



## INNOVATIVE INSTRUCTIONAL STRATEGIES INTERACTIVE MULTIMEDIA INSTRUCTION AND COMPUTER AIDED INSTRUCTION FOR TEACHING BIOLOGY

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### Abstract

*Teaching has to do with helping individuals acquire knowledge, skills and attitudes in different areas of learning. Teaching is guiding, facilitating and motivating learners. The aim of teaching is not only to transmit information but also to transform passive students into active receptors of knowledge and constructors of their own knowledge To transform such knowledge requires professional practice to be continuously re-examined and updated for best use of digital technologies for teaching, learning and school improvement. To meet this requirement the present study is undertaken in which Interactive Multimedia Instruction and Computer aided Instruction for teaching Biology was compared in terms of achievement of students. The result indicated that Interactive Multimedia Instruction IMI is more effective than Computer Aided Instruction CAI. This indicates that technology equip teacher is better than technology based self learning.*

**Keywords:** *Interactive Multimedia Instruction IMI, Computer Aided Instruction, Creativity, Achievement, Criterion reference test*

"Education system mainly consists of three elements: Educational objectives, Learning experiences and Evaluation system." These three are inter-related with each other. Learning experiences mainly depend upon the learning process. Learning process is said to be effective when it is able to develop the cognitive, affective & psychomotor domains of an individual to its fullest extent. It means the main aim of instructional process is all round development of an individual. In this way, instructional process is multi- dimensional in nature According to Education Commission (1964-66), in this world based on science and technology, it is education that determines the level of prosperity, welfare and security of the people. Our success in the great enterprise of national reconstruction depends upon the quality of education and persons passing out of our schools and colleges, so it is necessary to renovate the educational system. It should be reconstructed according to the needs of the present society. Change in Science and Technology have had considerable impact on the educational system which aims at developing the ability of people to keep pace with each other in order to effectively apply technology to raise the level of efficiency. Therefore, the educational system must be changed. It will not be restricted in any ways; on the other hand, new features using computer aided instruction, interactive multimedia technology for educational purposes can prove their role, function and utility to suit the needs of present 21st Century. Different researches have been conducted in the field of computer education in abroad as well as in India. As far as India is

concerned, very little work has been done in the field of computer, work regarding to the computer in education is still in experimental stage.

In the present situation, it is observed that with the traditional method of teaching, students get only spoon feeding. They don't understand the subject clearly and they generally feel that the course is vast and difficult. Secondly, individual differences are the major problems in education due to difference in intelligence, abilities, interests and rate of learning. Every student cannot grasp at the same rate.

### Use of Computers by Science Teachers

With the capacity of processing data and also creating visuals, Computers can be a very good aid in transforming knowledge to the students for studying science. Unfortunately the vast potential of computers has not been tapped in class room situation. There are many reasons for this like; lack of facilities, and lack of attitude to use it. In India from past twenty to twenty five years very few researchers had tried to harness this computer technology field by using it in teaching through CAI or multimedia instruction and majority of them reported its positive impact on various aspects of teaching and learning. The present study is an attempt to compare these two modes of technology use in class room, which are interactive Multimedia Instruction and Computer Aided Instruction for learning Biology

### Biology and its Importance in School Curriculum

Biology occupies a unique position in the school



curriculum. Biology is central to many science related courses such as medicine, pharmacy, agriculture, nursing, biochemistry and so on. It is obvious that no student intending to study these disciplines can do without biology.

### **Rationale of the Study**

With the advancement of modern technology in the world, it is more urgent to use new pedagogy and also to develop efficiency in the way the students learn. There is a need to renovate our teaching methods to make classroom teaching effective. Most of the changes have been attributed to the "Information Revolution". Many of the transformations taking place are associated with the much rapid flow of information and greater capacity for its storage. In the present Information Technology system, computers have a pivotal role to play.

Different researches have been conducted in the field of computer education in abroad as well as in India. As far as India is concerned, very little work has been done in the field of computer, work regarding to the computer in education is still in experimental stage.

In the present situation, it is observed that with the traditional method of teaching, students get only spoon feeding. They don't understand the subject clearly and they generally say that the course is vast and difficult.

Secondly, individual differences are the major problems in education due to different intelligence, abilities, interests and rate of learning. Every student cannot grasp at the same rate. In classroom teaching, a teacher tries to pace with the average students and ignores the bright and poor students of the class. To solve such problems there must be some effective method or technique. It is found that very less research work has been done on utilization of Interactive Multimedia for teaching the students. It is known that the students are able to grasp more and understand the subject in better way if it is presented to them in audio-visual form.

Since CAI has certain limitation and to overcome the drawbacks of CAI as well as to take benefits of technological advancement in teaching process it has been decided to develop interactive multimedia instructions and CAI for Biology teaching. No study has been reported so far on comparison between CAI and Interactive Multimedia Package. The present study is directed towards finding the effectiveness of multimedia instruction and Computer Aided Instruction so that the teachers in Biology can utilize the findings and results to transfer knowledge in an effective way to the students of Biology, thus helping them to understand the subject in a better way.

