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The Effectiveness of Computer Assisted Instruction on Science Achievement of Secondary School Students

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ABSTRACT

The present study examines the effectiveness of computer assisted instruction in terms of the achievement in science at secondary level. The study is experimental in nature and observing the difference between the effectiveness of CAI and traditional method of teaching. The sample constitute of 280 students of 9th class matched on intelligence, drawn from two U.P BOARD affiliated schools (co ed) of Meerut city using cluster random sampling technique. Selected students were divided into two groups namely experimental and control group randomly. The experimental group was taught the topics 'Force' and 'Motion' through computer assisted instruction and the control group was taught the same topics through traditional method. After teaching, a self-developed achievement test was conducted for all students and the answers were evaluated and tabulated group wise. Data were analyzed by using Mean, S.D and t-test. The findings of the study indicate that experimental group performed better than the control group in respect to achievement. Comparing the achievement of male and female students taught through CAI method, no significant difference was found.

Keywords: CAI, traditional method, science achievement

Scientific discoveries and technological advancement have changed the pattern of life of all human beings. Education is also forced to make a note of technology. Technology has helped to improve the quality and pace of activity as well as productivity in most aspects of human endeavor. The new technologies have brought about changes in pedagogy and curriculum content and have been instrumented in increased academic achievement and teaching effectiveness.

In recent years, computer has become an important tool for instruction. Traditional teaching in the classrooms using blackboards can be supplemented with lessons prepared with the help of computers.

To realize the vast potential of computers as a tool for education, effort is required in the direction of thinking of how to use the computers as a teaching aid and consequently develop appropriate software for the subject matter. Computer is an impersonal machine system which can help wonderfully to handle information needed to collect, analyze and interpret data.

Computer assisted instruction (CAI) has emerged as an effective media of instruction. In mathematics teaching the CAI has been proved to be greatly beneficial to understand the unfamiliar situations and in making the conceptual clarity. There is a need to recognize the importance of CAI package as a necessary device to impart the scientific knowledge to pupils. Therefore, it is worthwhile to find the effectiveness of CAI in teaching learning process of science.

NEED OF THE STUDY

The significance of the present study is to put in the hands of the teachers an effective and time saving device for removing the weakness in the science teaching. It should contribute to the development of existing knowledge in science education. It should be specified the specialization group when a candidate has offered this strategies. The present study is future intended to give better appropriate equipment to the teacher to teach by effective strategy. The present study is also intended to serve for teachers with more time to plan and prepare curriculum because teachers are the right people who know the need and requirements of pupil as well as nation.

The present study is further intended to give emphasis to computer assisted instruction movement in the country. It represents a motivating force to deep into contents of the present problem and undertaking comprehensive study of the subject. The main objective of the present study is to put in the hands of teachers an effective, efficient, time saving and labour saving strategy for removing weaknesses in their teaching.

Operational Definition of variables involved

1. **Effectiveness:** It refers to the effect of particular treatment given to the learners that produce a significant change in any public behavior of the learner in terms of achievement.
2. **Computer assisted instruction (CAI) :** refers to the use of computers to facilitate teaching and instruction. In CAI the computer is used to present new information to the students, receive and record their responses, analyze the responses and take appropriate action such as offer new information, cross question help in analyzing problem etc.
3. **Traditional method of teaching :** The conventional teaching methods like lecturing and demonstrating generally used by teacher in the class.
4. **Achievement in science :** Knowledge attained or skill developed in the prescribed science syllabus, usually designated by test scores assigned by teacher.

Objectives of the study

1. To compare academic achievement in science of secondary students in pre-test, taught through C. A. I and traditional method of teaching.
2. To compare academic achievement in science of secondary students in post-test, taught through C.A.I and traditional method of teaching.
3. To compare academic achievement in science of secondary male students in post-test, taught through C.A.I and traditional method of teaching.
4. To compare academic achievement in science of secondary female students in post-test, taught through C.A.I and traditional method of teaching.

Hypotheses of the study

1. There is no significant difference between the secondary students taught through CAI and traditional method in terms of their science achievement in pre-test.
2. There is no significant difference between the secondary students taught through CAI and traditional method in terms of their science achievement in post-test.
3. There is no significant difference between the secondary male students taught through CAI and traditional method in terms of their science achievement in post-test.
4. There is no significant difference between the secondary female students taught through CAI and traditional method in terms of their science achievement in post-test.

