



IMPACT OF MULTIMEDIA APPROACH ON THE ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS IN SCIENCE

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ABSTRACT : Science and Technology have played a crucial role in shaping the world we live in today. The integration of Science and Technology in education has transformed the way we teach and learn. It has opened up new possibilities for enhancing learning experiences and improving educational outcomes. The present study was carried out by the investigator to compare the effectiveness of the Multimedia approach and the Normally Practiced method of teaching on achievement in science among secondary school students. Multimedia Approach is one of the most important tools of ICT, which will provide a theoretical background to the student, enhanced by the use of different media such as sound, video, text, pictures and animations. These multimedia presentations aim at providing the students with a realistic description of the topic and enhance greatly their interest, retention and effective learning. . The investigator experimented using MMA (Multi-Media Approach) on experimental group and NPM(Normally Practiced Method) on control group after equating them using Pre-Test and Post-Test was administered on both groups to study the Impact of Multimedia Approach and Normally Practiced Method for comparative analysis.

Keywords: MMA, NPM, Achievement in Science.

I. Introduction

In recent years, there has been a growing interest in the use of multimedia resources such as videos, animations, and simulations in the classroom, particularly in the field of science education. Multimedia resources offer a range of benefits for teaching and learning , including increased engagement, enhanced retention, and improved understanding of concepts. However, despite the potential benefits of multimedia, there is a need to assess the effectiveness of these resources in achieving learning outcomes, particularly in the field of science. This study aims to explore the impact of multimedia resources on the achievement of science among secondary school students. The study will investigate the effectiveness of using multimedia resources in the classroom and whether they can lead to improved learning outcomes, such as increased knowledge retention and improved academic performance.

Need and Importance of the Study

A multimedia approach is essential in teaching because multimedia resources such as videos, animations, and simulations can make learning more engaging and interactive. These resources can capture students attention and help them understand complex concepts in a fun and interesting way. Multimedia resources can also help to provide visual representations of abstract concepts and processes that are difficult to explain through words or static images. Visuals can help to improve retention and understanding of concepts , especially for visual learners, and multimedia resources can provide learning opportunities for students with different learning styles. Students can learn through auditory, visual and kin-esthetic modes which can help to improve learning outcomes and engagement. They can be accessed from various locations, providing students with the flexibility , to learn at their own pace and in their preferred environment. This can help to promote self-directed learning and increase motivation. Multimedia resources can provide authentic and real life experiences that cannot be replicated in the classroom. Multimedia approach is essential in the study because it captures students attention and make learning more engaging. This can help to increase student participation and motivation, leading to better learning outcomes. It promotes active learning by providing opportunities for students to interact with the material and can be accessed from

anywhere, at any time, providing flexibility for both teachers and students. It enhances and supports teacher-learner effectiveness by providing them with additional tools to teach difficult concepts in the learning process.

Teaching of science as the nature of science demands should have more scope for direct and purposeful learning experiences that ultimately leads to promotion of rationality and scientific attitude among students. This demands for a shift from conventional /rote method of learning to modernize experiential learning., that ignites multi-sensory perception. In the context of constructiveness for the teacher can use varieties of methods, approaches and strategies that are supported with contextual usage of varieties of media. This is termed “Multimedia Approach of Teaching Science”.

II REVIEW OF RELATED STUDIES

Review related literature on the study of Impact of Multimedia Approach on the achievement in science among secondary school students in India

There have been several studies examining the impact of multimedia approach on the achievement in science among secondary school students in India. Below is a brief review of some of the relevant literature:

A study by **Singh and Agarwal (2014)** investigated the impact of Multimedia approaches on the achievement of Science among secondary school students in India. They found that Multimedia instruction significantly improved students understanding of science concepts and their ability to apply these concepts to real world situations.

Another study by **Chiryali and Mathew(2016)** examined the effect of multimedia-based teaching on the achievement of science among secondary school students in kerala, India. They found that students who received multimedia-based instruction had higher test scores and better understanding of science concepts compared to students who received traditional instruction.

A study by **Yadav and Yadav(2016)** investigated the impact of multimedia approaches on the achievement of science among secondary school students in Haryana, India. They found that multimedia instruction significantly improved students scores on science tests and increased their interest in science.