### **Studies Conducted in the field**

From then reviews it is seen that many studies reported that CAI could improve the achievement of the students. This is seen from the researches of , Maksumoto & Baba (1987) Niemice & Walberg (1987), Hugh (1988) , Woodward (1988),

Glenn, Craig (1988) , Bailey, Zan Tamar (1990) , Ryser (1990) ,Mridula D. Ranade (2001), Ringstaff & Kelley (2002), David Collins, Alan Deck, Myra Mccrickard, (2008), Erdogan Kose (2009), Kanmani M., Radha (2009) ,Mustafa Yesilyurt (2010), Wuhan, Hubei, China (2010) , Khan Zebun N, (2010), Ponde Mukund S (November 2011) and many more.

Also the studies in multimedia instructions when compared with traditional methods of classroom instruction, direct that multimedia are effective in increasing the achievement. Studies of Ravindranath, M.J.(1982 ), Reddy, Lokandha. G, & Ramar. R.(Summer 1995), Schodorf, J.B.; Yoder, M.A.; McClellan, J.H.; Schafer(1996), R.W.Aug (1996 ), Luann K. Stemler (1997) ,Soosairaj J, (March 2005), Kingsley, Karla V.;; Malvinder Ahuja & Tuchanut Yuiuva (2006) , M. Vellaisamy, (2007) , Boone, Randall, (December 22, 2008) and many more.

Further many studies have been carried out abroad, and very little research is done in India. It is also observed that researchers have worked with computer by taking different variables; different target groups and they had their own designs. India is responding to new technologies of use in computer education. But very little work has been done in area of use of interactive multimedia instructions. Hence it is necessary that study the impact teachers using multimedia package to teach the students and its impact on achievement of students and comparing the effectiveness of computer aided instruction when the students use them for self learning. Different variables and characteristics of the learners were taken into consideration for the study, results of which can be used for motivating the teachers to take up multimedia based teaching. This is also important with the advent of virtual learning environments and new technologies supporting e-learning also. Keeping this in mind, present study has been undertaken.

### **Objectives of the Study**

To develop Interactive multimedia Instruction and Computer Aided instruction in biology and study its effectiveness in terms of Achievements of the students.

To compare the mean overall achievement score of the students taught through multimedia instruction with those studied through CAI by taking creativity as covariate.

### **Hypothesis**

There will be no significant difference between the pre and post test mean overall achievement score of students taught through Interactive Multimedia instruction.

There will be no significant difference between the pre and post test mean overall achievement score of students studied through Computer Aided instruction.

There will be no significant difference between the mean overall achievement score of students taught through Interactive Multimedia instruction with those studied through Computer Aided instruction.



There will be no significant difference between the mean overall achievement score of students taught through Interactive Multimedia instruction with those studied through Computer Aided instruction by taking creativity as co-variate.

**Population**

The population of the present study was selected from Yavatmal city of Maharashtra state. The students of two English medium high schools namely Maharshi Vidya Mandir and School of Scholars Yavatmal studying in Std 9th during Academic Year 2009-10 were selected for the study. Both the schools were affiliated to CBSE New Delhi.

**Tools**

The tools used for the study Self developed four criterion reference tests for measuring the achievement of class 9th students in Biology and Passi Test of Creativity (PTC) is used.

**Design**

In the beginning the Criterion reference test was administered through paper pencil to the 120 students of both the Schools. 4 criterion test based on 4 units of content was administered as pre test. The evaluation of the tests was done manually using scoring key. After pre test the group was divided in to two. One group was taught through developed multimedia instruction with the help of LCD Projector; by the investigator. Another group was asked to study through CAI. The CAI software was made available to them through school computer lab. After completing a unit the students were asked to solve the same Criterion reference test which was administered as post test. In this manner all the 4 units were taught and subsequent post tests were administered. After post test Creativity test developed by Passi was administered to both the groups.

**Effectiveness of Interactive Multimedia Instruction and CAI in terms of achievement**

One of the criteria used for studying the effectiveness of Interactive Multimedia Instructions and Computer Aided Instruction in terms of achievement of students on criterion test. The present study involved students of class IX taught through developed Interactive Multimedia instruction support material and Computer Aided Instruction. The pre test and posttest marks were analyzed by employing the correlated t test. To see the overall effectiveness of Interactive Multimedia instructions and Computer Aided Instruction, the total marks obtained on all 4 criterion tests were taken for both i.e. IMI and CAI groups. The results are summarized in table 1

From table 1, it is evident that: The overall achievement of students on criterion tests was calculated by the total score of all criterion tests of each student of IMI and CAI group.

