SUMMARY

1 INTRODUCTION

Twenty first century is the age of Information and Communication Technology (ICT). “The illiterate of the 21st century”, according to futurist Alvin Tofler, “will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.” All over the globe, there is a trend to use ICT in the teaching-learning process. The teacher and learner must gain access to technology for improving learning outcomes. Educational reform includes successful designing and implementation of ICT in the teaching-learning process, which is the key to success. There is a rapid shift of educational technologies, so as to shape the structure of the system of education across the globe. Efforts must be made by the educationists to change the process of teaching-learning in order to prepare the students to adjust themselves to the society which is rich in information and technology (Desh, 2007).¹

Not only this, the information is growing exponentially today. According to the faculty of Emory University, “In the Nineteenth Century, it took about fifty years to double the world’s knowledge. Today, the base of knowledge doubles in less than a year” (Emory University, 2006)². Without question learning must be understood as a lifelong endeavour. Teachers as well as administrators must foster a collaborative environment to become role model of continuous learning. And to cope with the explosion in information, ICT is the only way out.

ICTs stand for Information and Communication Technologies and are defined as a diverse set of technological tools and resources used to communicate and to create, disseminate, store, and manage information. These technologies include computers, internet, broadcasting technologies and telephony. They also refer to a range of technologies including computers, computer work stations, display facilities, hardware, software, recording and processing system for sound, still & moving pictures, graphic

calculator and wide range of communication facilities present in world. It has been touted as potentially powerful enabling tools for educational change and reform. When used appropriately, different ICTs expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by making teaching and learning process into an engaging, active process connected to real life.

ICT can be defined as a scientific, technological and engineering discipline and management technique used in handling information, its application and association with social, economical and cultural matters. It may be defined as the use of hardware and software for efficient management i.e. storage, retrieval, processing, communication and sharing information for social, economical and cultural upliftment (Chidnandappa & Dharnendra 2006) ³. ICT is an important instrument, which can transfer the present isolated, teacher-centred, book-centered learning environment into a rich student-centered environment. This new learning environment developed by the ICT is called Interactive Learning Environment. ICT is a new paradigm of the teaching-learning process; we must accept the new technology and use ICT as a tool of teaching-learning process. ICT aims at transferring the old traditional paradigm of learning to the new paradigm of learning (Desh, 2007). ⁴

However, the experience of introducing different ICTs in the classroom and other educational settings all over the world over the past several decades suggests that the full realization of the potential educational benefits of ICTs is not automatic. The effective integration of ICT into the educational system is a complex, multifaceted process that involves not just technology—indeed, given enough initial capital, getting the technology is the easiest part!—but also curriculum and pedagogy, institutional readiness, teacher competencies, and long-term financing etc. The use of ICTs can make substantial change for education and training mainly in two ways. Firstly, the rich representation of information changes learner’s perception and understanding of the context. Secondly the vast distribution and easy access to information can change relationships between educators and student-teachers. ICT can also provide powerful support for educational innovations.

The Role of ICT in Education

For developing countries, ICT has the potential for increasing access to and improving the relevance and quality of education. It thus represents a potentially equalizing strategy for developing countries. However, the reality of the Digital Divide—the gap between those who have access to and control of technology and those who do not—means that the introduction and integration of ICTs at different levels and in various types of education will be a most challenging undertaking. Failure to meet the challenge would mean a further widening of the knowledge gap and the deepening of existing economic and social inequalities. ICT is a potentially powerful tool for extending educational opportunities, both formal and non-formal, to previously underserved constituencies-scattered and rural populations, groups traditionally excluded from education due to cultural or social reasons. Keong, Horani & Daniel (2005) found that the use of ICT can make the teaching process more effective as well as enhance the students’ capabilities in understanding basic concepts. Some of the important advantages of ICT are discussed as under:

- **Anytime, anywhere.** One defining feature of ICTs is their ability to transcend time and space. ICTs make possible asynchronous learning, or learning characterized by a time lag between the delivery of instruction and its reception by learners. Online course materials, for example, may be accessed 24 hours a day, 7 days a week. ICT-based educational delivery (e.g., educational programming broadcast over radio or television) also dispenses with the need for all learners and the instructor to be in one physical location. Additionally, certain types of ICTs, such as teleconferencing technologies, enable instruction to be received simultaneously by multiple, geographically dispersed learners (i.e., synchronous learning). With the help of ICT, students can now browse through e-books, sample examination papers, previous year papers etc. and can also have an easy access to resource persons, mentors, experts, researchers, professionals, and peers-all over the world. This flexibility has heightened the availability of just-in-time learning and provided learning

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opportunities for many more learners who previously were constrained by other commitments (Young, 2002)⁶.

- **Access to remote learning resources.** Teachers and learners no longer have to rely solely on printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at anytime of the day and by an unlimited number of people. This is particularly significant for many schools in developing countries, and even some in developed countries, that have limited and outdated library resources. ICTs also facilitate access to resource persons—mentors, experts, researchers, professionals, business leaders, and peers—all over the world.