A study by **Nagaraju and AnilKumar(2018)** investigated the impact of multimedia approaches on the achievement of biology among secondary school students in Karnataka, India. They found that multimedia instruction significantly improved students test scores and increased their interest in biology.

Singh and Gupta (2016) conducted a study on the effectiveness of multimedia approach in teaching science to secondary school students in India. The study found that multimedia approach significantly improved the students' achievement in science and helped develop a positive scientific attitude.

Kaur and Singh (2015) investigated the effect of multimedia approach on the development of scientific attitude among secondary school students in India. The study revealed that multimedia approach positively influenced the students' scientific attitude, which in turn enhanced their achievement in science.

Reddy and Jha (2017) conducted a study on the use of multimedia approach in teaching physics to secondary school students in India. The study showed that multimedia approach had a significant impact on the students' achievement in physics and helped develop a positive attitude towards the subject.

Kumar et al. (2018) investigated the effectiveness of multimedia approach in teaching biology to secondary school students in India. The study found that multimedia approach significantly improved the students' achievement in biology and helped develop a positive attitude towards the subject.

Overall, these studies suggest that the use of multimedia approaches in science instruction can improve student achievement and interest in science among secondary school students in India, However, it is important to note that the effectiveness of multimedia approaches may depend on several factors, such as the quality of the materials used and the instructional design.

III METHODOLOGY

Statement of the Problem

The title of the study is “**Impact of Multimedia Approach on the Achievement of Secondary School Students in Science**”.

Objectives of the study

1. To compare the achievement of Secondary students in Science, taught using MMA and NPM.
- 2 To find out the impact of MMA on the achievement of Secondary students in Science, in total.
- 3 To compare the achievement of Secondary Boys and Girls in Science , when taught using MMA.
- 4 To compare the Achievement of Secondary Boys taught using MMA and NPM.

5 To compare the Achievement of Secondary Girls taught using MMA and NPM.

Hypotheses of the study

The major hypotheses formulated for the study in Null form are:

- 1..There is no significant difference in the achievement of Secondary students in Science taught using MMA and NPM.
2. There is no significant impact of MMA on the achievement of Secondary students in Science.
3. There is no significant difference in the achievement of Boys and Girls taught using MMA.
4. There is no significant difference in the achievement of Secondary Boys taught using MMA and NPM.
5. There is no significant difference in the achievement of Secondary Girls taught using MMA and NPM.

Variables

The following variables are considered in the study:

1. Independent variable- Methods of Teaching science.: a)Multimedia Approach[MMA] b)Normally Practiced Method [NPM].
2. Dependent variable- Achievement in Science
3. Intervening variable – Gender[Boys and Girls]

Operational Definitions

MultiMedia approach

Multimedia approach is an approach of teaching in which different media are incorporated to make the teaching-learning process more effective, enthusiastic, inspirational, meaningful and interesting. It refers to the application and usage of diversified instruments, gadgets and electronic devices of multi-sensory perception, as well, advanced modes of curriculum transaction and evaluation, using internet, LCD, smart class, CAI, Virtual class room, Dry lab and other media in schools in the present study MMA includes..

In the present study, the Multimedia Approach [MMA] of teaching science includes using of .Projected materials included Text on Screen, Diagrams, Animated Pictures, Video Clips and Graphics Pictures. Related to physics, chemistry, biology , concepts of secondary science Visuals included Models, Specimens, Charts and Chalk board, Print Media included Work sheets, Books (text, reference), and Oral Media included Explaining, Questioning and Group Discussion on topics related to science .

NPM: Normally Practiced Method of teaching refers to the conventional or usually practiced methods of teaching-learning, which normally involve explaining the content by the teacher, followed by questioning and dictation of notes using chalk board and charts or models.

Achievement in Science

Achievement in Science refers to an increase in the Knowledge, Understanding, Application ,Attitude and Skills of students when they are taught Science. Normally achievement of students with respect to improvement in the levels of achieving aforesaid objectives in terms of scores gained in Science Test. In the present study achievement of Secondary students in science is measured in terms of scores gained by the students in pre and post test .

Gender: It refers to difference in students, as Boys and Girls based on Sex.

Population , Sample and Sampling Procedure: Population for the present study consists of two hundred 9th standard students studying in two selected Private Unaided Schools located in the city of Mysuru with English as the medium of instruction. . To draw this sample “**Stratified Proportionate Random Sampling Procedure** “ was employed.

