ICT BASED TEACHING MODEL IN THE CLASSROOM: AN EXPERIMENT WITH SCIENCE SUBJECTS

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Abstract

The aim of the present study was to see the effect of ICT based teaching and learning on the academic achievement of students in science and mathematics subjects. Two Govt. Senior Secondary Schools located in Dilshad Garden, Delhi were taken in this study and 148 students of class VI participated in the study. These students were divided into an equal number of two groups i.e. 74 in Experimental and 74 in the Control group. In both groups, there was an equal number of boys and girls. Both the groups of students were taught 30 days each. In the present study, the investigator administered the pre-test achievement test in science and mathematics subject on 148 students. The test had 30 items (containing fill in the blanks, true-false, etc.) carrying 1 mark each (total test is of 30 marks). Teaching for control group occurred in their regular classrooms. Lesson planning was done in advance for the control group. Selected topics and its contents were taught by the investigators as per their scheduled time. The lesson ended with a summary and recapitulation.

The experimental group was exposed to the use of ICT based technology. They were taught with the help of multimedia CD having figures, text, explanation related to the content. Investigator was present to explain the various concepts taken for teaching through the use of computer and CD-ROM. Teaching occurred for 35 minutes of a period for thirty days to complete the content assigned by the subject teacher in both control and experimental groups. Administration of the post-test was conducted after the instructional treatment and delivery of classroom teaching for both the experimental and control groups. It was found that the students taught through ICT have scored excellent in Science and Mathematics after treatment.

Keywords: *ICT Based Teaching, Traditional Teaching, Achievement in Science and Mathematics.*

INTRODUCTION

Traditionally it is believed that every teacher teaches in the way he was taught by his favorite teacher. Therefore the traditional methods of teaching kept perpetuating without evaluation for a quite long time. But the emergence of modern technology, psychology, and philosophy in the field of education has brought tremendous changes in the teaching and learning methodologies. There have come several formal techniques, approaches, and models which are gaining popularity now a day due to their usability and effectiveness. Even then, most of the teachers especially in social sciences use old-fashioned techniques of transferring the knowledge and understanding involved in these

courses. This often results in lessening of interest and lack of predestined outcomes. Resulting, the whole process of taking up the social sciences at school level comes under a big question. To avoid such uninvited situations it is necessary to devise and use state of art mechanisms and technologies in the realm of the teaching of social sciences.

Teaching is an eternal process of human development. Hence, Pre Service Teacher Education can never be considered as sufficient to meet the needs of teachers and pupils in the times to come. There emerges a need to educate and refresh the In-Service Teachers in the upcoming aspects of teaching-learning in classrooms. This study inclusively deals with the teachers already active in schools and taking social sciences at the secondary level. The term in-service teacher education program connotes any program provided to teachers already working in schools, with the explicit purpose of updating and renewing their knowledge, technical skills, etc., for enhancing their efficiency. In-service teacher education can be seen as a continuation of pre-service teacher education. In fact, the relevance of in-service education can be understood only when viewed in this context. Even in the case of an effective pre-service program, the impact on recipients can wear out over time. Teaching, being creative and individualistic requires periodic rejuvenation of teachers' attributes and upgrading of their technical know-how. Even a school teacher who has been 'an outstanding B.Ed. student' who begins his/her teaching career with great enthusiasm, equipped with an initial amount of technical know-how and the positive feedback received while 'under training', needs improvement.

Over the years, every batch of students that a teacher faces is a new batch whose entry behavior makes unforeseen demands on the same teacher, for which he/she is obviously not prepared. Most often, teachers deal with such conflict by resorting to the use of 'authority' which they assume they have over students. In-service education which includes the training of teachers in the area which have emerged recently by conducting workshops and seminars and can be used as a best and innovative practice by the institute would continually help effective teachers stay effective.

