

Impact of Multimedia Technology in Teaching of Biological Science to the Underachievers in Science at Secondary School Level

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Abstract

There are several teaching methods which are used to teach various disciplines at secondary level in India. However, majority of the teachers use only lecture method to teach even science subjects. Multimedia teaching plays an important role for better achievement in biological science. Multimedia, is the combination of various digital media types such as text, images, sound and video, into an integrated multi-sensory interactive application or presentation to convey a message or information to an audience. This paper addresses the impact of multimedia technology in teaching of biological science. A pilot study was carried out selecting 60 underachievers in science out of 300 students of class 9th studying in secondary schools of Faridabad. The rationale for the study was to identify the underachievers in science and to find out the ways through which their level of achievement can be improved in biological science. RPM was used to measure the intelligence of the 9th standard students for selecting underachievers in science. The results revealed that Multimedia technology plays an important role for better achievement in biological science.

Keywords: Underachiever in Science, Multimedia Technology, Biological Science

Introduction

Teaching is both an art and a science. Able teachers always find ways and means to improve their teaching techniques. With the change in time the teachers are asked to employ newer methods for teaching their pupils more effectively so that they must be able to cope with the demand of the age. All scientific knowledge, as its technological applications, is reflected in everyday life. The introduction of multimedia technology into teaching has posed a great challenge to the traditional teacher-centered method. It believes that the significance transcends the mere application of advanced technology and the increase of the teaching efficiency.

It is the need and demand of the time to address a changed role to teachers who should act as a mentor, motivator and counselor. They should attach thrust not an imparting bookish 'knowledge' but act on identifying the strengths and ready to play counseling to put the studies in the right path of learning other than a guardian they should act as a catalyst to promote the potential creative abilities of the underachievers in science. The secondary education commission emphasized the need of the dynamic method of teaching. Kothari Education commission (1964-66) too recommended improving upon method of teaching in educational institutions.

Multimedia

The term "multimedia," which consists of "multi" – which means integrating many expression methods – and "media" – which implies technical key words such as "computer," "dialogue," and "digital," has changed its meaning through the decades. The term multimedia can be defined as a platform that integrates analogue information in various forms such as text, images, and audio-visual materials to a single digitized data and relays them using several (multi) vehicles (media). It is a system that allows users the use of easy and high-speed information communication networks. As information becomes digitized, all media can now be integrated into one and all the necessary multimedia equipment may be controlled by just one computer system. Multimedia is the exciting combination of computer hardware and software that allows you to integrate video, animation, audio, graphics, and text resources to develop effective presentations on an affordable desktop computer. (Fenrich, 1997).

Multimedia is characterized by the presence of text, pictures, sound, animation and video; some or all of which are organized into some coherent program (Phillips, 1997). Today's multimedia is a carefully woven combination of text, graphic art, sound, animation, and video elements. Thus, multimedia is an integration of multiple media elements (audio, video, graphics, text, animation etc.) into one synergetic and symbiotic whole that results in more

benefits for the end user than any one of the media element can provide individually.

Nature and Characteristics of Multimedia Approach

- Multimedia approach uses a number of media, devices, and techniques in the teaching-learning process.
- Multimedia approach has come out of researches and experiments in educational technology utilized to improve the process of teaching-learning.
- Multimedia approach aims at providing meaningful learning experiences.
- Select the media carefully so that one does not hamper or reduce the effect of the other i.e. each media must complement the other.
- Use media sequentially and judiciously. Then it would be possible to make optimum use of them in a most economical manner.

Impact of Multimedia Technology in Teaching of Biological Science

Shortly after the internet explosion of the 1990s, technology was immediately integrated into the classrooms. Many efforts have been established to help educators realize the benefits of technology and ways of implementing them in the classroom. Multimedia technology can be used to support and enhance learning. Some examples of technologies used in the education system are video content and digital movie making, laptops, computers, and handheld technologies. New uses of technology, for example, podcasting and tablets are constantly being created. Many students are growing up in a digital age where they have constant exposure to a variety of media that is impacting on the way they interact and use information. It is clear that using multimedia in the classroom the students;

- have more fun
- are more enthusiastic
- have increased engagement in learning
- are more interested in learning
- are more self-directed in learning
- have greater self-confidence and self- esteem
- focus on improving performance
- have greater ICT skills
- increase their research skills
- improve problem solving and critical thinking skills
- write more extensively with improved quality

- have increased access to information
- can present information more effectively
- Enjoy learning actively.

Multimedia is changing the way we communicate with each other. The way we send and receive messages is more effectively done and better comprehended. The inclusion of media elements reinforces the message and the delivery, which leads to a better learning rate. The power of multimedia lies in the fact that it is multi-sensory, stimulating the many senses of the audience. It is also interactive, enabling the end-users of the application to control the content and flow of information. Children can use technology individually, through computer-assisted instruction, to learn biological science concepts.

