

# Bridging Learning Digital Divide Through ICT in Teaching Physics

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## Abstract

TECHNOLOGY has gained a lot of importance in the present. In education, technology plays a vital role, because skill is considered to be a source of transferring knowledge in most parts of the world. Integrating technology in the process of teaching -learning has changed the mind set of both the teachers and the learners to think, to work and to reciprocate. Creativity has lead to innovations which helps in the transaction of the content to the learners in a more innovative way. Schools and other educational institutions should consider integration of ICT in their curriculum, so that the students can live in the society which is full of knowledge that is "Knowledge Society" Several studies argue that when we make use of various technology in the classroom it provide opportunity for the learner to discover and to maneuver the information. Many evidences shows that the conventional educational environment are not appropriate for the learners to function in the workplaces. Integration of ICT in education refers to technology-based teaching learning process which also include the learning technologies/ aids available in the schools. Students are now a days more technology friendly, so they learn more quickly and efficiently in an environment which is technology based , for this the school and the classrooms should be integrated with ICT . The use of technology in education acts as one of the pedagogical tool which leads to effective learning. ICT gives complementary support to both teachers and students for an effective learning where the computers play an important role and act as a teaching / learning aid. Computers and technology cannot replace quality instructors, yet they are considered to add-on enhancements required for effective in instructing learning process. ICT reconciliation in training is vital, in light of the fact that technology helps the learner to understand the concept with more clarity and one of the important benefit is whenever educators and students are physically in separation. In any case, ICT mix is definitely not a solitary advance showing learning process, but integrated ICT process of learning is a continuous one as it provides proactive teaching-learning environment. In the present study the ICT integrated teaching learning material in science (Physics) was developed. The e-content for the same was also developed with the help of audio video recording in the studio of Regional Institute of Education, Bhopal. The intervention was carried out in Demonstration Multipurpose School, Bhopal, for class IX students.

**Keywords:** ICT, Integration. Teaching-Learning, Achievement , e-content, Secondary School.

## Introduction

In a country like India, out of 29 states and 7 union territories, we have 1.5 million schools, 8.5 million teachers, 48 school boards and 26 crores children in school. Out of 15 lakh schools, we have 85 lakh teachers. The goal of teachers is to bridge the digital gap and impart quality education. The envisions of digital India campaign 2015, which also emphasizes on the Computerized foundation as a center utility of each nation, on interest and for the advanced strengthening of subjects. Digital India Mission of our present prime minister comprises of 9 pillars, one of which is digital education. In this context, ICT is used in education which occupies a pivotal position in the learning process. Research conducted in India and abroad prove the effectiveness of integrating ICT in the instruction and learning process.

Twenty-first century is known as the “Century of Technology”. Technology has conquered the world over, including the field of education. The futurologist Alvin Toffler viewed that the society of this century is ‘Super Industrial Society’. Integration of technology in the teaching learning process has changed the mind set of both the teachers and the learners to think, to work and to reciprocate (Grabe, 2007). Recent research indicates that the nature of teaching has significant influence on, what is taught and how teaching occurs which in turn influences the learning outcomes. Creativity has lead to innovations which helps in the transaction of the content to the learners in a more innovative way. Schools and other educational institutions should consider integration of ICT in their curriculum, so that the students can live in the society which is full of knowledge that is “Knowledge Society” (Ghavifekr, Afshari & Amla Salleh, 2012). Several studies argue that the utilization of new innovations in the classroom is fundamental for giving chances to the learners to maneuver in the era of information. Many evidence demonstrates that conventional instructive situations are not proper for the learners to function in the workplaces. Integration of ICT in education refers to technology - based teaching learning process which also include the learning technologies/ aids available in the schools. Students are now a days more technology friendly, so they learn more quickly and efficiently in an environment which is technology based , for this the school and the classrooms should be integrated with ICT . The use of technology in education acts as one of the pedagogical tool which leads to effective learning. ICT gives complementary support to both teachers and students for an effective learning where the computers play an important role and act as a teaching / learning aid. On the other hand, integration of ICT is not only the step in the process of teaching, but integrated ICT process of learning is a continuous, as it provides proactive teaching-learning environment (Arnseth & Hatlevik, 2010). Amalgamation of ICT in instruction is basically the utilization of computer base correspondence in the day by day classroom exchange in the educating learning forms. ICT plays a key role to the teachers and teacher educators in every day classes so that they can prepare the students for the current digital era. Integration of ICT in the teaching - learning process aims to improve and enhance the quality and accessibility of instructional material to students and provides an opportunity network the educated community to look the challenges in this digital era of current globalization. (Albirini, 2006, p.6). ICT is an ongoing and nonstop process that maintain the schooling - learning process and also provide knowledge from other sources (Young, 2003).