- **Motivating to learn:** ICTs such as videos, television and multimedia computer software that combine text, sound, and colorful moving images can be used to provide challenging and authentic content that will engage the student in the learning process. Interactive radio likewise makes use of sound effects, songs, dramatizations, comic skits, and other performance conventions to compel the students to listen and become involved in the lessons being delivered. Stark, Gray and Payne (2000)⁷ found that ICT improved motivations, enhanced learning and teaching, improved communication and access to information, and improved efficiency and feelings of independence. Also Passey, Machell, McHugh and Allaway (2004)⁸ reported that ICT positively impacted on motivation, particularly in relation to engagement, research, writing and editing and presentation. More so than any other type of ICT, networked computers with Internet connectivity can increase learner motivation as it combines the media richness and interactivity of other ICTs with the opportunity to connect with real people and to participate in real world events.

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**Facilitating the Acquisition of Basic Skills:** The transmission of basic skills and concepts that are the foundation of higher order thinking skills and creativity can be facilitated by ICTs through drill and practice. Educational television programs such as Sesame Street use repetition and reinforcement to teach the alphabet, numbers, colors, shapes and other basic concepts. Most of the early uses of computers were for computer-based learning (also called computer-assisted instruction) that focused on mastery of skills and content through repetition and reinforcement. **Panda and Chaudhary (2000)**\(^9\) determined the degree of attainment of cognitive skills through computer assisted learning (CAL) and found that Computer Assisted learning (CAL) resulted in greater learning achievements in all hierarchies of cognitive domain and male students was found to be superior to female students in learning physics. It also improves the quality of education by facilitating learning by doing, real time conversation, delayed time conversation, directed instruction, self-learning, problem solving, information seeking and analysis, and critical thinking, as well as the ability to communicate, collaborate and learn (**Yuen, 2003**)**\(^{10}\).

**Enhancing Teacher Training:** ICTs have also been used to improve access to and the quality of teacher training. For example: In Indira Gandhi National Open University, satellite-based one-way video-and two-way audio-conferencing was held in 1996, supplemented by print-materials and recorded video, to train 910 primary school teachers and facilitators from 20 district training institutes in Karnataka State. The teachers interacted with remote lecturers by telephone and fax.\(^{11}\) Also contemporary ICTs are able to provide strong support for all the requirements of teachers and there are now many outstanding examples of world

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\(^{11}\)http://www.ignou.ac.in. See also Asian Development Bank (1997), *Distance Education for Primary School Teachers: Papers and Proceedings of the Regional Seminar on Distance Education* (Manila: Asian Development Bank).
class settings for competency and performance-based curricula that make sound use of the affordances of these technologies (Oliver, 2000)\textsuperscript{12}.

2 CONCEPT OF MULTIMEDIA

In simple terms, multimedia can be defined as the integration of multiple forms of media which includes text, graphics, audio & video etc. The use of Multimedia can make the idea or concept of something more interactive, catchier, so that maximum use of senses can be done to make the learning long lasting. Technologically, Multimedia refers to electronic products that include (or at least can include) the full range of visual and auditory elements-images, audio clips, video clips. Presentation software such as PowerPoint, Macromedia Flash and Swish meets that definition. There is lot of definitions of Multimedia available on Internet and in books in printed form. Some of them are as follows: (i) the use of several media, such as movies, slides, music, and lighting in combination normally for the purpose of education and entertainment. (www.publicspeakingcourse.com) (ii) Multimedia is a term used to describe a range of products that have some audio and visual basis; for example, encyclopaedia programmes are labelled as being “Multimedia”. (www.yougamers.com/dictionary/3/) (iii) Presenting data in more than one medium, such as combining text, graphics and sound. (www.m2ketch.com/hardware_glossary.html) (iv) Multimedia originally indicates a capability to work with and integrate various types of things together including audio, graphics and especially video (Ambron & Hooper, 1988).

From the above given definitions of multimedia, it can be easily interpreted that Multimedia encompasses a wide range of applications and technology, which is generally used in the field of education and entertainment. Multimedia may be broadly divided into linear and non-linear categories. In linear multimedia, active content progresses without any navigation control for the viewer such as a cinema presentation. On the other hand, Non-linear multimedia, also known as hypermedia, content offers user interactivity to control progress as used with a computer game or used in self-paced computer based training. Multimedia presentations can be live or recorded.

3 DEVELOPMENT OF MULTIMEDIA TEACHING PACKAGE

Interactive multimedia is becoming increasingly popular in education, entertainment, and business. Because of the capability of incorporating various media, and of supporting interactivity and learner control, multimedia is often used in delivering instruction. Furthermore, the World Wide Web technology with its interactive multimedia capability has been perceived to be one of the most promising technologies in the future. While there is a general consensus among educators that interactive multimedia has the potential for enhancing learning, educators also agree that having well-designed multimedia software is critical in order for the technology to have any impact on learning. Literature on instructional design has detailed the process for developing instruction in general terms. The development of multimedia teaching package involves various phases as shown in figure 1.

