



Effect of Computer Based Multimedia Teaching on Achievement in Biology

Dr. SANJOY BHUYAN

Assistant Prof. in Education

Jamshedpur Women's College, Jamshedpur, India

SWETA MALANI

PGT Biology

Delhi Public School, Ranchi, India

Abstract:

The main purpose of this study is to investigate the effectiveness of computer based multimedia teaching on achievement in biology of senior secondary students. The study also discussed the effectiveness of multimedia teaching on achievement in biology with respect to gender and level of achievers (i.e. high and low achievers). Equivalent group post-test only design was adopted for this study. The sample of this study was drawn purposefully from Delhi Public School, Ranchi. The sample included 52 students of Class XI. Selective response type achievement test in biology was developed by the researchers having 40 items. Mean, standard deviation and t-test were used to analyse the data. The findings of the study showed that the computer based multimedia teaching was effective in enhancing achievement in biology and also in promoting achievement level among low achievers.

Key words: Multimedia, achievement in biology.

INTRODUCTION

In this era of technological explosion, technology has blended itself so intricately in our day to day life that the very thought

of techno-less life frightens us. Life seems to become unimaginable even for a moment without technology. When all walks of life have been amalgated with technology how can education remain untouched? Formal school education has made a drastic shift from lectures of gurukul to chalk and talk to highly sophisticate smart classes in these modern days. The creeping in of modern technology into education is a result of demand and need of the time. Increase in school going population and students eagerness, in a technological advanced era, has certainly compelled to change the teaching strategy from more teacher centered to a highly student centric one.

Science education is been emphasized all over the world. Science education in India has also gained momentum. Many reforms have been made to enhance the quality of science education. Still science education in India has got miles to go. The chalk and talk method is still prevalent in many Indian Schools. A good teaching always aim effective communication and appropriate learning outcomes. In the last two decades, educators and researchers have taken interest to know how student learn science best. It is generally accepted that students learn best by doing particularly in science courses (Dalton et. al., 1997), when students are engaged in actively constructing knowledge from a combination of experience, interpretation and structured interactions with the peers and teachers(Roschelle et.al., 2000) they are more likely to gain an expert understanding of science concept. Technology tools are one way to expose children to this type of learning. Indeed as, researchers have begun to understand that technology when used effectively can enable ways of teaching that are much better matched to how children learn. (Roschelle et.al., 2000).

Biology is one of the important branches of science. Biology connects us to the world we are living and reminds us of our interconnectedness with all other life forms. Study of biology is a prerequisite to a numerous varied careers in agro-sciences, animal sciences, environment sciences, medical

sciences, genetic sciences, food sciences etc. So such an important subject definitely needs proper way to be transmitted into the young minds. Though many methods and strategies are being adopted for biology teaching, one of the recent approach is computer based multimedia approach.

Media combinations are generally referred to as multimedia system. Multimedia means 'Many Media'. According to Shah (1988) "Multimedia is more than one medium used in a single communication either sequentially or simultaneously". Experts are of the opinion that different media serve different educational functions, so that various media should not be used in isolation, rather they should be integrated.

Multimedia attributes (e.g., animation, recorded speech, graphics, video, music) accommodate a variety of learning styles (Ayersman, 1996; Provenzo, Brett, & McCloskey, 1999). 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 (Vaughan, 1998). This has introduced important changes in our educational system and impact the way we communicate information to the learners (Neo & Neo, 2000). The evolution of multimedia has made it very possible for learners to become involved in their work. This would make them active participants in their own learning process, instead of just being passive learners of the educational content. Multimedia applications promote a constructivist approach to learning by encouraging complex interactions between learners and content, whereby learners construct much of what they learn and understand as a function of their experiences (Schunk,

2000). Use of presentation software such as PowerPoint or Hyper Studio can transform students from being mere recipients of knowledge to active learners who make decisions about how to direct their learning (Thorsen, 1998).