Need and Significance of the Study

Technology is evolving at an astonishing rate. It has dramatically changed the ways we work, learn, interact, and spend our leisure time. Computers and information technologies have visibly revolutionized nearly every aspect of life. It is both reasonable and expected that technology should also help lead the way to improve teaching and learning in our schools. Technology offers new ways of teaching and learning, and provides new ways for all involved in education to be openly accountable to parents, communities, and students (National Research Council, 1995).

Science is a way of knowing, a method of learning about nature. Its formal and systematic study is called scientific inquiry. In doing scientific inquiry, scientists use a variety of empirical approaches, techniques, and procedures to collect data from nature, examine and analyze that data, and construct knowledge based on it. This knowledge relates to living organisms, non-living matter, energy, and events that occur naturally.

Method of teaching is extremely important. Application of new technologies can convert educational institutes into learning rather than teaching institutes with vast implications for curricular and instructional methods. When imparting knowledge, every care should be employed in adopting effective teaching technique. Learner should be provided comfortable and pleasant atmosphere to learn. Underachievers in science need a sense of accomplishment and a cycle of success leading to feelings of self-worth. Even the best curriculum and the most perfect syllabus remain dead unless supported by the right strategies of teaching. In order to make effective teaching, it is important for the educators to adopt an effective teaching method that suits the individual learning style.

The evolution of multimedia has made it very possible for learners to become involved in their work. With multimedia technologies, they can create multimedia applications as part of their

project requirements. This would make them active participants in their own learning process, instead of just being passive learners of the educational content. It promotes project-based learning styles. Technology lends itself as the multidimensional tool that assists the process. Multimedia technology enhances and promotes biological science learning. The study may help educators understand what experiences are internalized by underachievers in science through using multimedia technology. The study will help to answer the question of what effect these technology tools have on student achievement in biological science learning. Therefore, the researcher tried to explore the Impact of Multimedia Technology in Teaching of Biological Science to the Underachievers in Science at Secondary School Level.

Objectives

1. To study the basic concepts of Biological Science.
2. To study the effectiveness of multimedia technology in teaching of Biological Science to the underachievers in science.
3. To study the significant difference in achievement of underachievers in science in Biological Science through conventional teaching method and through multimedia technology.

Hypotheses

There is no significant difference between the pre- test and post-test scores of academic achievement in 'Biological Science' of secondary school underachievers in science.

1. There is no significant difference between academic achievement in Biological Science of secondary school underachievers in science through conventional teaching and multimedia teaching.

Methodology

Considering the nature of the problem an experimental method was considered to be the most appropriate. This method concerns with studying the relationship between dependent and independent variables. A sample of 300 students of IX standard, 150 from government schools and 150 from government - aided schools was taken through Cluster Random Sampling technique from population of 10 Secondary Schools situated in District Faridabad. Achievement Test in science and Advanced Raven Progressive Matrices was administered on the population in order to select underachievers in science. The raw scores of achievement test in science and intelligence test were converted into standard scores. The difference of standard scores of achievement test in science and intelligence was calculated. Those IX standard students who scored at least 1 δ less marks in achievement test in science in comparison to the

marks obtained in intelligence test were taken as sample for the study. Thus 60 underachievers in science were obtained. There after they were divided into two groups the control and the experimental groups. Experimental Group was given the treatment by teaching biological science through multimedia technology by the investigator and the Control Group was taught the same concepts by conventional method. In other words, this group was not given the treatment. After the completion of the treatment the experimental and the control groups were administered achievement test in biological science to access their conceptual understanding.

Population

The population of the study was 9th class underachievers in science of government and government –aided secondary school of Faridabad.

Samples

The sample for present study consisted of 60 underachievers in science of class 9th. The sample was divided into two groups (30 students in control group and 30 students in experimental groups).

Tools Used

1. Achievement test in science prepared by the investigator in order to select underachievers in science.
2. Achievement test in biological science prepared by the investigator was administered to know the achievement in biological science by using conventional and multimedia methods of teaching of biological science.
3. Ravens progressive matrices were used to measure their level of intelligence.

Procedure of Data Collection

The data were collected by the researcher by visiting the selected schools and administering the tools on the sample. The sample was divided into section- A of 9th class as experimental group and Section B of 9th class as Control group. These groups were made equivalent on the basis of student's intelligence and scores achieved in pre-test achievement. General topics were selected by the investigator from basic concepts of Biological science of 9th class. The Investigator prepared 60 slides on different topics of biological science by using multimedia technology. These concepts were taught to the experimental group through multimedia and to the control group by the conventional method.

Analysis and Interpretation of Data

Mean, Standard Deviation, Z-score and t-Test were used for analyzing and interpretation of the

data.

Raven's Advanced Progressive Matrices was administered on students of class 9th to measure their level of intelligence for the homogeneity of the groups. These underachievers in science were taught Biological science for a period of one month. Having taught Biological science to the control group by traditional method and experimental group by using multimedia in teaching for a period of one month, the intelligence test "Raven's Advanced Progressive Matrices" was administered again on the sample in order to measure if there was any increment on their level of intelligence and no significant difference was found between pre-test and post-test scores of intelligence of experimental group and control group.