Integration of ICT in schooling, for the most part alludes to innovation based educating - learning method that correspond to the use of accessible learning advances in the schools. Innovation as an instrument in instruction adds to a bigger degree in the educational perspectives. “The use of technology in education contributes a lot in the pedagogical aspects in which the application of ICT will lead to effective learning with the help and supports from ICT elements and components” (Jamieson-Procter et al., 2013). Almost all the subjects like, mathematics, science, languages, arts , humanities etc., can be taught and learned more effectively through technology-based tools. ICT also provide complementary support to the teachers and

learners for an efficient learning with the aid of the computer as an teaching / learning aid (Jorge et al., 2003). Computers and technology cannot substitute excellent teachers but they supplement valuable materials for effective learning. Integration of ICT in education is vital, because technology helps the learner to understand the concept with more clarity is important when teachers and learners are physically in distance.

ICT helps the teachers and students to learn and disseminate the knowledge about their respective subject areas through the effective teaching-learning process. A technology- based teaching - learning aid includes edifying videos, e-content , motivation, storage of information, the practice of database, concept-mapping, guided innovation, brainstorming, music, evaluation , blogs, to think out of the box etc., WWW makes the teaching - learning procedure more satisfying, cost effective and significant (Finger & Trinidad, 2002).

Learners are benefitted by the teaching – learning material developed by the integration of ICT, as the material developed consists of content not limited to the curriculum but has the material from other resources, hands-on activities is designed in such a manner that it helps the learner to stimulate their understanding about the subject. It likewise causes educators to structure their exercise designs in a compelling, imaginative and fascinating methodology that would result in learners dynamic learning.( Zhao , Y., and Frank, 2003). “The use of ICT in teaching will enhance the learning process and maximize the students’ abilities in active learning” (Finger & Trinidad, 2002; Jorge et al., 2003; Young, 2003; Jamieson-Procter et al., 2013).

Three stages in ICT are integration, enhancement and complementary that are highly valued by the teachers Hermans, Tondeur, Van-Braak, and Valcke ,2008)

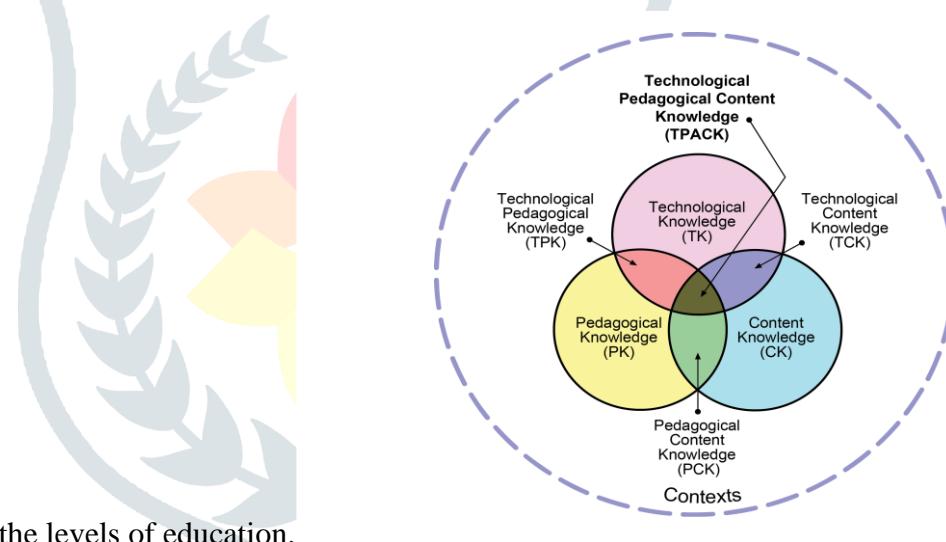
The first main stage identified is Integration which is about executing the precise executing utilization of ICT in a branch of knowledge which includes complex ideas and abilities which enhances learners accomplishment and achievement. The survey of educational programs is likewise basic with the goal that it chooses fitting programming and ICT assets to be introduced for the fundamental points and destinations of educational programs to be accomplished. Improvement approach is tied in with utilizing ICT to give incredible accentuation to present the point. For example, Power Point can serve as a tool to introduce the subject in an exceptionally imaginative and innovative way, and the assessment of the subject will lead into dialogue and exchange thoughts and facts. At last, correlative methodology is where the ICT is utilized as a teaching aid for the learner. This methodology enable students to be increasingly sorted out and productive where they can acquire notes from PC and email can be used to present the work, talk about their questions utilizing web journals and gather more/finish data from different sources online to satisfy the assignment given (Hermans et al., 2008).

