

Effectiveness of Computer Assisted Instructions (CAI) in Teaching of Physics at Secondary Level

Abstract

The present study investigated the effects of computer assisted instruction (CAI) on secondary school students' performance in physics adopted experimental method and observing the difference between (CAI) and traditional method. This research was quasi experimental type pre test post test control group design. The sample for the study comprised 100 secondary students of 9th class studying in schools affiliated to CBSE, New Delhi, sampled from 02 private schools in Meerut. The sample was divided into two groups namely experimental and control group. The experimental group consisted 50 students who were taught 'Force' by the computer assisted instructions and the control groups comprising 50 students were taught by the conventional method of teaching. The findings of the study showed that the performance of students exposed to CAI were better than their counterparts exposed to the conventional classroom instruction. The study demonstrated that CAI is an effective media of instruction for teaching Physics at secondary students.

Keywords: Effectiveness, Instructions, CAI, Construction

Introduction

In recent years the computer has established itself as an important feature of modern life. Many of us use computers daily, sometimes without even being aware of the fact. Schools and governments have devoted resources to computer literacy or knowledge about computers and computing. The use of computer in teaching learning process has stepped many stages of its evolution. The computer can be used as a mainstay of a course for backup revision, reinforcement, extension or a variety of other purposes. It may communicate with student visually by displaying text, graphics or video images on a screen. Instructional works so carried out with the help of computers is generally known as Computer Assisted Instruction or CAI in brief. Computer assisted instruction is defined as a method of instruction between a learner and computer device having useful instructional material as software for helping the individual learner to achieve the desired instructional objectives with his own pace and ability at his command. Computer assisted instruction is the process by which written and visual information is presented in a logical sequence to a learner through computer. The student learns by reading the text material presented or by observing the graphic information displayed. Some of the programs provide audio-visual presentation with an option to the student to select audio presentation in addition to the visual media. Each segment of text is followed by multiple choice questions, for student's response. Feedback on response is indicated immediately.

It is a form of independent learning where the students have the responsibility to learn. In its broadcast meaning it is a process in which students take the initiative with or without the help of others in diagnosing their learning needs, formulating learning goals, identifying human material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes. There are many teaching methods which can be used in teaching of science in secondary school students such as lecture cum demonstration, field trip, project, activity and play way method. In normal classroom teaching teacher adopts same method of teaching for all students while the needs of students are different and their entering behavior too. Students get only bookish knowledge by

Ashish Pathak

Assistant Professor,
Deptt.of Teacher Education,
SMP Govt Girls PG College,
Meerut

traditional methods and outdoor methods (field trip method, activity method, project method, play way method) need much more time but generally there is not so much time that student could be taught all the principles of Physics by these outdoor methods. So students take no interest in physics. In such a way we can't achieve the objectives of physics.

In this complicated situation we may use CAI which serves the information more effectively with graphics, sound, animated forms, 3-D pictures etc. The present traditional system of instruction is highly group oriented. Students are in a group for the purpose of instruction, irrespective of individual differences in their intellectual ability, motivation, interest and emotional development etc. No doubt educators and administrators have always advocated the need for an instructional system attuned to the background and abilities of the individual. But nothing substantial has been done in our country to individualize instructional process in order to cater to the needs of individual learner. Learners at the college stage are mature enough in terms of language, comprehension and development of other mental abilities to a great extent. It indicates the capabilities of these learners to learn at their own speed if suitable environment is provided. They should try to learn at their own pace by self learning process of CAI and by doing different activities. Active involvement of the learner makes the content easy and more understandable. Certain topics in Physics are based more on imagination; the computer assisted instructions (CAI) can prove to be helpful to teach such topics. There is a need to recognize the importance of computer assisted instructions as necessary device to impart the scientific knowledge to pupils. Therefore, it is worthwhile to find the effectiveness of CAI in teaching learning process of Physics.