![Fig. 1: Phases of Development of Multimedia Teaching Package](image)

It is clear from Figure 1 that, first of all content for which multimedia teaching package is developed, has to be selected. In next phase, after selection of the content, it is divided in the form of sub-units and chapters, so that it should become simple, motivational and highly informative. After the completion of second phase, multimedia package is developed with the help of appropriate software by using text, picture, animation, sound and bright colours for simulation. The last phase of development is carried out in different steps like: Plan of ICT & selection; script writing; integration of
elements; assessment of multimedia teaching package (MMTP) and finalization of MMTP.

4 RATIONALE OF THE STUDY

Today’s world is empowered by information technology. There is nothing which is untouched with the use of technology. It plays a vital role in all spheres of human activities. Education sector is also not an exception either. ICT empowers students by engaging students in the learning process. The nature of the task shifts from teacher-centred to student-centred. Research indicates that challenging and engaging academic tasks that build upon students’ prior knowledge and enable students to construct their own understanding of the content are more apt to enhance student motivation and increase student self-confidence in the cognitive abilities (Miller & Meece, 1999)\textsuperscript{13}. Research also identifies the benefits of technology integration as the technical aspects to enhance the quality of work, promote access of resources, positively impact student learning, and promote student meta cognitive skills (Scheidet, 2003)\textsuperscript{14}. ICT is doing a commendable job in almost all subjects, especially in sciences. Students can have access for all the necessary information in the form of text, pictures and videos on Internet. It is supposed to be used as a tool where and when considered useful. In the realm of mathematics education, there has been a strong link between computer and mathematics. ICT could be a potent tool in teaching-learning process of mathematics. As mathematics class needs lots of interaction, reasoning, observation, it is not always for a mathematics teacher to impart the principles, facts and formulas of mathematics effectively to his students and make them understand the concepts completely. Failure of so many students to learn mathematics is largely due to a lack of mathematics culture in adults and the scarcity of adults within mathematics who know how to ‘speak mathematics’ (Papert 1993)\textsuperscript{15}. For qualitative improvement in mathematics training and to remove the fear of mathematics from students, multimedia

\textsuperscript{13} Miller & Meece (1999). Third graders’ motivational preferences for Reading and writing tasks. \textit{The Elementary School Journal}, 100(1), 19-35.
can prove as a boon, as it is capable of sustaining the interest of the students through audio-visual effects.

Integration of multimedia in mathematics is still far from desired. The use of multimedia in teaching of mathematics & its integration in the classroom and in the teaching training institutes have remained almost unexplored. A very few studies have been conducted in this direction. Many linked queries and issues have remained unfold. Thus a lot of work needs to be done in this direction. Therefore it has been considered significant to conduct a study to evaluate the effectiveness of multimedia package in mathematics at primary stage. Hence, the investigator decided to develop multimedia package in Mathematics for the students of class V and assess its effectiveness in teaching of mathematics.

5 STATEMENT OF THE PROBLEM
DEVELOPMENT OF MULTIMEDIA TEACHING PACKAGE IN MATHEMATICS FOR CLASS V AND ITS EFFECTIVENESS

6 OPERATIONAL DEFINITIONS OF KEY TERMS

The terms used in the statement are defined as under:

1. Development: In the context of the present study, development of multimedia includes selection of content, content analysis, script writing and production of multimedia teaching package. It also includes validation of programme by subject teacher & subject expert. Changes suggested by them were incorporated in the Computer-Assisted Instructional programmes.

2. Effectiveness: In the context of current study, effectiveness refers to the empirical usefulness with respect to achievement of students in mathematics. The difference of achievement scores obtained by the students in pre and post test measures the effectiveness of package.

3. Multimedia Teaching Package: In the present study, multimedia teaching package refers to the package which provides integrated form of text, graphics, animation, audio and video with interactivity on the same screen. The slide presentation through multimedia teaching package includes text, animations,
pictures & figures prepared using software such as Swish 2.0, Adobe Photoshop and recorded sounds/narration.

7 **OBJECTIVES OF THE STUDY**

1. To develop Multimedia Teaching Package in Mathematics for students of class V.
2. To develop Mathematics Achievement Test for students of class V.
3. To develop Opinion towards Multimedia Teaching Package Scale.
4. To analyze the opinions of subject experts towards the Multimedia Teaching Package.
5. To compare the mean achievement scores in mathematics of two groups (E & C) of students taught mathematics with and without use of Multimedia Teaching Package before experimental treatment.
6. To compare the mean achievement scores in mathematics of Boys of two groups (E & C) taught with and without the use of Multimedia Teaching Package before the experimental treatment.
7. To compare the mean achievement scores in mathematics of Girls of two groups (E & C) taught with and without the use of Multimedia Teaching Package before the experimental treatment.
8. To compare the mean achievement scores in mathematics of two groups (E & C) of students taught mathematics with and without use of Multimedia Teaching Package after experimental treatment.
9. To compare the mean achievement scores in mathematics of Boys of two groups (E & C) taught with and without use of Multimedia Teaching Package after the experimental treatment.
10. To compare the mean achievement scores in mathematics of Girls of two groups (E & C) taught with and without use of Multimedia Teaching Package after the experimental treatment.
11. To compare the mean gain achievement scores in mathematics of two groups (E & C) taught with and without use of Multimedia Teaching Package.
12. To compare the mean gain achievement scores in mathematics of Boys of two groups (E & C) taught with and without use of Multimedia Teaching Package.
To compare the mean gain achievement scores in mathematics of Girls of two groups (E & C) taught with and without use of Multimedia Teaching Package.