Comparison between Pre-test and Post-test Scores of Achievement Test in Biological Science of Control Group

The table-1 shows the descriptive statistics of the scores of achievement in biological science of 30 underachievers in science of control group at pre-test and post-test.

Tests	N	Mean	Std. Deviation	t-ratio	Remarks
Pre-test	30	20.4	2.57	1.62	Significant at 0.05 and 0.01level
Post-test	30	22.15	3.78		

The calculated t-ratio between the pre-test and post-test scores of achievement scores in Biological science of control group was calculated to be 1.62 which is statistically not significant at 0.05 and 0.01 levels of significance, so there does not exist a significant difference between pre-test and post-test scores of achievement in Biological science of control group. Thus, it is concluded that the traditional teaching was not so effective as the result shows that the underachievers in science scored same at pre-test and post-test in achievement test in Biological science.

Comparison between Pre-test and Post-test Scores of Achievement Test in Biological Science of Experimental group

Below mentioned table shows the descriptive statistics of the scores of achievement test in biological science of 30 underachievers in science of experimental group at pre-test and post-test.

Table 2: Comparison between pre-test and post-test Scores of Achievement Test in Biological science of Experimental group					
Tests	N	Mean	Std. Deviation	t-ratio	Remarks
Pre-test	30	17.5	3.54	9.18	Significant at 0.05 and 0.01level
Post-test	30	28.6	3.67		

The critical ratio between the pre-test and post-test scores of achievement scores in Biological science of experimental group was calculated to be 9.18 which is statistically significant at 0.05 and 0.01 levels of significance, so there exists a significant difference between pre-test and post-test scores of achievement test in Biological science of experimental group. Therefore, it is concluded that teaching of biological science with multimedia technology was very effective.

Comparison of Post-Test Scores of Achievement Test in Biological Science between Control Group and Experimental Group

The table 3 shows the descriptive statistics of post- test scores of achievement test in Biological science between 30 underachievers in science of control group and 30 underachievers in science of experimental group.

Table 3: Comparison of post-test Scores of Achievement Test in Biological science between control group and experimental group					
Post-Tests	N	Mean	S.D.	t-ratio	Remarks
Control Group	30	22.15	3.78	6.36	Significant at 0.05 and 0.01level
Experimental Group	30	28.6	3.67		

The calculated t-ratio of the post-test scores of achievement test in Biological science between control group and experimental group was calculated to be 6.36 which is statistically significant at 0.05 and 0.01 levels of significance, so there exists a significant difference between control group and experimental group with respect to post-test scores of achievement test in Biological science. Thus, it is concluded that there was a great deal of enhancement of achievement in Biological science of underachievers in science instructed through multimedia technology.

Delimitations

1. Only selected topics in Biological science were taught in the study.
2. The study was delimited to 9th class underachievers in science studying in a government and government aided secondary schools located at urban area of Faridabad district of Haryana only.

Major Findings

1. The control and the experimental groups were homogenous because the two groups did not differ significantly in their levels of intelligence.
2. No significant difference was found between pre-test and post-test scores of achievement scores in Biological science of control group, therefore, it can be concluded that the traditional teaching was not effective in teaching of Biological science.
3. The use of multimedia in teaching Biological science was effective as the result shows that the underachievers in science scored better at post-test in achievement test in Biological science.
4. When the post-test scores of achievement in Biological science of control group and experimental group were compared a significant difference was found between the achievement scores of the two groups.
5. Multimedia based teaching method proved to be better than conventional direct method of teaching Biological science to class IX underachievers in science.

Conclusion

The results of the study show that the experimental group underachievers in science who were taught Biological science by multimedia based method performed better than conventional direct method. Thus multimedia based teaching method proved to be better than conventional direct method in teaching of Biological science to class IX underachievers in science. Multimedia allows reaching a simplified strategy which leads to easy understanding on the part of the underachievers in science. It raises the underachievers' academic achievement in Biological science subjects.

Educational Implications

The present study focused to find out the application of multimedia in teaching which could be helpful enhancing achievement in Biological science.

- Teacher should be encouraged to prepare simple software package including animation and simulation as children are more attracted toward colored visuals and the teachers should use different instructional strategies to make their lesson interesting.
- Multimedia instructional strategy can improve the knowledge and competencies of the children.
- Multimedia instructional strategy improves the open-mindedness, open-discussion when on-line discussion is done at the various places of the world.

- It is also worthy to note that teaching and learning materials should be relevant to the learning needs of the pupils; if not, the main objective would be defeated.

Suggestions for Further Research

- The study can be conducted involving the entire course of Science.
- This study can be conducted in other subjects at middle or primary level.
- The study may be conducted by involving more variables like age, personality and socio-economic status of underachievers in science.
- Similar studies may be conducted to compare the effectiveness of Activity based teaching with other strategies of teaching.
- The study may be conducted at college/schools level to find out the effectiveness of multimedia.

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