Experimental Design

Two Group –Pre-Test and Post Test design was employed

General Achievement Test in Science: In the beginning a general achievement test was administered on all the 240 students on four sections of two schools, finally after equating the scores gained, 200 students were selected for the study that included 100 from each school. 100 students of Nataraja English medium school were considered as experimental group and they were taught using MMA, on the other hand 100 students of Vidya Vikas English medium school formed control group and were taught same lessons using NPM. Then post test was administered to find out whether any significant differences exist.

A General Science Achievement Test was administered in the beginning on all 240 students of two schools (NES and VVES) in order to select two equated groups of 100 students of each school. Further 100 students of Nataraja English Medium School [Experimental Group] and 100 students of Vidya Vikas Public School [Control Group] were administered with pre- test, so as to know their existing

levels of Knowledge, Understanding, Application, Attitude and Skills related to a few selected Science concepts. This was followed by Experimental Group treatment given to Experimental Group, by teaching the concepts using MMA and the control Group using NPM.

Treatment

For the present study, Experimental Method of research was used by the researcher.

Two Group –Pre-Test and Post Test design was employed. Students of Experimental Group were exposed to teaching Physics, Chemistry and Biology of 9th standard science using MMA, on the other hand students of Control Group were taught the same concepts with NPM that included teaching of science using explanation followed by questioning and giving notes.

Tools used in the study

In order to obtain data on the variables considered in the study, the following tools were used.

1. Achievement test in Science for equating the groups
2. Achievement Test in Science (Pre-test)
3. Achievement test in Science (Post-test)
4. MM Package on selected concepts of science
5. All the achievement Tests in Science were developed by the researcher.
6. Multimedia Instructional Package in Science was also developed by the Researcher.

Procedure for Collecting Data

Achievement test in science for class 9th students was developed and administered by the researcher on both control group and experimental group to assess their achievement in science. Both the groups were taught for a period of six months. Controlled group was taught selected science concepts using NPM and students of Experimental group were taught the same concepts using MMA. Further the achievement test in science developed by the researcher was administered on both the groups to know their achievement in science after treatment. Scores obtained from both the groups in pretest and post test were compared and also the difference of achievement in science between control and experimental group were estimated using suitable statistical techniques.

Statistical Technique employed

Statistical Techniques such as Mean, SD, t-test and ANOVA were employed for Analysis and Interpretation of the Data.

III Analysis and Interpretation of Data

In order to test the Objectives, Hypotheses have been formulated and tested for their significance level, Appropriate Statistical Techniques i.e. Mean, Standard Deviation and t-test were computed for the gain scores of Experimental and Control group for measuring Achievement in Science.

Analysis of Gain in Achievement in Science

Comparison of Gain Scores of Experimental and Control group in Science.

Mean pre test scores on science achievement of experimental and control groups and results of Independent sample 't' test

Table 1

Mean pre-test and post-test scores on science achievement of students of experimental and control groups

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
NPM	27.28	3.92	35.17	3.43	7.89
MMA	26.77	3.86	47.14	3.52	20.37
Total	27.03	3.89	41.16	6.93	14.03
Test statistics	Gain (overall) = $F = 2515.453$; $p = .001$ Gain (groups) = $F = 490.576$; $p = .001$				

In the case of science achievement scores, irrespective of the groups, we find a significant increase in the achievement scores of the selected sample. The obtained F value of 2515.453 was found to be highly significant at .001 level. In the pre-test the mean achievement scores was 27.03, which has been increased to 41.16, with an increase of 14.03 scores, which was found to be significant. Further, group wise comparison revealed that the experimental group had significantly increased its achievement scores ($F = 490.576$; $p = .001$), where the gain is as much as 20.37 scores (pre-test 26.77; post-test 47.14), as against control group which has gained only 7.89 scores (pre-test 27.28; post-test 35.17). This clearly indicates the effectiveness of intervention in increasing the achievement in science.

Table 2

Mean pre-test and post-test scores on science achievement of students in the experimental group

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
MMA	26.77	3.86	47.14	3.52	20.37
Test statistics	Paired samples $t = -37.55$; $p = .001$				

Paired samples t revealed a significant increase in the scores of students under experimental group. An increase of 20.37 scores from pre-test (mean 26.77) to post-test (mean 47.14) was found to be highly significant ($t = -37.55$; $p = .001$).