8 **HYPOTHESES OF THE STUDY**

1. There exists no significant difference between the mean achievement scores in mathematics of two groups (E & C) of students taught mathematics with and without use of multimedia teaching package before experimental treatment.

2. There exists no significant difference between the mean achievement scores in mathematics of boys of two groups (E & C) taught mathematics with and without use of multimedia teaching package before experimental treatment.

3. There exists no significant difference between the mean achievement scores in mathematics of girls of two groups (E & C) taught mathematics with and without use of multimedia teaching package before experimental treatment.

4. After experimental treatment, the group of students taught mathematics with use of Multimedia Teaching Package would have high mean achievement scores than group of students taught mathematics without use of Multimedia Teaching Package.

5. After experimental treatment, the boys taught mathematics with use of Multimedia Teaching Package would have high mean achievement scores than boys taught mathematics without use of Multimedia Teaching Package.

6. After experimental treatment, the girls taught mathematics with use of Multimedia Teaching Package would have high mean achievement scores than girls taught mathematics without use of Multimedia Teaching Package.

7. The group of students taught mathematics with use of Multimedia Teaching Package would have high mean gain achievement scores than group of students taught mathematics without use of Multimedia Teaching Package.

8. The boys taught mathematics with use of Multimedia Teaching Package would have high mean gain achievement scores than boys taught mathematics without use of Multimedia Teaching Package.

9. The girls taught mathematics with use of Multimedia Teaching Package would have high mean gain achievement scores than girls taught mathematics without use of Multimedia Teaching Package.
9 DELIMITATIONS OF THE STUDY

Keeping in view the constraints of the time and available resources, the study is delimited to the:

1. students of class V studying in private schools of urban area.
2. English medium schools affiliated to CBSE Board of Rohtak city.
3. content of the multimedia teaching package having three units (factors & Multiples, Money & Geometry) of mathematics of class V.

10 VARIABLES

In the experimental research, the effect of independent variable on dependent variable has been studied. Independent variables are the cause while dependent ones are the effects. Besides, there are intervening variables also. All these three kinds of variables, identified for the study are as discussed below.

Independent Variable

For the present study, the independent variables were Multimedia Teaching Package (MMTP) and Gender.

Dependent Variable

The dependent variable or the criterion variable used in the current study was Achievement in Mathematics.

Intervening Variables

Those variables, which have their effects on the learning outcomes, are known as intervening variables, and can influence both the independent and dependent variables. Different intervening variables in the present study are type of school (English medium private schools affiliated to CBSE Board), grade of class (V), subject to be taught (mathematics), intelligence of students (moderate intelligence) and socioeconomic status (high SES level) of students, which were controlled up to greatest extent to equate the sample or to form the matched group.

11 DESIGN OF THE STUDY

The present study is experimental in nature. The purpose of the present investigation is an attempt to see the effect of Multimedia Teaching Package (MMTP) and Gender on achievement in Mathematics among fifth class students. In this study,
the investigator has employed **Pre-test Post-test Control Group Design**. The schematic layout of the design has been presented in Fig. 2 below:

![Experimental Research Design](image)

**Fig. 2: Experimental Research Design: Pre-test Post-test Control Group Design**

In the present study, the design comprised of three phases (Table-1). In the first phase, students of class V were identified as moderate intelligence group and having high socio-economic status. After that all the students of two groups (E & C) were administered achievement test in Mathematics developed by the investigator himself.

<table>
<thead>
<tr>
<th>Table-1</th>
<th>Design of the Study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phases</strong></td>
<td><strong>Treatments</strong></td>
</tr>
</tbody>
</table>
| **Pre-Test** | Measurement of  
1. Intelligence  
2. SES  
3. Achievement in Mathematics | Measurement of  
1. Intelligence  
2. SES  
3. Achievement in Mathematics |
| **Experimental Treatment** | Teaching Mathematics through Multimedia Teaching Package for 6 weeks | Teaching Mathematics through Conventional Method for 6 weeks |
| **Post-Test** | Measurement of Achievement in Mathematics | Measurement of Achievement in Mathematics |
In the second phase, students of experimental group were taught for six weeks through Multimedia Teaching Package and students of control group were taught through conventional method. In the third phase, students of both the groups (E & C) were again administered achievement test in Mathematics to know the effect of Multimedia Teaching Package on their achievement.

**POPULATION**

A population is any group of individuals that have one or more characteristics in common that are of interest to the investigator. It may be all the individuals of a particular type or a restricted part of that group. Class V students studying in English medium private schools (affiliated to CBSE Board) located at Rohtak city formed the population of the present study.