Researchers in India and abroad, at different levels of education has been conducted to find out the effect of multimedia teaching on several measures in different subject areas like Mathematics (Nwaocha,2010), Science (Vellaisamy, 2007), Physics (Bakac et. al., 2010; Adegoke, 2011),Writing Competence (Sangeeta, 2004), Environmental Science (Maya, 2011), Geography (Srinivasalu, 2011), Economics (Krishnakumar and Thollapan, 2011), Biology (Ritt and Stewart, 1996 ; Angadi, 2011 ; Vivien et. al. 2011; Cheng et al 2012), Accountancy (Babu and Vimala 2008) etc. These studies showed the positive effect of multimedia teaching on achievement and various other measures. But its effectiveness on achievement in biology and to what extent multimedia teaching contributes for the achievement of students of different achievement levels is scarcely reported particularly in India. Hence keeping in mind the importance of using multimedia approach in classroom instruction and assuming that it would enhance the achievement in biology the present study to find the ‘impact of computer based multimedia teaching on achievement in biology” is intended.

STATEMENT OF THE PROBLEM

Effect of Computer based Multimedia Teaching on Achievement in Biology.

OBJECTIVES

1. To find out the effect of computer based multimedia teaching on achievement in biology.
2. To find out the effect of computer based multimedia teaching on achievement in biology among boys and girls.

3. To find out the effect of computer based multimedia teaching on achievement in biology of high and low achievers.

HYPOTHESES

1. Computer based multimedia teaching would promote achievement in biology.
2. Boys and girls would not differ in achievement in biology when taught through computer based multimedia teaching.
3. High and low achievers would not differ in achievement in biology when taught through computer based multimedia teaching.

OPERATIONAL DEFINITION

Multimedia

Multimedia is the combination of different media. In the present study, the multi - media included: Computer projected materials that included text on screen, diagram, animated picture, video clips, and digital audio, sound effects and graphics pictures.

Achievement in Biology

In the present study it is referred to any desirable learning in biology that is observed in the students. The index of achievement in biology was the total scores or marks in biology that the students get in test.

Design of the Study

In this study independent variable is the teaching strategy i.e. computer based multimedia teaching and the dependent variable is achievement in biology. Experimental design i.e. post test only-equivalent group design was used for the present study. This design was used because the difference of

achievement in biology is found by computing the difference on post test scores only. Though equivalence can be assured by random assignment of students to either experimental or control group but to have a more accurate equivalent group, equivalence is maintained by one to one matching procedure.

Paradigm of the design

Random assignment of the groups	Matching of one-to-one subject (student)	Treatment	Post-test
Experimental	Achievement test	Multimedia based teaching	Achievement test in Biology
Control	Achievement test	Conventional teaching	Achievement test in Biology

Sample and Sampling Procedure

For the present study, Delhi Public School of Ranchi was chosen purposefully. Class XI had two sections having 48 and 50 students respectively. The students of these two sections were matched by pairing their achievement scores of Biology of their last examination conducted by the school. By matching the subjects 26 pairs were selected. Selection was done in such a way that students scoring above 80 and below 60 were considered. Students scoring above eighty are considered high achievers while student scoring below 60 are considered low achievers in this study. Out of these two matched section one was taken as experimental and the other as control group randomly. So out of 26 pairs of students 26 were taken as control and 26 as experimental

Tools

Selective response type achievement test in Biology having 40 items was developed by the investigators and was used for data collection. The maximum score of the test was 40.

Procedure for Collecting Data

Before actually implementing this experiment, the investigator had prepared an exhaustive plan of the entire procedure. The contents taught using multimedia package were 1. Cell structure and function, 2. Photosynthesis, 3. Digestion, and 4. Excretion. The contents been divided into terms of lessons (by lesson is meant one period of 45 minutes). The investigators developed computer programme which included story board having text, instructional design, and graphics. The programme contained colourful animated cartoons, digital narrations and texts, graphics and digital audio. The narrations were in the voice of children to draw more attention of the students. Appropriate graphics were used accompany the text having proper colours and font. Graphics, video and cartoons were obtained from the internet.

Treatment

The experimental group was exposed to the multimedia teaching developed by the researchers and the control group was taught the same lessons by traditional method. The experiment was done for 20 periods for both the groups.

Statistical Technique

t-test was used for the analysis of the data.