Innovation based instructing and learning can turn out numerous improvements in school, yet that requires appropriate preparation, and execution of the policies. Scientists and policymakers both must have a similar knowledge about the opportunities in the future. Dudeney (2010) noticed that nationwide ICT

arrangements can serve a few critical function. They give a method of reasoning, a lot of objectives, and a dream of how instruction frameworks can be used if ICT is coordinated into educating and learning procedure, and how are they valuable to students, educators, guardians and the all inclusive community of a given nation. Be that as it may, the infrastructure and facility of ICT is should have been given to the schools all through the country as they are as yet missing behind. A key issue being used in ICT is adequate for PC labs. One ought to guarantee that the concerned subject educators have a simple access to ICT equipments at whatever point required (Hennessy, S., Wishart, J., Whitelock, D., et.al., 2007).

Absence of satisfactory ICT gear and web get to, is one of the significant issues that schools explicitly in rustic zones are confronting now. Even in schools with computers, the student-computer ratio is high. Furthermore, that the schools with ICT framework are mostly bolstered by guardians' drive or society control (Chapelle, 2011). From the above discussion, it can be said that ICT can be used as one of the most powerful multi-media aid in transacting the contents, effectively.

UNESCO has suggested a model of integrating ICT in the teaching learning which is popularly known as the TPACK Model. Therefore, there is a need to implement this model for the classroom transaction of the



content, irrespective of the levels of education.

(Mishra, P., & Koehler, M. J., 2006).

## Objectives

1. To study the effectiveness of ICT integrated learning on achievement gain in Physics at secondary level.
2. To compare the mean achievement scores of male and female students.

## Hypothesis

The following null hypothesis are formulated

- There is no significant difference between the mean achievement scores of students taught with ICT

integrated teaching learning material and those taught without the ICT integrated teaching learning material.

- There is no significant difference between the mean achievement scores of male and female students taught with ICT integrated teaching learning material.

### **Methodology**

The researcher used a quasi-experiment following a non equivalent control design to verify the effectiveness of the ICT integrated teaching learning materials. It involved the comparison of students taught through ICT integrated teaching learning materials to those who were taught through traditional methods. The student's achievement score were gathered and measured before and after been taught by ICT integrated teaching learning materials.

### **Sample for the study**

The research was conducted at Demonstration multipurpose school, Bhopal. The respondents of the study were the two sections of class IX students where the researcher conducted the effectiveness of ICT integrated learning material. In total 35 students were selected for the study. Out of the selected 35 students for the study 14 were Girls and 21 were boys.

### **The study made use of the following point**

1. The Pre and Post Achievement Test
2. The traditional approach
3. The ICT integrated teaching Learning material (constructivist approach)

The pre-achievement test was administered to the two groups. Experimental group was taught with the help of ICT integrated teaching learning material and the control group with traditional method for a period of time.

At the end of the study, a post achievement test was again administered to measure the achievement level of students.