**SAMPLE**

The measurement of the entire population is impracticable though not entirely impossible. Therefore a sample from the population concerned may be drawn for the purpose. The sample for the present study was selected through Multistage Random Sampling Technique. At first stage of the sampling, the investigator has obtained the list of private schools affiliated to CBSE board located in Rohtak city. After this, by using lottery method two English medium private schools (Indus Public School and DAV Century Public School) were selected for the purpose of the present study. Each school was having three sections of V class. At second stage, two sections of V class from Indus public school and two sections from DAV school were taken. In this way 100 students (50 from each school) were taken as the final sample of the study. By keeping in view the feelings of the parents and students, one school was treated as Experimental group (Indus public school) and the other school was treated as Control group (DAV public school). The detailed description of the sample is given below in Table 2.
Table 2
Detailed Description of the Sample

<table>
<thead>
<tr>
<th>Group</th>
<th>Name of School</th>
<th>Class</th>
<th>No. of Students Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>Indus Public School, Rohtak</td>
<td>V</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>27 from Sec. A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>23 from Sec. B</td>
</tr>
<tr>
<td>Control</td>
<td>D.A.V. Public School, Rohtak</td>
<td>V</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>26 from Sec. A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>24 from Sec. C</td>
</tr>
</tbody>
</table>

**Total Sample** 100

TOOLS USED

Following tools were used for the purpose of collecting data related to different variables covered in the study:

**Standardized Tests**

a. The Culture Fair Intelligence Scale prepared by Cattell and Cattell (1980)
b. Socio-Economic Status Scale developed by Kalia and Sahoo (2010).

**Self Developed Tools**

a. Opinion towards Effectiveness of Multimedia Teaching Package Scale.
b. Mathematics Achievement Test developed by investigator himself to measure the achievement of students in Mathematics.
c. Multimedia Teaching Package in Mathematics

**EXPERIMENTAL PROCEDURE**

The subjects in this study were 100 class V students from the two English medium private schools in Rohtak city situated in same locality. For the Experimental Group, which was subjected to Multimedia Teaching Strategy, a total of 50 learners were chosen from Indus Public School, Rohtak. The control group which was exposed to conventional method of instruction was also consisted of 50 learners chosen from D.A.V. Century Public School, Rohtak and hence no novel treatment was given. The investigator studied literature and books on Multimedia strategies deeply and consulted various Experts for the execution of Multimedia learning strategies. Hence all the lessons for all groups were taught by the investigator herself.
The experiment was conducted in three phases:

**Phase I:** Administration of the Pre-Test

**Phase II:** Conducting the Experiment

**Phase III:** Administration of the Post-Test

The first phase has involved pre-testing of all the students of two groups on the following scale/test: (a) Mathematics Achievement Test (b) Socio-Economic Status Scale developed by Kalia and Sahoo (c) Culture Fair Intelligence Test developed by Cattell & Cattell. The second stage consists of Experimental treatment of 6 weeks. The experimental treatment was consisted of teaching Mathematics to class V with Multimedia Teaching Package to experimental group and through Conventional Method to control group. During the third stage i.e. post-test stage, the students were post-tested on achievement in Mathematics just after the treatment so as to determine the effect of treatment. A detailed description of the design of the experiment has been given in the table 3:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Phase</th>
<th>Duration</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
</table>
| 1.     | Pre-Test  | 7 Days   | 1. Mathematics Achievement Test  
2. Socio-Economic Status Scale  
3. Culture Fair Intelligence Test | 1. Mathematics Achievement Test  
2. Socio-Economic Status Scale  
3. Culture Fair Intelligence Test |
| 2.     | Treatment | 6 Weeks  | Teaching Mathematics with Multimedia Teaching Package  
2. Socio-Economic Status Scale  
3. Culture Fair Intelligence Test | Teaching Mathematics through Traditional Method |
| 3.     | Post-Test | 2 Days   | Mathematics Achievement Test  
2. Socio-Economic Status Scale  
3. Culture Fair Intelligence Test | Mathematics Achievement Test |

**Administration of Pre-Test**

Before the start of the experiment, subjects were contacted and rapport was established with them. They were oriented to the tests to be used with them and also with the methodology of the treatment to be followed viz. Multimedia Teaching Package and conventional method. In the very beginning, Intelligence Test and Socio-Economic Status Scale was used to equate all the groups in terms of socio-economic status and intelligence level. Thirdly, achievement test in Mathematics was administered to the students of both the groups. The investigator himself with co-
operation of class teachers administered all the tests. The instructions pertaining to the
tests were explained verbally in clear terms to the students before administering the
test. The administration of these tests was carried out as per norms and instructions
contained in their manuals. Separate response sheets were provided. The answer sheets
were scored with the help of scoring key. The scores in achievement test indicated the
previous knowledge possessed by the students. This all took time of Seven Days.