ANALYSIS AND INTERPRETATION OF DATA

ANALYSIS OF POST TEST SCORES OF ACHIEVEMENT IN BIOLOGY OF EXPERIMENTAL AND CONTROL GROUP.

Comparison of post-test scores of achievement in biology of experimental and control group.

Hypothesis – 1

Computer based multimedia teaching would promote achievement in Biology.

For the purpose of testing the hypothesis, post-test scores of achievement in biology of experimental and control group were tabulated. Mean, standard deviation and t-values were computed and are presented in table 1.

Table 1. Mean, Standard deviation and t-values of post-test scores of achievement in biology of experimental and control group.

Experimental Group N=26		Control Group N=26		
Mean	S.D	Mean	S.D	t-value
33.88	2.32	30.92	1.52	5.448**

**significant at .01 level

Table-1 shows that the post test mean score of experimental group is higher when compared with the mean score of the control group. The obtained t-value of 5.44 is greater than the table t-value of 2.68 for 50 degrees of freedom at .01 level of significance. Hence the hypothesis is accepted. This indicates that there is a significant difference between mean scores of experimental and control group in the biology achievement test. It is thus concluded that multimedia based teaching helped in improving achievement in biology.

Increased biology achievement of experimental group can be attributed to the multimedia programme, which drew attention and called for active participation of the students. Students were not just passive listeners rather they were exposed to a variety of graphics, digital audio and video, models which drew their attention more and involved more of their sense organs. They might have enjoyed the multimedia programme as the narration were by the children and use of varied colours, animation attracted them and keep them focussed to the lessons which made them learn better compared to the control group where only chalk and talk method was employed. This finding is consistent with the previous findings of Pal, Sana and Ghosh (2012) where they found that experimental group taught through interactive multimedia

courseware dramatically increased achievement in biology. Tumbel (2013) also found that computer based multimedia teaching significantly increased biology learning achievement of the student group who was taught through it in comparison to the other group which is taught using conventional learning method. Even Satyaprakasha and Sudhansu (2014) also found that multimedia instruction significantly promoted achievement in biology.

ANALYSIS OF POST-TEST SCORES OF ACHIEVEMENT IN BIOLOGY OF EXPERIMENTAL GROUP WITH RESPECT TO GENDER

Comparison of post-test scores of achievement in biology of boys and girls of experimental group.

Hypothesis 2.

Boys and girls would not differ in achievement in biology when taught through computer based multimedia teaching.

In order to test this hypothesis, post-test scores of achievement in biology of boys and girls of experimental group were tabulated. Mean, standard deviation and t-values were computed and are presented in table 2.

Table 2. Mean, Standard deviation and t-values of post-test scores of achievement in biology of boys and girls of experimental group.

Experimental Group (N=26)				
Boys (N=14)		Girls (N=12)		
Mean	S.D	Mean	S.D	t-value
33.86	2.51	33.92	2.19	.063

The table 2 shows that the post- test mean score of boys is slightly lower than that of the girls in the experimental group. The t-value of experimental group is .063 respectively which is less than the table value of 2.06 at .05 level of significance for 24 degrees of freedom.

Though the post-test mean score of achievement in biology of boys of experimental group is slightly lower than the

girls, the t-value reveals that there is no such significant difference between the boys and girls. Hence the hypothesis is accepted. Gender neutrality in achievement in biology can be attributed to equal opportunity, participation and treatment provided to both boys and girls. This is supported by previous study of Berge (1989), Gupta and Lata (2014) and Satyaprakasha and Sudhansu (2014) where they found the gender neutrality in science achievement when students are taught with the help of activities and microcomputers, IT enabled instructional package and multimedia teaching respectively. The little higher mean score of the girls can be attribute to the fact the lessons were of biology and girls seems to possess a better attitude towards biology in comparison to boys.

ANALYSIS OF POST-TEST SCORES OF ACHIEVEMENT IN BIOLOGY OF EXPERIMENTAL GROUP WITH RESPECT TO LEVEL OF ACHIEVERS

Comparison of post-test scores of achievement in biology of high and low achievers of experimental group

Hypothesis 3.

High and low achievers would not differ in achievement in biology when taught through computer based multimedia teaching.