Traditional vs Ict based learning

Traditional instruction is a systematic way of planning, communicating, and delivering content in the classroom. This method provides a strong structure for students that help them to concentrate on their academic task. The traditional instructional approach assumes that all students learn in the same way. The role of the learners in traditional instruction as a passive listener, in this context teacher, controlled learning environments are considered for delivering instructions.

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Information and Communication Technology are electronic or computerized devices and associated with human interactive materials that enable the user to employ them for a wide range of teaching and learning processes in addition to personal use. The rapid development in Information and Communication Technology (ICT) and the use of computer in education have made it easier for users to access, deliver and store knowledge. Furthermore, the ability of Information and Communication Technology to deliver information quickly, correctly and attractively in the form of multimedia has also made learning more enjoyable. An enjoyable learning scenario is a necessity for effective instruction. Besides being an instruction that students enjoy, effective instruction also enables students to acquire specific skills, knowledge, and attitudes (Watkins, Gary Lynn, (1996).

In ICT based teaching-learning instructions are learner-centered and highly individualized that seeks a high level of learner involvement. It is focused and targeted on learner's interest and curiosity. It is flexible to explore diverse possibilities. Many ICT based learning programs do indeed make use of stimulants like pictures, graphics, sounds, videos, etc. ICT can bring both the best instructional process to the students. It also brings about the convergence of a stimulating and encouraging environment of learning to meet learning objectives.

Multimedia Learning

The modern research in the field of multimedia has often created an unwarranted hype about the superior nature of multimedia-based learning compared to the traditional teaching methods. However, it is of paramount importance that modern-day educationists realize the key factors behind the initial success of multimedia and decipher the key features that differentiate Multimedia-based instruction from the traditional methods. Only after we go through this process would we be able to understand the long-term impacts of multimedia and also realize the ways in which we can create synergy between multimedia and education. Emerging as a precious asset in pedagogy, technology is viewed as a potential element that can influence traditional education. The goals of using multimedia in education are to enhance teaching and learning and to increase the efficiency and effectiveness of the educational organization. Multimedia has been popular in this age of Science and Technology. It means integration of sound, still images, animation video, and text along with computing technology.

There is indeed a move away from the “transmission” or “passive-learner” model of learning to the “Experiential learning” or “Active learner model”. In some instances teachers may become more like guides and mentors, facilitators of learning, leading

students along a learning path, not the primary providers of information and understanding. The students, not teachers become the core of the teaching & learning process. This is a sensitive and highly politicized subject among educators, so educational software is often positioned as "enriching" the learning process, not as a potential substitute for traditional teacher-based methods. Interactive use of multimedia in schools involves the students themselves.

Significance of ICT based Learning and Multimedia

A number of studies (cited in Najjar, 1996) have been conducted in the area to ascertain the effectiveness of multimedia instruction. Analysis has been done by Bosco, (1986), Fletcher, J. D. (1990), and Tan and Leong, (2003) by examining over 200 studies. The information included sciences, foreign languages, and electronics. The control group normally learned the information via classroom or lecture combined with hands-on experiments. The comparison group learned information via interactive videodisks or computer-based instruction. The achievement of learning was measured via test taken at the end of the lessons. Over this wide range of students, a meta-analysis found that learning was higher when computer-based education was used. In conventional teaching, most of the time is consumed for input-output and less time is left for the process. But in teaching with multimedia CD, the input and output time is reduced and process time is increased. When the processing time is increased the time of student's activities, discussion, correlation with other subjects, brainstorming learning, etc. will increase. When we do teaching with the help of multimedia CD we get more time for the process phase which is more important in a period of 45 minutes or one hour. At the secondary level, the study of science comprises of physics, chemistry, and biology; all natural science which is later used in applied science like engineering, medical and pharmacy etc. Hence they need to be properly and clearly understood by the student for their best utilization in the future.