The t-test was used to determine if there was difference between the experimental and control groups in their:

- Pre-achievement scores in physics
- Post- achievement scores in physics
- Pre-achievement scores of male students in physics
- Post- achievement scores of female students in physics

## Analysis and interpretation of Data

The chapter deals with data analysis of pre-achievement scores in physics for both the control and experiment groups, post- achievement scores in physics for both the control and experiment groups pre- achievement scores of male students in physics for experiment groups , and post- achievement scores of female students in physics for experiment groups.

### I The difference between the pre- achievement scores of experimental and control groups

The pre-achievement test was conducted in order to find out if the respondents of both the groups possess the same cognitive level before the conduct of the study. The null hypothesis states that there is no significant difference between the pre-achievement scores of experimental and control groups. Table 1.1 shows the difference between the pre-achievement scores of both the experimental and control groups.

**TABLE 1.1: The difference between the pre-achievement scores in physics of both the experimental and control groups**

Group	Mean	SD	df	t
<b>Physics</b>				
Control	5.57	2.30	68	1.91
Experimental	6.51	1.77		

From the table 1.1 it clearly shows that the value in Physics for the control group has a mean score of 5.57 and a standard deviation of 2.30 and the experimental group has a mean score of 6.51 and standard deviation of 1.77. In order to find out whether there is significant difference between the two means t-test was performed. It has been assumed that the distribution of the achievement scores for the pre- achievement test for the groups was normal. Assumption of homogeneity of variances was tested and satisfied via Levene's test  $F(68) = 0.744$   $p = 0.00$ . The t ratio of 0.947 has an associated probability of 0.00.

The obtained t value is less than table t value at 0.05 level of significance. Hence, the null hypothesis is not rejected. These shows that the significant difference between the pre-test mean scores of the two groups have the same cognitive level before the study was conducted.

### II The difference between the post- achievement scores in physics of experimental and control groups

The effect of ICT based teaching and non ICT based teaching approach in physics was determined. The actual scored of the two groups were treated. The null hypothesis that there is no difference in the post- achievement scores of experimental and control groups.

**TABLE 1.2: The difference between the post-achievement scores in physics of both the experimental and control groups**

Group	Mean	SD	df	t
<b>Physics</b>				
Control	6.51	1.77	68	1.85
Experimental	7.17	2.75		

Table 1.2 shows the students taught with the ICT integrated material in Physics had a post-test mean score of 7.17 and a standard deviation of 2.75 while the group which was not taught with the ICT integrated material had a post-test mean score of 6.51 and a standard deviation of 1.77. The t ratio of 1.85 has an associated probability of .000. The t-value obtained is greater than the table t value at 0.01 level of significance hence the null hypothesis is rejected. Therefore, there is a significant difference between the achievement scores of the two groups after intervention. Assumption of homogeneity variances was tested and satisfied via Levene's F test,  $F(68) = 2.87$ ,  $p = .240$ .

After the intervention the respondents of the two groups varied statistically in terms of their physics achievement. It also signifies that the ICT integrated approach as a tool in teaching science (physics) did enhance better achievement of students than the traditional method i.e., non ICT integrated approach.

### **III The difference between the pre and post achievement scores of the students taught with the help of ICT integrated approach**

The pre and post achievement test were administered in order to find out whether there was a significant change on the achievement of the students taught with the help of ICT integrated approach in science ( physics). Table 1.3 shows the difference between the pre and post achievement scores of the students taught with the help of ICT integrated approach

**TABLE 1.3: The difference between the pre and post achievement scores of the students taught with the help of ICT integrated approach (experimental group)**

Group	Mean	SD	df	t
<b>Physics</b>				
Pre-test	6.51	1.77	34	1.21
Post-test	7.17	2.76		

The table 1.3 shows a remarkable difference in the mean scores of the students before and after the intervention. Before intervention the mean score of the students in Physics was 6.51 with a standard deviation of 1.77 which was increased significantly to 7.17 with a standard deviation of 2.76 after

intervention. The table also shows that the t -ratio is 1.21 which has a probability of 0.234 which shows that the null hypothesis is rejected. The obtained t value is greater than the table t value at 0.01 level of significance .

Hence, there is significant difference between the pre and post achievement scores of the students taught with the help of ICT integrated approach (EXPERIMENTAL GROUP). Thus, the null hypothesis is rejected. The students showed keen interest and performed better with ICT integrated teaching approach.