Objectives of the Study

1. To develop the computer assisted instruction material on the topic of 'Force' for 9th standard students studying in school affiliated to CBSE, New Delhi.
2. To compare the achievement of students taught by CAI and traditional methods

Hypotheses of the Study

1. There is a significant difference between achievement scores of students taught by CAI and traditional methods.

Research Methodology Research Design

The present study was a Quasi experimental type of the pre test post test control group design. In this research the effect of independent variable (teaching method) on a dependent variable (learning achievement) was to be found out.

The present study aimed at ascertaining the effectiveness of computer assisted instruction by comparing it with the traditional method of instruction in the teaching of Physics for secondary students.

This study was conducted in two phase:

1. Development of educational software for computer assisted instruction.

2. Experimentation with CAI to ascertain the effectiveness of CAI in terms of student achievement.

Sample

The target population of this research was the first year secondary science students in Meerut. The nature of the study, however, required that the research sample was purposively selected. This is because a research on CAI must necessarily be conducted in schools where computers are available for students' use and where the students are computer literate. This was why the Jyoti Public School Madhavpuram Meerut and S.D. Senior Secondary School Meerut were purposely sampled for the study. Both the schools were affiliated to CBSE, New Delhi. Sample was divided into two groups namely experiment and control group. The experimental group consisted 50 students who were taught 'Force' by the computer assisted instructions and the control group comprising 50 students was taught by the conventional method of teaching. The sample was randomly assigned into two groups, experimental (n = 25) and control groups (n = 25). While the experiment group was taught with CAI, the other group continued their instructions with the regular teaching method.

Instruments / Tools

To carry out any of the type of research investigations, data must be gathered to test the hypothesis. Various methods and procedures have been developed to aid in the acquisition of data. These tools employ distinctive ways of describing and quantifying the data. Each is particularly appropriate for certain sources of data, yielding information of the kind and in the form that can be most effectively used.

In any scientific study the selection of tools and techniques largely depend upon the nature of the problem under study and kind of the data necessary. Keeping in view the nature of the problem an achievement test is made by the researcher.

Construction of Achievement Test

Achievement Test to be used as pre test and post test was developed by the researcher. Test was comprised of 50 multiple choice items. This test was based on the text material included in the computer assisted instruction program. A panel of three experienced Physics teachers validated the test. Pilot test was conducted by administering the test to 30 students of IX class who were not included in the sample of the study. Item analysis was done and reliability coefficient was computed on statistical package for social science (SPSS). To find reliability coefficient with the help of Kuder-Richardson method is called coefficient of internal consistency. Pilot test revealed the reliability coefficient of 50 items test to be 0.74. It was considered acceptable according to a thumb rule suggested by Frankel and Wallen (1993) that reliability of a test for research purpose should be at least 0.70 and preferably higher. Finally investigator developed and validated a 50 items achievement test which was tried out on 30 students.

Development of CAI

Text material of the unit "Force" from the 9th standard class was transformed into CAI software. The contents were taken from the 9th standard state board on the mathematics. The treatment instrument, Computer Assisted Instructional Package (CAIP) on Force, was a self-instructional, interactive package. CAI programme was finalized after discussing with experts from subject and methodology fields. It contained seven framed. It was developed by the researchers, with the assistance of a professional programme developer.

Experimental Procedure

The experiment was conducted in three phases

1. pre-testing
2. Experimental Treatment
3. Post-testing

Both the groups were subjected to the achievement test as pre test. Administration of this test to the experimental group and control group helped the investigator to study the initial level of achievement of the pupils. Then, the students in The experimental group were exposed to CAI and the controlled group students were exposed to the conventional teaching method on the same content used for experimental group. After the treatment both the experimental and controlled groups were exposed to the post test. To find the significance of the difference between pre and post test scores t-test was applied.

Used Statistical Techniques

In the present study following statistical techniques were used.

1. Mean
2. Standard Deviation
3. Significance of the difference between two mean.

Results and Discussion

The results obtained in the experiment were tabulated and have been presented in the form of table and discuss below:

Research Hypothesis (H₁)

There is a significant difference between achievement scores of students taught by CAI and traditional methods."