Nowadays it is the need to prepare our students for the 21st century. But in the conventional method, the textbook as the main teaching tool alone is insufficient to meet the need of the students as they find it difficult to visualize the concept and to grasp information that is presented either verbally or in text. The interactive multi-media enhance effective self-learning among students. The concept of theory as well as practical can be taught with the help of animation graphics, sound, etc. for example the basic concept of human body systems can be explained through graphics. However, an

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enjoyable scenario is a necessity for effective instructions. In order to achieve effective instructions; instructor need to create an enjoyable learning environment and one of the methods is to use of multimedia teaching instructions. The use of multimedia enables both synchronous and asynchronous learning. Studies conducted over the years have indicated that the use of multimedia can address different learning styles of students. The investigators felt that Multimedia has contributed a lot to the field of education. Coming from a science background it craves investigator to study more about the contribution of education thoroughly. The present research has been conducted to study the contribution and effectiveness of ICT based learning in comparison to conventional methods of learning.

OBJECTIVES OF THE STUDY

1. To study the effect of ICT teaching on the achievement of students in Science subject.
2. To study the effect of ICT teaching on the achievement of students in Math subject.
3. To compare the effectiveness of ICT teaching and traditional teaching.

METHODOLOGY OF THE STUDY

In order to make the sample representative, a random sampling technique was applied by using "draw of lots" in which every individual gets equal chances of being selected. Thus, from a total of 332 students of class-VI were matched on the basis of their age and sex. Only those students were chosen who were of 11 to 11.5 years of age and an equal number of boys and girls were chosen. Hence, only 176 students were found meeting the matching criterion. Finally, 72 students were selected from Girls School by using the 'draw of lots' technique. Similarly, 76 boys were selected from Boys School. The selected students were divided into two groups. Therefore, out of 72 girls, 36 were provided ICT teaching in science and Math and the rest group of girls was provided traditional teaching. Similarly out of 76 boys 38 were provided ICT teaching and rest were provided traditional teaching in science and math.

Phase I- Pre-test

Investigator administered the pre-test in math and science subject on 148 students. The test had 30 items (containing fill in the blanks, true-false, etc.) carrying 1 mark each (total test is of 30 marks). Students were asked to fill in the entries. Before distributing test papers to them, important instructions were given to them.

Phase II- Treatment

Conduction of pre-test was followed by treatment to the experimental group. The conventional method was employed to teach Control group. Teaching for control group occurred in their regular classrooms. Lesson planning was done in advance for the control group. Selected topics and its contents were taught by the investigators as per their scheduled time. The lesson ended with a summary and recapitulation.

The experimental group was exposed to computer and ICT based material. They were taught with the help of a computer. Investigator was also present to explain the various concepts taken for teaching through the use of computer and CD-ROM. Teaching occurred for 35 minutes of a period for thirty days to complete the content assigned by the subject teacher in both control and experimental groups.

Phase III- Administration of the post-test after the instructional treatment of thirty days, Post-test was administered to both the experimental and control groups.

TOOLS AND TECHNIQUES

The content of pre-test was related to knowledge about the topics which they have studied in their previous class i.e. class V. Pre-test and post-test for this study were consisted of objective type test items i.e. fill in the blanks, multiple choice questions, matching type, etc. In each of the test, there were 30 items, carrying 1 mark each. Test items were based on the objectives of education related to cognitive, affective and psychomotor domains like knowledge, comprehension, and application, etc. A post-test was designed from the content of NCERT Science books of class VI. The content was chosen under the assistance of the subject teachers of the selected school. The content was selected which is not taught by the regular teachers of class VI.