#### **IV The difference between the pre and post achievement scores of the students who were taught with the help of ICT integrated approach with respect to gender**

The pre and post achievement test were administered in order to find out whether there was a significant change on the achievement of the male and female students who were taught with the help of ICT integrated approach in science ( physics).Table 1.4 shows the difference between the pre and post achievement scores of the male and female students who were taught with the help of ICT integrated approach .

**TABLE 1.4: The difference between the pre achievement scores of the male and female students who were taught with the help of ICT integrated approach**

Group	Mean	SD	df	t
<b>Physics</b>				
Male	6.71	1.79	33	0.81
Female	6.21	1.76		

The table shows the difference between the pre achievement scores in Physics of the male and female students who were taught with the help of ICT integrated approach the mean score of male was 6.71 with a standard deviation of 1.79, and mean score of female students was 6.21 with a standard deviation of 1.76 The t- ratio of 0.81 which has a probability of 0.42 tells us that there is a significant difference between the post achievement scores of male and female students in Physics.

**TABLE 1.5: The difference between the post achievement scores of the male and female students who were taught with the help of ICT integrated approach**

Group	Mean	SD	df	t
<b>Physics</b>				
Male	6.71	1.79	33	0.82
Female	6.21	1.76		

The table 1.5 shows the difference between the post achievement scores in Physics of the male and female students who were taught with the help of ICT integrated approach the mean score of male was 6.85 with a standard deviation of 2.81, and mean score of female students was 7.64 with a standard deviation of 2.70. The t- ratio of 0.82 which has a probability of 0.41 tells us that there is a significant difference between the post achievement scores of male and female students in Physics.

The obtained t value is greater than the table t value for 0.01 level of significance. Hence, the null hypothesis is rejected.

The result shown in the table means that there is significant increase in the mean score of the students after the intervention as well the traditional approach of teaching is also effective in improving the performance of students in science (Physics) , therefore, it should not be discarded. But the ICT integrated approach has more impact hence it should be employed in teaching of science.

## Conclusion

In the present study efforts were made to study the effectiveness of ICT integrated teaching learning material of Demonstration Multipurpose School students.

Based on the findings of the study, the following conclusions were drawn

- The ICT integrated approach of teaching is effective in enhancing student's achievement and inspiring, motivating to develop modules of interest to understand the concept with clarity.
- The achievement scores of pre and post control group were satisfactory.
- The achievement scores of pre and post experimental group were found to be more than the control group which was encouraging
- The achievement scores of male and female for pre and post test of experimental group showed a difference, which suggest the difference in the understanding level of the students in terms of gender.
- The pre-test scores indicated that the two groups respondents had the same cognitive level before the study was conducted.
- After the intervention the two groups varied statistically in terms of their achievement in science (physics).
- The enhancement in the achievement scores of after the intervention signifies that ICT integrated teaching learning material can serve as a tool in teaching learning process of science (Physics)
- The higher post achievement scores of the experimental group attributes to the fact that the students are interested to accept a change in the methodology of teaching learning process from traditional method to the ICT integrated method (smart classes).
- The students were highly motivated to play an active part in their acquisition of knowledge by giving them an active role of learning which helped them to perform better after the intervention.

## Implication of the study

On the basis of the findings of the study, the recommendations are

- The use of ICT integrated teaching learning material helped the students to understand, interpret, apply and analyze the subject with more precision, therefore, it is recommended that the teachers develop various modules and use the technology for better understanding of science (physics) in both 2 as well 3 dimensions.
- Teachers may develop and innovate various concept with the help of ICT.
- Teachers should be encouraged to develop modules, participate in workshops and seminars.
- The schools should provide the necessary facility required for conducting such smart classes.
- More studies should be conducted in order the study the effectiveness of ICT integrated teaching learning material in all subjects for every class.

## Suggestions for further study

- Study can be conducted in all subjects and at every level.
- Study can be conducted to compare the achievement scores of students of CBSE and MP Board affiliated schools.
- Study can also be conducted to compare between the students urban, rural and tribal locale.
- Study can also be conducted to compare between the students KV, JNV, State, Convent, missionary etc., schools

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