In order to test this hypothesis, post-test scores of achievement in biology of high achievers and low achievers of experimental group were tabulated. Mean, standard deviation and t-values were computed and are presented in table 3.

Table 3. Mean, Standard deviation and t-values of post-test scores of achievement in biology of high achievers and low achievers of experimental group.

Experimental Group (N=26)				
High Achievers (N=15)		Low Achievers(N=11)		
Mean	S.D	Mean	S.D	t-value
35.60	1.18	31.55	1.04	9.086**

** significant at .01 level

The table-3 shows that the post-test mean scores of high achievers in the experimental group is higher than that of the low achievers. The t-value reveals that there exists a significant difference in the achievement in biology among the high achievers and low achievers in favour of high achievers. Hence the hypothesis is rejected. The said difference in achievement in biology between the high achievers and low achievers is due to their ability and intelligence. Though there exists a difference between the high and low achievers, the mean score of low achievers which is 31.55 out of a maximum score of 40 is 78.87. This shows that though the low achievers lag behind the high achievers, their scores has certainly improved to 78.87 %. Hence, it can be said that the multimedia based computer technology has increased the level of low achievers. This result may be attributed to the high attractiveness and attention drawing multimedia programme which drew the interest and attention of even the low achievers which resulted in their high participation, attention and interest in biology which led to their better achievement. This finding is consistent with the findings of Reddy and Ramar (1997) where they found that computer assisted multimedia approach had significantly developed the performance level in science of slow learners. Similar results were also seen by Satyaprakasha and Behera (2014).

MAJOR FINDINGS

Computer based multimedia teaching significantly enhanced the achievement in biology as compared to conventional teaching. It had an equal effect on boys and girls. It had not only enhanced the achievement level of high achievers but also had enhanced the performance of low achievers to a considerable extent.

Educational Implications

The results of this study show the high effectiveness of computer based multimedia teaching on achievement in biology at senior secondary level. This result can have the following implications:

Teachers are crucial in planning teaching learning process. The teacher has to acquire competency in developing, preparing and using multimedia in classroom along with the content. For this the teachers have to be exposed and oriented to multimedia teaching. Pre-service and in-service training programme should incorporate components in multimedia development and usage. School administrators must take adequate steps to equip the classrooms with necessary technology devices, encourage and promote teachers to make maximum use of multimedia in class room.

REFERENCES

- Adegoke, B.A. (2011). Effect of multimedia instruction on senior secondary school students' achievement in physics. *European Journal of Educational Studies*, 3 (3), 537-550.
- Angadi, G. R. (2011). Development and validation of multimedia package in biology. *Journal of Research and Extension in Education*, 6 (1), 68 – 73.
- Ayersman, D. J. (1996). Reviewing the research on hypermedia-based learning. *Journal of Research on Computing in Education*, 28 (4), 500-526.
- Babu, R., & Vimala, T.S. (2008). Impact of multimedia method in accountancy learning at higher secondary level. *Journal of Education Research and Extension*, 45(4), 51-58.
- Bakac, M., Tasoglu, A.K., & Akbay, T. (2011). The effect of computer assisted instruction with simulation in science and physics activities on the success of student: Electric

- current. *Eurasian Journal of Physics and Chemistry Education*. Spl.Issue. 34-42. Available online at <http://www.eurasiajournals.com/indexphp/ejpce>.
- Berge, L.Z. (1989). Effect of group size, gender and ability grouping on learning science process skills using microcomputers. *Dissertation Abstract International*, 49 (10), 2948-A.
- Cheng, Y.H., Cheng, J.T., & Chen, D.J. (2012). Effect of multimedia computer assisted instruction on student learning achievement using high school curriculum entitled 'molecules that dominate secret of life'. *WSEAS Transaction on Information Science and Applications*, 9 (1), 1-33.
- Dalton, B., Morocco C. C., Tivnan T., & Rawson Mead, P. L. (1997). Supported inquiry science: teaching for conceptual change in urban and suburban science classrooms. *Journal of Learning Disabilities*, 30 (6), 670-684.
- Gupta, M., & Lata, P. (2014). Effectiveness of IT-enabled instructional package (ITEIP) on science achievement of X class students in relation to their gender. *British Journal of Education*, 2 (4), 17-30.
- Krishnakumar, R., & Tholappan, A. (2011). Effectiveness of computer assisted instruction in learning economics at higher secondary school. *GCTE Journal of Research and Extension in Education*, 6. (1), 158-161.
- Maya, S. (2011). Computer assisted learning and learning environment. *Journal of Research and Extension in Education*, 6 (2), 145-149.
- Neo, M. & Neo, T. K. (2000). Multimedia Learning: Using multimedia as a platform for instruction and learning in higher education. *Paper presented at the Multimedia University International Symposium on Information and Communication Technologies 2000 (M2USIC'2000)*, Petaling Jaya, Malaysia.