Table 3

Mean pre-test and post-test scores on science achievement of boys and girls in the experimental group

Gender	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
Boys	27.20	3.87	47.36	3.82	20.16
Girls	26.34	3.84	46.92	3.21	20.58
Total	26.77	3.86	47.14	3.52	20.37
Test statistics	Gain (gender) = $F = 0.149$; $p = .701$				

Repeated measure ANOVA revealed a non-significant difference in the science achievement scores from pre- test to post-test situation. Both the genders gained equally after intervention ($F = 0.149$; $p = .701$). Boys have gained a mean score of 20.16 whereas girls gained a mean score of 20.58, which were statistically almost the same.

Table 4: Mean pre-test and post-test scores on science achievement of boys in the experimental and control groups

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
NPM	27.64	3.91	35.36	3.46	7.72
MMA	27.20	3.87	47.36	3.82	20.16
Total	27.42	3.88	41.36	7.04	13.94
Test statistics	Gain (overall) = F =1110.55; p=.001 Gain (groups) = F =221.102; p=.001				

In the case of science achievement scores of boys only considered, irrespective of the groups, we find a significant increase in the achievement scores of the selected sample. The obtained F value of 1110.55 was found to be highly significant at .001 level. In the pre testing the mean achievement scores was 27.42, which has been increased to 41.36, with an increase of 13.94 scores, which was found to be significant. Further, group wise comparison revealed that boys in the experimental group had significantly increased their achievement scores (F=221.102; p=.001), where the gain is as much as 20.16 scores (pre-test 27.2; post-test 47.36), as against control group which has gained only 7.72 scores (pre-test 27.64; post-test 35.36).

Table 5**Mean pre-test and post-test scores on science achievement of girls in the experimental and control groups**

Groups	Tests				Gain
	Pre-test		Post-test		
	Mean	S.D	Mean	S.D	
NPM	26.92	3.94	34.98	3.43	8.06
MMA	26.34	3.84	46.92	3.21	20.58
Total	26.63	3.88	40.95	6.85	14.32
Test statistics	Gain (overall) = F =1414.723; p=.001 Gain (groups) = F =270.259; p=.001				

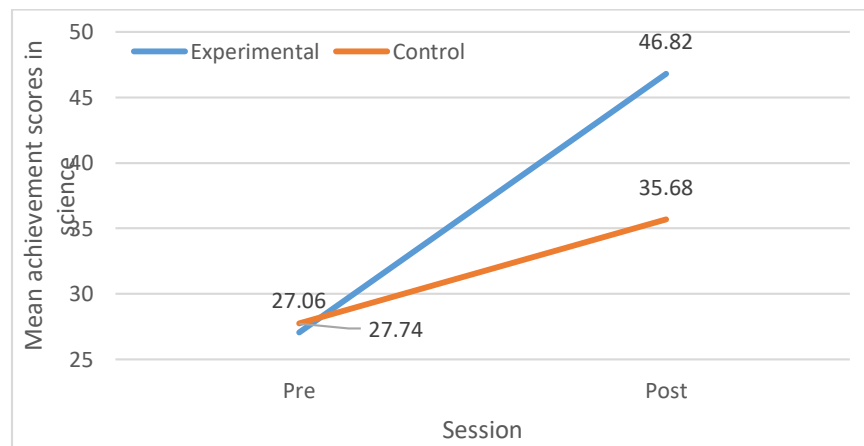
In the case of science achievement scores of girls only considered, irrespective of the groups, we find a significant increase in the achievement scores of the selected sample. The obtained F value of 1414.723 was found to be highly significant at .001 level. In the pre testing the mean achievement scores was 26.63, which has been increased to 40.95, with an increase of 14.32 scores, which was found to be significant. Further, group wise comparison revealed that Girls in the experimental group had significantly increased their achievement scores (F=270.259; p=.001), where the gain is as much as 20.58 scores (pre-test 26.34; post-test 46.92), as against control group which has gained only 8.06 scores (pre-test 26.92; post-test 34.98)

Descriptive Statistics

	Group	Mean \bar{x}	Std. Deviation (σ)	N
pre science total	NPM	26.9200	3.93747	50
	MMA	26.3400	3.83651	50
	Total	26.6300	3.87860	100
Post science total	NPM	34.9800	3.42553	50
	MMA	46.9200	3.21248	50
	Total	40.9500	6.84957	100