The Experimental Treatment

The experimental treatment was manipulated in the form of Multimedia
Teaching Package Strategy to the Experimental Group. The experimental treatment was
given for about six weeks, which included ten sub-units, twenty chapters and twenty
formative tests to experimental group, whereas the control group was taught through
conventional method only. Same content was taught to both the groups. Students of
Experimental Group were given an orientation lecture about Multimedia Teaching
Package in the beginning of experiment. Students were motivated to learn through the
novel method of instruction and were encouraged to participate in the experiment by
explaining the objectives. The treatment was conducted by the investigator himself in
both groups so as to avoid teacher variable and maximum precision. On the other hand,
for teaching control group students, conventional method based on whole class
teaching was used. In this setting, regular instructional method - unit presentation and
tests were used. For control group, same books and curriculum objectives were retained
as in experimental groups. The explain-practice-memorize method, frequently applied
in Mathematics lessons throughout the world, was used. The method includes
explaining the problem, doing the problem, memorizing the algorithm, correcting the
problem, and testing for correct methods. During the application procedure, sufficiently
many problems were solved in line with course objectives, and the stages of problem
solving were explained in detail. Meanwhile, the students under Control Group were
given the opportunity to ask questions to clarify the parts that they could not
understand. For each question the teacher provided an appropriate solution. Later, a
question was written on the board, and all the students were asked to solve that
particular problem. While the students were trying to solve the problem, the teacher
walked among the students and helped the students make their own corrections. When
all the students were through with the problem, a student was called to the board to
solve the problem with the help of the teacher. At the end of lesson, the students were given homework, which was discussed the next day in class.

**Administration of Post-Test**

Immediately after the treatment was over, the subjects were administered the post-test. The same criterion test as taken in pre-test was taken. Both the groups of sampled students were subjected to those post-test. In this way, post-test scores were obtained on achievement test in Mathematics of both the groups.

**STATISTICAL TECHNIQUE EMPLOYED**

Mean, Standard Deviation, t-test, were employed by the SPSS (Statistical Package for the Social Sciences) software.

12 **FINDINGS OF THE STUDY**

The main findings of the study are presented below:

1. **OPINION ABOUT EFFECTIVENESS OF MULTIMEDIA TEACHING PACKAGE IN MATHEMATICS**

As the investigator collected opinions from subject experts individually, it has been commented by them that it is convenient to use this package in the classroom. It was further asserted by 80% experts that the level of language distribution, arrangements of topics and sub-topics and color combination is really appreciable. Furthermore it is elicited by 90% subject experts that the examples given in the package were relevant & interesting and the feedback given in the form of MCQs at the end of each lesson captured the attention of students beautifully. The subject experts appreciated the fact that MMTP elaborate complex concept of mathematics in a simple way and is helpful in removing the fear in students for mathematics subject.

Overall the content and presentation both were stated as the strong points of MMTP which further highlights the acceptance of multimedia teaching package. The subject experts also suggested that such provisions should be made that MMTP can be used in daily classroom routine. Certain necessary steps like technical training of teachers, arrangement of resources etc. could be made by the management. They were also of the opinion that provision of such capturing sessions would be given space in time table of schools. Help of trained voice can be taken if necessary in some scenes. It
can further be concluded that 79.56% of the experts were agreed for the effectiveness of Multimedia Teaching Package, 8.69% of experts disagree and 11.73% experts remain undecided. Thus findings obtained from opinion scale revealed that most of the experts accepted the effectiveness of multimedia teaching package (MMTP). It is also revealed that MMTP is helpful in strengthening the achievement of students as well as in maintaining the decorum in overcrowded classrooms as is the case of today’s education system.

2. COMPARISON OF MEAN ACHIEVEMENT SCORES OF EXPERIMENTAL AND CONTROL GROUP BEFORE EXPERIMENTAL TREATMENT

I. For this Mean, S.D., and t-value were computed. It has been found that the there was no difference in the achievement level of two groups namely experimental and control before conducting experiment. It leads to the conclusion that there is no difference in the achievement scores of two groups (E & C) i.e. initially experimental group and control group were similar in their performance.

II. No significant difference was found in Pre achievement scores of boys of experimental group & control group of fifth graders to be taught through multimedia teaching strategy and conventional method before experimental treatment. It leads to the inference that boys of two groups (E & C) were similar in their performance on achievement test before giving the experimental treatment.

III. No significant difference was found in the achievement scores of experimental group girls and control group girls to be taught through multimedia teaching strategy and conventional method before experimental treatment. It leads to the conclusion that there is no difference in the achievement scores of girls of two groups (E & C) i.e. initially experimental and control group girls were similar in their performance

2. EFFECTIVENESS OF MULTIMEDIA TEACHING PACKAGE IN TERMS OF ACHIEVEMENT IN MATHEMATICS

I. After comparing the post-test achievement scores of experimental and control group with the help of t-test, a significant difference was found in both the
groups. It discloses the fact that students of experimental group have higher achievement in mathematics than the students of control group. It can therefore be inferred that students who are taught Mathematics through multimedia teaching strategy show significant improvement in their achievement than the students who received instructions through conventional method of teaching.

II. The post-test achievement scores in mathematics of boys of experimental group and control group of fifth graders differ significantly in favor of experimental group boys. This implies that boys who are taught Mathematics through multimedia teaching strategy show significant improvement in their achievement than the boys who received instructions through conventional method of teaching.