DISCUSSION OF RESULTS

Table 1: The Mean score on Pre-Test and Post Test of Control Group (traditional Teaching) Science and Math

Variables	N	Mean score in Science	Mean Score in Math
Pre-test	74	14.40	15.75
Post-test	74	16.15	17.5

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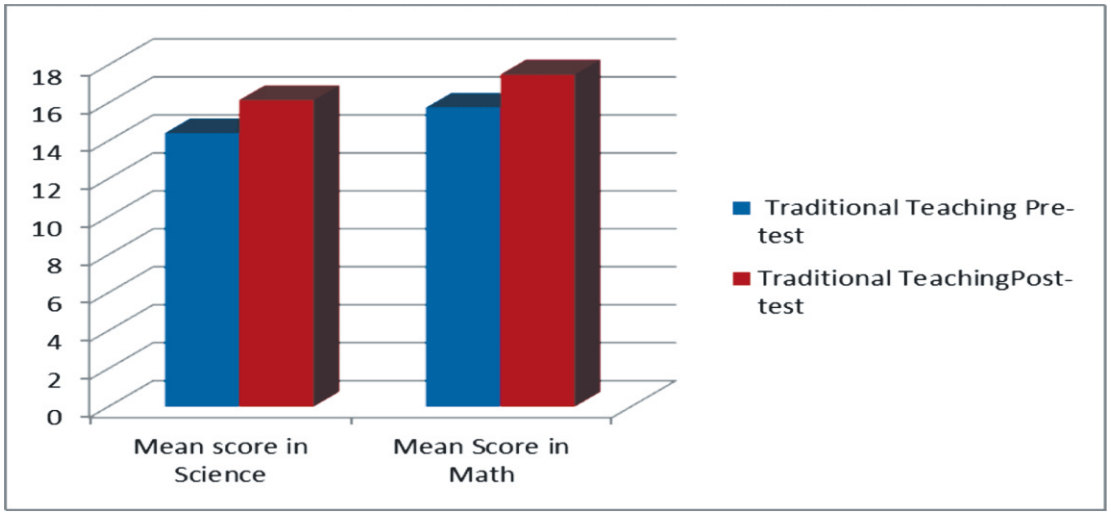

Fig:1 Showing comparison in Pre and Post-test score of Science and Math of Traditional Teaching.

Table 1 and Figure 1 reveal that there is a negligible improvement in the result of the students in science and math taught through traditional methods of teaching.

Table 2: Mean score on Pre-Test and Post-test of (Experimental Group) in Science and Math

Variables	N	Mean score in Science	Mean Score in Math
ICT Teaching Pre-test	74	14.61	15.90
ICT Teaching Post-test	74	26.30	27.10

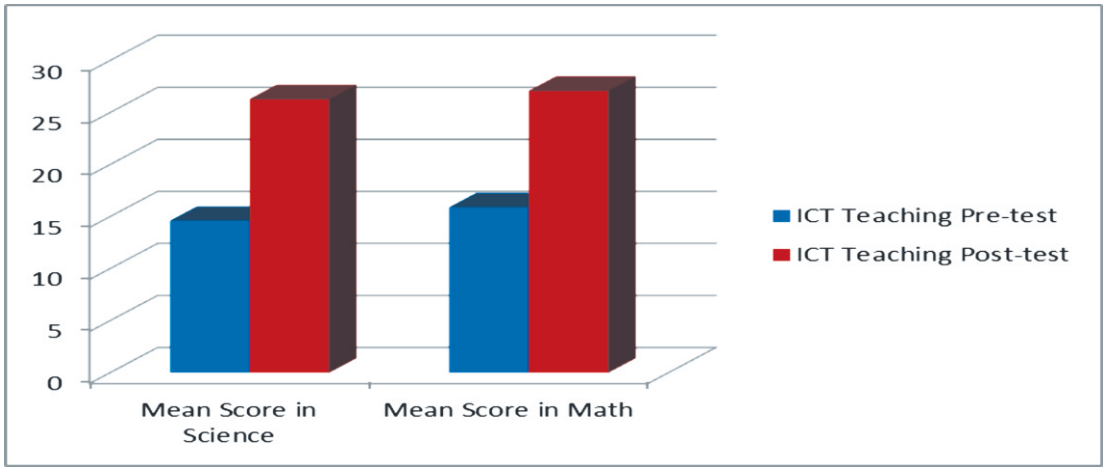

Fig: 1 Showing comparison in Pre and Post-test score of Science and Math of ICT Teaching.