- Nwaocha, V. O. (2010). Enhance students' interest in mathematics via multimedia presentation. *African Journal of Mathematics and Computer Science Research*, 3(7), 107-113. Available online at <http://www.academicjournals.org/AJMCSR>
- Pal, S., Sana, S. & Ghosh, A.K. (2012). Influence of interactive multimedia courseware: A case study among the students of physical science of class VIII. *Bhatter College Journal of Multidisciplinary Studies*, 2, 76-88.
- Provenzo, E. E, Jr., Brett, A., & McCloskey, G. N. (1999). *Computers, curriculum, and culture change: An introduction for teachers*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Reddy, G. L., & Ramar, R. (1997). Effectiveness of multi-media based modular approach in teaching of english slow learners. *Slow Learners their Psychology and Instruction*. New Delhi: Discovery Publishing House. 202
- Ritt, L., & Stewart, B. (1996). Applying technology in the classroom, innovative strategies for teaching anatomy and physiology. *TechTrends*, 41(1), 41-42
- Roschelle, J. M., Pea, R. D., Hoadley, C. M., Gordin, D. N., & Means, B. M. (2000). Changing how and what children learn in school with computer-based technologies. *The Future of Children*, 10 (2), 76-101.
- Sangeeta, S. (2004). Role of multimedia and cooperative learning in enhancing the writing competence of students. *Edutrack*, 4(7), 25-28.
- Satyaprakasha, C.V., & Behera, S.(2014) Effectiveness of Multi Media Teaching on Achievement of VIII Standard Students in Biology. *International Journal Of Informative & Futuristic Research*, 1 (8), 59-69. Available online at - <http://www.ijifr.com/searchjournal.aspx>
- Satyaprakash, C.V., & Sudhanshu, Y. (2014). *Effectiveness of Multi Media Teaching on Achievement in Biology*.

- International Journal of Education and Psychological Research, 3 (1), 68-76.*
- Schunk, D. H. (2000). *Learning theories: An educational perspective*. Upper Saddle River, NJ: Merrill
- Shah, D.B. (1988). *Educational Technology Edited by N. Venkataiah*. Daryaganj New Delhi: APH Publishing Corporation.
- Srinivasalu, G.N. (2011). Effectiveness of Computer Multimedia Package on Achievement in Geography. *GCTE Journal of Research and Extention in Education, 6 (1)*, 80-84.
- Thorsen, C. (1998). *Technology-based models for classroom teachers: Volume III*. Teaching presentation software: Thinking in 3-D. Boise, ID: Boise State Educational Technology Program.
- Tumbel, M.F. (2013). Effectiveness of animation and multimedia teaching on students' performance in science subjects. *British Journal of Education, Society and Behavioural Sciences, 42 (2)*, 201-210.
- Vaughan, T. (1998). *Multimedia: Making it Work* (4th Ed.), Berkeley, CA: Osborne/McGraw-Hill.
- Vellaisamy, M. (2007). Effectiveness of multimedia approach in teaching science at upper primary level. *Indian Educational Review, 43 (1)*, 125-132.
- Vivien, E. R., & Douglas, G. (2011). Are multimedia resources effective in life science education? A Meta-Analysis. *Bioscience Education, 18(3)*, 1-14. Available at www.bioscience.heacademy.ac.uk/journal/vol18/beej-18-3.pdf.