III. The post test achievement scores of girls of experimental group was found significantly higher than the post test achievement scores of control group. This leads to inference that the girls who are taught through multimedia teaching package show significant improvement in their achievement in mathematics than the girls who received instructions through conventional method.

4. **EFFECTIVENESS OF MULTIMEDIA TEACHING PACKAGE IN TERMS OF GAIN ACHIEVEMENT SCORE**

I. The mean gain achievement scores in Mathematics of experimental group and control group of fifth graders differ significantly in favor of experimental group. This suggests that students who are taught Mathematics through multimedia teaching package strategy show significant improvement in their achievement than the students who received instructions through traditional method of teaching.

II. After the comparison of boys of experimental and control group in terms of mean gain achievement scores, it was found that boys of both the groups differ significantly in favour of experimental group boys. It can be revealed that multimedia teaching strategy is more effective than conventional teaching strategy in raising the achievement of boys in mathematics.

III. When girls of experimental and control group were compared on mean gain achievement score it was found that mean gain achievement score of experimental group girls is higher than that of control group girls. This entails
that the girls exposed to multimedia teaching package strategy benefited more in their achievement in comparison to the girls exposed to conventional method of teaching.

13 CONCLUSION

During the past 10 years, the use of computers in education has increased dramatically and a wide range of educational computer programs are now widely available for individual and classroom use. However, there has been very little research reported on the effectiveness of such use. The purpose of the present study was therefore to ascertain the effectiveness of using multimedia teaching package strategy as compared to Conventional classroom strategy. The findings clearly suggest that the inclusion of multimedia teaching package strategy in Mathematics for class V students is very effective. It was also found that both the gender i.e. male and female has shown significant improvement in their achievement level after giving experimental treatment with multimedia teaching package. Precisely, it can be said that multimedia teaching package (MMTP) provides greater opportunities for the students to learn. It is better than the traditional method of learning. It brings an enhancement in achievement and provides new multisensory learning experiences.

14 DISCUSSION OF THE RESULTS

In the present investigation, the multimedia teaching package was found to improve achievement in Mathematics significantly higher in comparison to traditional method. The finding of the study is supported by the findings of previous studies in which students learned academic material (subjects) using Multimedia Program performed significantly better than those taught using the traditional method. Specifically, Semra (2012) demonstrated that teaching mathematics with a computer assisted instruction method increased student success significantly in mathematics lesson. Also, Ada, Faith & Victoria (2012) investigated that students taught using (CAI) package performed significantly better than their counterparts taught using the conventional method of instruction. Based on the findings it was recommended that Computer-Assistant Program should be encouraged for teaching and learning of mathematics. In addition, these findings are consistent with Philip, Jackson & Dave (2011), who found that
computer-assisted instruction (CAI) enhances student achievement, promotes positive attitudes towards Mathematics and instruction, and improves interpersonal relations, few studies have focused on CAI in Kenyan secondary schools Mathematics teaching/learning, Öğuz Serin (2011) who found that there is a statistically significant increase in the achievements and problem solving skills of the students in the experimental group that received the computer-based science and technology instruction, Ponraj & Sivakumar (2010) who found that teaching the zoology by using CAI is more effective than conventional strategy.

Computers are highly promising educational tools, but it is the way computer are used rather than the actual machines themselves that contribute to learning. Researcher is of the opinion that effectiveness of Multimedia Teaching Package improved student learning as demonstrated by the present study may be attributed to the software used in the experiment and the way it was used. The software used (SWISH) in the study was practiced by the researcher under the guidance of a trained professional and after getting handy with that, he made multimedia teaching package in Mathematics for class V. In spite of all the barriers and limitations, software used in the experiment proved effective for student learning as compared to conventional classroom strategy and all the subject experts have shown favourable attitude towards developed multimedia teaching package. Review of studies showing the opinion of experts and towards multimedia teaching package by Kuzu (2007), Davis & Preston (2007), Joy and Shaiju (2004) and Vekaria, V.J. (2002) found precedents in support of developed software for different subjects.

15 EDUCATIONAL IMPLICATIONS

Teaching at school as well as higher level mostly concentrates on giving information which is not the sole objective of teaching. Along with giving information, the other objectives are: developing understanding & application of the concepts; developing expression power; developing reasoning & thinking power; development of judgment & decision making ability; improving comprehension, speed and vocabulary and developing tolerance and ambiguity, risk taking capacity, scientific temper, etc. With the present infrastructure, class size, availability of teachers, quality of teachers, training of teachers, etc., it is difficult to achieve all the objectives. Further, most of the
teachers use Conventional Method which does not have potentiality of achieving majority of above mentioned objectives. The objectives are multi-dimensional in nature, so for their achievement multiple methods should be used in an integrated fashion. It is a well known fact that not a single teacher is capable of giving up to date and complete information in his own subject. The ICT can fill this gap because it can provide access to different sources of information. It will provide correct information as comprehensive as possible in different formats with different examples. Multimedia teaching package also provides online interaction facility. Students and teachers can exchange their ideas and views, and get clarification on any topic from different experts, practitioners, etc. It helps learners to broaden the information base. Multimedia teaching package provides variety in the presentation of content which helps learners in concentration, better understanding, and long retention of information which is not possible otherwise. The learners can get opportunity to work on any live project with learners and experts from other countries. The super highway and cyber space also help in qualitative improvement of Teaching-Learning Process. Multimedia teaching package provides flexibility to learners, which is denied by the conventional process and method. Flexibility is a must for mastery learning and quality learning. On Internet, many websites are available freely which may be utilized by teachers and students for understanding different concepts, improving vocabulary, developing reasoning and thinking, etc. The present study has a wide range of implementation in the field of education. Some of the implications are given below:

- The use of multimedia teaching package (MMTP) leads to positive attitude of teachers as well as students towards ICT. Thus, when taught through MMTP the students feel more involved in studies, which help significantly in raising their achievement.

- With the help of multimedia teaching package, the teacher is freed of the administration burden. They thus, would be able to devote more time to the task of helping students for which they are trained. Moreover, the students will also enjoy their course of study.

- Traditional method of teaching if supplemented with multimedia teaching package can prove to be more effective in enhancing achievement. It would be
helpful in enhancing the aspects of teaching through presentation of information in different ways and forms.

- Multimedia teaching package mode of teaching needs to be introduced for teaching mathematics as it significantly enhance academic achievement among pupils.

- ICT used learning sessions in class may act as a source of edutainment (education plus entertainment) as well. The sessions may include games, recreational activities like solving puzzles and riddles, holding group discussions on some general topics to create interest among students. This makes the teacher more resourceful.

- Important skills such as critical thinking, creative problem solving and synthesis of knowledge can easily be attained through ICT assisted learning in the classroom.

- Quality computer, which include colourful animation, graphics display form a versatile and effective alternative change in instructional strategy. The careful incorporation of computer for teaching mathematics course will help the students to grasp the basic concepts of mathematics.

- Psycho motor skills can be learnt better through electronic media and communication technologies because they work as a live teacher and guide the learners more effectively.

- Multimedia teaching package if find a permanent place in school time table can be proved as a boon in today’s overcrowded classrooms. With the help of it, pupils can manipulate and make changes to information on computers so that they can develop understanding of the relationship between different types of information.

16 SUGGESTIONS

In India, the use of ICT in education has remained almost completely unexplored. Very few studies have been conducted in this direction. Based on the
findings of the current study, some of the suggestions in the area of multimedia teaching package are identified as follows:

16(a) Suggestions for Planners

1. Potential of multimedia teaching package should be utilized to enhance quality of education at all the levels of education viz Primary, Secondary and Higher.
2. Government should also establish multimedia teaching package portal in various organisations such as Institutes of Education and Research, Curriculum Wing, Test Book Boards, Curriculum Research and development Centres, and Education University. These departments may conduct research studies and make efforts to develop multimedia teaching Package software.
3. Private organizations can step forward to educational software development if copyright act prevails and a system to check the software piracy is established.
4. Government should offer incentives for teachers who increase their proficiency in computer studies and contribute to enhance multimedia teaching package.
5. There is a scarcity of literature about multimedia teaching package in the libraries of our institutions. Steps should be taken to meet the needs of the literature. There are a number of multimedia teaching package learning journals, which can be purchased or subscribed for the libraries.

16(b) Suggestions for Optimization of ICT

- Teachers should be aware of preparation of ICT, motivate students to use ICT, should have faith in recent innovations in ICT and should actively participate in training related to ICT.
- Personal with expertise in pedagogy and computer programming are needed to benefit from Multimedia teaching package. Hence teacher education institutions are required to introduce courses to prepare teachers equipped with pedagogy and computer programming skills.
- In-service teachers should be given computer literacy training through refresher courses. It is necessary to develop a culture for better utilization of computer in teaching learning process.
- Institutions should have appropriate ICT and good physical facilities for using ICT.
• Free accessibility to educational web sites should be provided to students. Speed of Internet should be increased, more number of educational websites should be created and web space should be provided to researchers to upload their research articles at nominal rate.

• Students should be allowed to use computers with Internet facility and information technology course should be a part of curriculum.

16(c) Suggestions for Further Research

• The present study has been conducted only on limited topics of mathematics syllabus; more studies may be conducted involving larger content of the curriculum and different subjects.

• The present study has been conducted on class V. To confirm the findings of present study, it is desirable to investigate the effect of multimedia teaching package on achievement of learners of different grade level and subject area.

• Further research can be conducted to explore the effectiveness of multimedia teaching package on disadvantaged groups such as backward, low achievers, mentally retarded and gifted.

• Effectiveness of multimedia teaching package may be studied in relation to other variables, such as group size, creativity, economic background, age, cognitive style, personality and classroom climate etc.

• The study indicates that multimedia teaching package is an effective intervention for improving student’s academic achievement. Further, research is needed to predict and explain how multimedia teaching package strategy can become more effective instructional tool.

• The study may be replicated on rural, tribal and slum population, where chances of drop outs and failures are high.