Graph

Mean pre test and post test scores on achievement in science of students in experimental and control groups

**IV Major Findings of the Study**

The major findings of the study were :

1. Comparison of Mean pre-test and post-test scores on science achievement of students in experimental and control groups, comparison of group revealed that the experimental group had significantly increased in achievement scores.. This clearly indicates the effectiveness of intervention of MMA in increasing the achievement in science.
2. Comparison of Mean pre-test and post- test scores on science achievement of students in the experimental group revealed that there is a significant increase in the scores of students of experimental group. The result implies that the multimedia approach is more effective on the achievement of science
3. The Mean pre-test and post-test scores of Boys and Girls of experimental group have significantly higher scores as compared to control group.
4. The Comparison of Mean pre-test and post- test scores on science achievement of Boys in the experimental and control groups revealed that experimental group scored significantly higher as compared to control group.
5. The Comparison of Mean pre-test and post- test scores on science achievement of girls in the experimental and control group revealed that girls in the experimental group had significantly increased in their achievement scores.

Conclusion

The present study concludes that, MMA of teaching science proved to be better than the NPM in teaching of science, When the control group students were taught some concepts of science by the NPM and experimental group of students were taught by MMA. It was found that the achievement of experimental group was higher when in science compared to control group , experimental group was better. Therefore MMA of teaching science is more effective in fostering science achievement. Multimedia teaching approach was very significant with respect of achievement in science among both boys and girls.

The Impact of Multimedia on the achievement in science among secondary school students appeared to be positive. The use of multimedia, such as videos, animations and simulations, can enhance students understanding of science concepts with an increase in their motivation and their engagement in science learning.

Multimedia can provide students with visual and interactive representations of scientific phenomena that may be difficult to understand through conventional methods, such as lecture method.

Additionally, multimedia can allow for personalized learning experiences, where students can learn at their own pace and in their preferred learning style.

However, it is important to note that the effectiveness of multimedia in science education depends on the quality of the multimedia materials, as well as how they are integrated into the curriculum transaction. Teachers must have appropriate training and support to effectively incorporate multimedia into their teaching practices.

Furthermore, whole multimedia can be a valuable tool in science education, it should not replace hands on, experiential learning opportunities, such as laboratory experiments and field based learning experiences. These types of activities can provide students with important skills, such as critical thinking and problem solving, that are essential for an enhanced in science.

Overall, the use of multimedia in science education can have a positive impact on the development of achievement in science among secondary school students, but it should be used in conjunction with other teaching strategies and implemented carefully and thoughtfully.

EDUCATIONAL IMPLICATIONS:

There are several educational implications that can be drawn from the study on the impact of multimedia on the achievement of science among secondary school students in India.

1. **Incorporate multimedia into science curriculum:** The study suggests that multimedia can enhance students understanding of science concepts and increase their motivation and engagement in science learning. Therefore, education in India should incorporate multimedia, such as videos, animations and simulations, into their science curriculum to support student learning.
2. **Provide training to teacher:** Teachers should receive training on how to use effectively multimedia in their teaching practices. This includes selecting appropriate multimedia materials and integrating them into the curriculum in a meaningful way. Teacher training programs can be designed to help teachers become proficient in using multimedia and to promote effective teaching practices.
3. **Encourage hands on, experiential learning :** Whole multimedia can be a valuable tools. It should not replace hands on experiential learning opportunities. Therefore, educators in India should encourage laboratory experiments and field work, which can provide students with important skills, such as critical thinking and problem solving.
4. **Foster personalized learning experiences:** Multimedia can allow for personalized learning experiences, where students can learn at their own pace and in their preferred learning style. Therefore, educators in India should design learning activities that enable students to personalize their learning experiences and get opportunities for self directed learning.
5. **Consider accessibility:** In India, access to technology and the Internet can be barrier to implementing multimedia in education. Therefore, educators should consider accessibility issues and ensure that all students have access to multimedia materials, regardless of their Socioeconomic background.

Overall, the study suggests that incorporating multimedia into science education in India can have a positive impact on students achievement. However, it is important to implement multimedia thoughtfully and carefully. While also providing opportunities for hand on experimental learning.

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