International Education Studies*; Vol. 8, No. 12, pp.176-184.
6. Anandan K. & Raja B.W.D., Educational Technology, New Delhi, APH Publishing Corporation.
7. Argyrous, G., Statistics for Research with the Guide to SPSS 2nd Edition, New Delhi: SAGE Publications.
8. Aytakin I., Aziz A., Barakat H. & Abdelrahman M. Saudi (2012). Secondary School Teachers Attitude towards using Interactive white board in classrooms. *The Turkish Online Journal of Educational Technology*. Vol.11, No. 3, pp. 286-296.
9. Beauchamp, G. (2004). Teacher use of the interactive whiteboard (IWB) in primary schools – towards an effective transition framework. *Technology, Pedagogy and Education*, Vol.13 (2), 329-349.
10. Brown A.H., Benson B. & Uhde A.P. You're doing what with Technology. *College Teaching* .pp 100-104.
11. C. Giselia & S. Jasmin (2016). ICT Competency and Integration among Faculty Members: An Action Plan. *Science Technology & Innovation Journal*. pp.5-8
12. Celik S. (2012). Competency Levels of Teachers in Using Interactive Whiteboards. *Contemporary Educational Technology* 3(2). pp.115-129.
13. Chai. C.S. Hang H.Y. & Teo T. (2004): Singaporean and Taiwanese Pre-service Teachers Belief and Their Attitude Towards the Use. A Comparative Study. *The Asia-Pacific Education Researcher* 18:1, pp.117-128.
14. Chand. V. S. & Shukla S. R. Teachers as transformers: Learning from outstanding primary school teachers. Gujarat Council of Primary Education, Gandhinagar Supported by UNICEF.