**Table - 1 Effectiveness of Interactive Multimedia Instruction and CAI in terms achievement on pre and post criterion test**

| Topic / Unit                                       | Test      | N  | Mean  | SD   | R   | t value |
|--|-----------|----|-------|------|-----|---------|
| Interactive Multimedia instruction IMI (All Units) | Pre Test  | 60 | 16.77 | 1.99 | .03 | 145.16* |
|  | Post Test | 60 | 75.91 | 2.45 |     |         |
| Computer aided Instruction CAI (All Units)         | Pre Test  | 60 | 17.63 | 2.28 | .05 | 81.45*  |
|  | Post Test | 60 | 64.68 | 3.85 |     |         |

**\* Significant at 0.01 level**

The t values of 145.16 for overall achievement of students of IMI group and 81.45 for overall achievement of students of CAI group on criterion test is significant at 0.01 level. It indicates that the total mean overall achievement score of student before the treatment differ significantly from that after the treatment for both the groups. Thus the Interactive Multimedia instruction and Computer Aided Instruction was found to be effective in terms of the achievement of students on post criterion reference tests.

**Effectiveness of Interactive Multimedia Instruction and CAI Material in terms of achievement**

To test effectiveness of the Interactive multimedia instruction and developed CAI material, the post test score on criterion test of both the groups were analyzed by using t test results are summarized in table 2.

**Table - 2 Effectiveness of Interactive Multimedia Instruction and Computer Aided Instruction in terms of achievement**

| Group     | Test      | N  | Mean  | SD   | R    | t value |
|-----------|-----------|----|-------|------|------|---------|
| IMI group | Post Test | 60 | 75.91 | 2.45 | 0.87 | 19.08*  |
| CAI group | Post Test | 60 | 64.68 | 3.85 |      |         |

**\* Significant at 0.01 level**

From table 2, it is evident that t value of 19.08 for achievement on all units is significant at 0.01 level. It indicates that the mean post test score (75.91) of students of Interactive Multimedia Instruction(IMI) group is significantly higher than the mean post test score (64.68) of students of computer Aided Instruction CAI group after the treatment, it indicates that Interactive multimedia instruction group students performed better than CAI group on post criterion test.

Thus the interactive multimedia Instructions were found to be effective in terms of the achievement of students on post criterion reference tests as compared to achievement of students through CAI:

Comparison of Multimedia Instructions with Computer aided instruction in terms of overall achievement by taking creativity as co-variate

To compare the effectiveness of Interactive multimedia instruction, and Computer Aided Instruction CAI in terms of achievement of students by taking creativity as co-variate. The post test marks on criterion test of both the groups IMI and CAI along with creativity score of the



groups were analyzed by ANCOVA analysis of co variance the results are summarized in table 3

**Table 3 - The significance of difference between mean achievement scores of the CAI group (Control Group) and the MI group (Experimental Group) by taking Creativity as Covariate**

| Group | Number | Mean of Creativity Scores | Mean of Ach. Score | Adjusted mean of Ach. Score |
|-------|--------|---------------------------|--------------------|-----------------------------|
| 1     | 60     | 142.67                    | 64.68              | 66.74                       |
| 2     | 60     | 162.17                    | 75.92              | 73.86                       |

Group 1 = CAI - Control Group, Group 2 = MI - Experimental Group

**Analysis of Co-variance of achievement scores**

| Source of Variance | Sum of Squares | Df  | Mean Square | F value | Sig. level |
|--------------------|----------------|-----|-------------|---------|------------|
| Group              | 732.61         | 1   | 732.61      | 113.28  | 0.01       |
| Error              | 756.7          | 117 | 6.47        |         |            |
| Total              | 1489.31        | 118 |             |         |            |

The F value for the significance of difference between adjusted mean achievement scores of the CAI learners group and the MI group was 113.28 which were significant at 0.01 levels. Hence the null hypothesis "There will be no significant difference between the adjusted mean overall achievement score of students studied through CAI with those taught through Interactive Multimedia Instruction by taking creativity as covariate" was rejected. So it can be said that there was significant difference between adjusted means of science achievement scores of CAI group and MI group.

**Findings**

The Multimedia Instructions were found to be effective in terms of achievement of students on criterion reference tests

The Computer Aided Instruction was found to be effective in terms of achievement of students on criterion reference tests.

Multimedia instructions were found to be more effective than computer Aided Instructions in terms of achievement of students.

The Interactive Multimedia Instructions were found significantly superior to the Computer Aided Instruction in terms of overall achievement when creativity is taken as a covariate.

**Discussion**

The job of the teacher requires that he assists the learner to learn. The teacher can do this effectively by making the teaching/learning environment, stimulating, challenging and dynamic. The instructional strategies we have briefly highlighted can assist the learner reduce the monotony associated with using only the "chalk and talk" option. The finding of the above research concluded that

Interactive multimedia Instruction found to be superior than Computer aided Instruction in terms of achievement of students for Biology subject this indicate that presence of teacher with use of advance technology is more effective than self learning by students through Computer Aided Instruction CAI. Further presence of teacher is supportive in the class room to enhance achievement of students. People often say that not everyone can learn. Yet the reality is that everyone does learn. Every person is born with a brain that functions as an immensely powerful processor. Traditional schooling, however, often inhibits learning by discouraging, ignoring, or punishing the brain's natural learning processes The goal of instruction is the creation of expertise through a well and flexibly organized, easily retrievable, knowledge base.

- (Sternberg, 1998)

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