It is evident from Table 2 and Figure2 that mean value of Pre-test is 14.61 and Post-test mean of the experimental group is 26.30. Thus it can be inferred that ICT teaching is effective in learning Science in terms of academic achievement. ICT overcomes the physical ICT barriers of classrooms as it enables the students to see visually with various visual, auditory and text-based effects.

Table 3: Mean, S.D. of Post-test scores and mean difference of Control Group and Experimental Group in Science and Math

Groups	MEAN OF POST TEST in Science	MEAN OF POST TEST in Math	S.D OF POST-TEST in Science	S.D OF POST-TEST in Math
Control Group	16.15	17.50	10.09	11.70
Experimental Group	26.30	27.10	9.16	11.81

Table 3 shows mean score of students in science on post-test taught through conventional method is 16.15 whereas mean score of student taught through ICT is 26.30, similarly mean score in math in post-test is 17.50 and 27.10 of control and experimental group respectively. From this, it is clear that on an average the performance of experimental Group on Post-test is found to be better than the control group on the post-test.

Table 4: Computed t-value of the mean difference of control and experimental group in science

Compared Variable	Group	N	Mean	S.D	Df	t-VALUE
Score in Science	CONTROL GROUP	74	16.15	10.09	146	6.4070
	EXPERIMENTAL GROUP	74	26.30	9.16		

Table 4 indicates that the mean in pre-test and post-tests of the control group and experimental group is 16.15 and 26.30 respectively. The computed standard deviation of post-test scores for control and experimental groups is 10.09 and 9.16 respectively. The calculated t value is 6.40 which is greater than the table value at 0.05 level of significance.

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Table 5: Computed t-value of the mean difference of control and experimental group in math

Compared Variable	Group	N	Mean	S.D	Df	t-VALUE
Score in Math	CONTROL GROUP	74	17.50	11.70	146	4.9670
	EXPERIMENTAL GROUP	74	27.10	11.81		

Table 4 reveals that the mean in Math subject in pre-test and post-tests of the control group and experimental group is 17.50 and 27.10 respectively. The computed standard deviation of post-tests scores for control and experimental groups is 11.70 and 11.81 respectively. The calculated t value is 4.9670 which is greater than the table value at 0.05 level of significance.

Thus it can be inferred that ICT based teaching is effective in the learning of science and math as compared to the conventional mode of teaching in terms of academic achievement. On the basis of the analysis of the results, the learners in ICT and conventional method for both experimental and control group a set of findings can now be discussed to clarify the effectiveness of these two methods. Thus it has been concluded that ICT based teaching overcomes the physical barriers of classrooms as it enables the students to use computer with various visual, auditory and text-based effects in education that increases the efficiency and effectiveness of the educational organization as compared to the conventional teaching; in which the use of Blackboard is the main support.

CONCLUSION

The interactive nature of ICT provides immediate and comprehensive feedback to students. Leaning form ICT is an active and engaging process. The ICT system presents stores, retrieves and transmits audio, video graphic, and textual information. These kinds of systems can have a powerful impact on the learner's problem-solving abilities and can generate a positive effect. ICT based learning is increasingly used to complement or replace conventional teaching methods. With the rapid progression in multimedia technologies, it has become feasible to integrate multimedia technology into the teaching and learning process. What has been the conventional teacher-centered approach is now seeing a shift into one which emphasizes on student-centered learning. Traditional

educational content can now be transformed into interactive multimedia content by using authoring packages. It has enabled the teacher to innovate his/her instructional design by presenting the educational content in an interactive and multi-sensory manner rather than the traditional single media format. This infusion of ICT into teaching and learning has altered instructional strategies in educational institutions.

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