Null Hypothesis (H₀)

"There is no significant difference between achievement scores of the control group and experimental group."

Control Group and Experimental group in their Pre Test

S. No.	Group of students	No. of Student	Mean	S.D.	C-R Value
1.	Control group	50	10.4	5.63	.58 [not significant]
2.	Experimental group	50	09.8	4.47	

Table denotes the mean value of learning achievement of control group is 10.4 and that of experimental group is 09.8 and mean difference is .6 which is not significant at .01 level or .05 level.

It indicates that the performance of the pupils in the two groups during the pre test was almost the same.

Showing the post test score analysis of Learning Achievement of Control group and Experimental group

S. No.	Group of students	No. of Student	Mean	S.D.	C-R Value
1.	Control group	50	19.1	4.85	6.98 [significant at .01 level]
2.	Experimental group	50	24.2	5.34	

Table denotes the mean value of learning achievement of control group on post test is 19.1 and that of experimental group is 24.2 and their mean difference is 5.1 which is significant at .01 level of significance.

Thus the null hypothesis is rejected and research hypothesis that There is a significant difference between achievement of students taught by CAI and traditional methods, is accepted.

Conclusion

The pre test achievement scores of the experimental group (taught by CAI) and control group (taught by traditional method) showed that the two groups did not differ significantly, prior to the intervention. A comparison of the post test scores of experimental and control groups on learning achievement showed that the two groups differed significantly i.e their mean difference found significant at .01 level of significance. Therefore the null hypothesis (H₀) is rejected and research hypothesis (H₁) stating there is significant difference between mean achievement scores of students taught by CAI and traditional method, was accepted. While both the methods led to effective learning, the CAI method was found superior to that of the traditional or conventional method. Results of the present study demonstrated that CAI is a better method of instruction for teaching of Physics for secondary students.

Educational Implications

Findings of the present study have a great implication for our educational system. Findings of the study point out that there is a need to expose CAI methods in classroom teaching of physics. These types of efforts reduce the work load of teachers as well as boring task of learning on the part of students. Bulk of theory can be completed within short duration. The teacher should use computer as a media of instructions in class room. CAI can be arranged to be presented in large class rooms as it provides maximum amount of variety and flexibility by maintaining the quality and quantity.

References

1. Bansal, S.K. (2002), *Fundamentals of Information Technology*, A.P.H. Publishing Corporation, New Delhi.
2. Bhargava, Dr. Mahesh and Shah, Late Prof. M. A. (2008), *Manual for Level of Aspiration Measure*, National Psychological Corporation, Agra.
3. Best, John W. & James V. Kahn (2004), *Research In Education*, Prentice Hall of India Pvt. Ltd, New Delhi.
4. Bhatnagar, Dr. A.B. & Dr. Meenaxi Bhatnagar (2003), *Advanced Educational Psychology*, International Publishing house, Meerut.

5. Bhatnagar, Dr. A.B. & Dr. Meenaxi Bhatnagar & Anurag Bhatnagar (2003), *Development of Learner And Teaching Learning Process.*, R. Lal Book Depot, Meerut.
6. Bhatnagar, R.P. & M. Bhatnagar (2005), *Shiksha Anushandhan*, Loyal Book Depot, Meerut.
7. Bhushan, Shailendra & Dr. Anil Kumar (1995), *Educational Tehnology*, Vinod Pushtak Mandir, Agra.
8. Chauhan, S.S. (1994), *Innovations in Teaching Learning Process*, Vikas Publishing House, New Delhi.
9. Garrett, Henry E. (2010), *Statistics in Psychology and Education*, Kalyani Publishers, Ludhiana.
10. Gupta, Dr. S.P. & Alka Gupta (2005), *Statistical Methods in Behavioural Science*, Sharda Pustak Bhawan, Allahabad.
11. Gupta, Dr. S.P. & Alka Gupta (2005), *Modern Measurement and Evaluation*, Sharda Pushtak Bhawan, Allahabad.

Webliography

1. <http://www.eric.ed.gov>
2. <http://www.oclc.com>