Method of Study

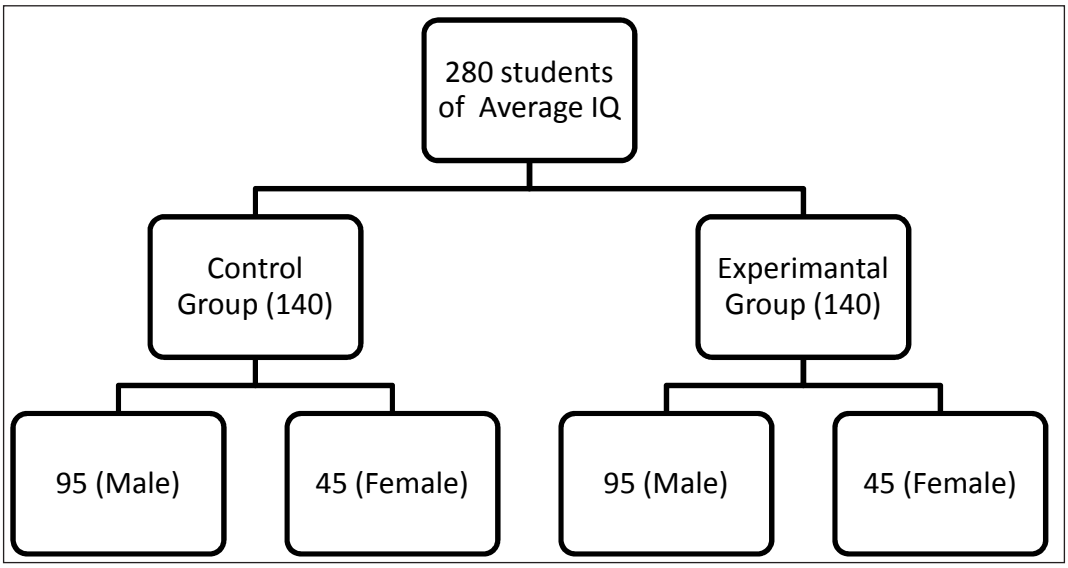
It's an experimental study and two group matched pre and post test experimental design was used to conduct the experiment. In the present study the experimental variable was computer assisted instruction (CAI) and it's impact on science achievement on secondary students was studied. Experimental research is generally regarded as the most sophisticated method of testing the hypotheses. It provides much control and establishes a systematic and logical association between manipulated factors and observed effects. Experimental method of research was chosen for achieving the objectives of the study and for testing the hypotheses formulated in the study.

Population

The population of the study consists of class 9^{th} science students of govt. aided co ed schools of Meerut district, affiliated to U.P. Board.

Sample

Two schools were selected from the population frame through 'Cluster sampling technique'. All the 384 students of both the schools were matched on the basis of intelligence. The 280 students of average IQ involved 190 boys and 90 girls were selected finally for the study. Now 95 boys and 45 girls were assigned randomly in the experimental group and the equal number of boys and girls in the control group. Group wise composition of male and female students is given below:



Tool used

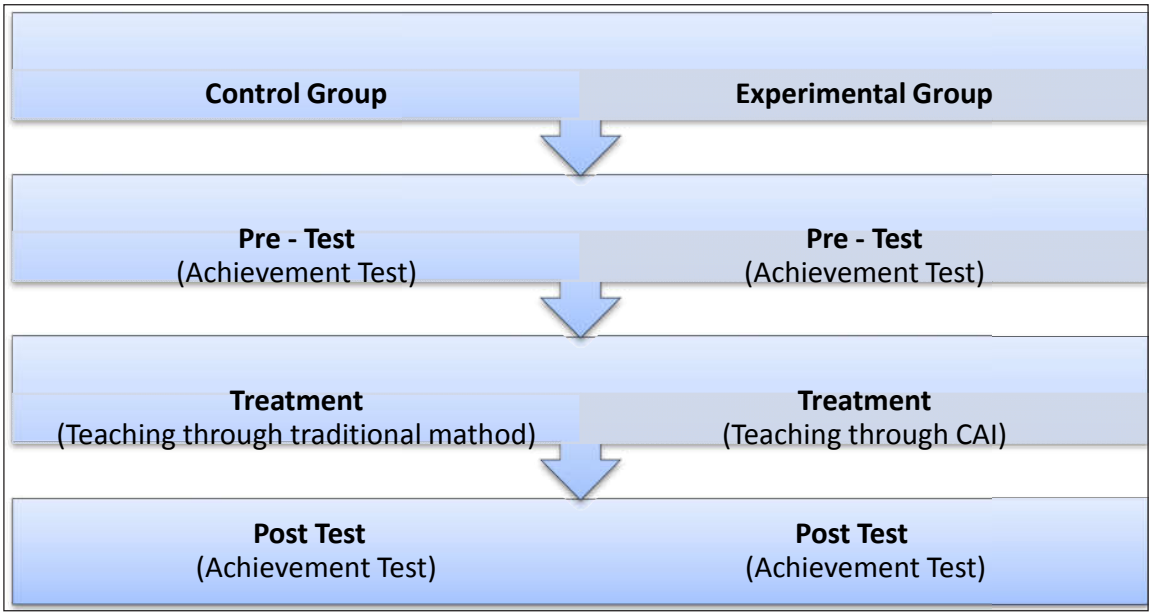
1. ***Achievement test:*** One self constructed achievement test based on basic science concepts which are expected to be known by a average science student of secondary level, was used as the pre-test. One other self constructed achievement test considered the whole content of the topic 'Force and Motion' as prescribed in U.P Board syllabus. The test consists of 30 multiple choice objective questions with four options. With the help of 'Test-Retest Method' of Reliability, the reliability coefficient of the test was .81. The responses of experts on the given questionnaire showed that the 'face validity' of the test was good and the test was valid for science students of secondary classes, for measuring their achievement in order to realize the objectivity of the study.
2. ***Intelligence test:*** To match the sample on the basis of intelligence, a standardized intelligence test constructed by Dr. R.K. Ojha and Ray Choudhary, was used in the study.

Procedure of experiment

The investigator applied the pre-test to the whole sample for evaluating the level of both the selected

groups about the basic knowledge of science. The experimental group was taught through CAI and the control group through traditional method for ten days in each case. Both the treatment were treated parallel, i.e. no interaction of students of one group to the other group. Investigator made each possible attempt to make the teaching environment similar in both the experimental and control group.

After ten days of teaching, post-test was applied to assess the impact of both the instructional strategies. After pre and post test administration, the scoring was done and suitable statistics were applied. The design of experiment is diagrammatically represented below:



Statistical Techniques

In order to achieve the objectives of the study and for testing the hypotheses, data were analyzed by using the mean, SD and t-test.

RESULTS AND DISCUSSION

Table 1: Showing the significance of difference between means of experimental group and control group achievement score in pre-test

Group	N	Mean	S.D	df	t-value	Level of Significance
Experimental	140	18.30	2.32	278	2.28	0.01
Control	140	17.56	3.05			

The Table 1 shows that obtained t-value is 2.28 which is lower than the table value at .01 confidence level that is 2.59. Therefore, it can be interpreted that the null hypothesis is accepted, hence there is no significant difference between the means of two groups. It means that, the students of both the groups at pre-test have nearly the same achievement level.

Table 2: Showing the significance of difference between means of experimental group and control group achievement score in post-test

Group	N	Mean	S.D	df	t-value	Level of Significance
Experimental	140	21.14	2.04	278	7.19	0.01
Control	140	19.28	2.28			

The Table 2 shows that the calculated t-value is 7.19 which is greater than the table value at .01 confidence level that is 2.59. Therefore, it can be interpreted that the null hypothesis is rejected, hence there exists a significant difference between the means of two groups. Therefore it can be safely concluded that C.A.I emerged as a superior teaching strategy then the traditional method of teaching in science at secondary level.

Table 3: Showing the significance of difference between means of male students in post test achievement scores of experimental and control group

Group	N	Mean	S.D	df	t-value	Level of Significance
Experimental	95	21.34	2.14	188	5.61	0.01
Control	95	19.60	2.13			

For the post-test of both the male groups, the score of total male students of experimental group were compared with that of the total male students of control group.

The Table 3 shows that the calculated t-value is 5.61 which is greater than the table value at .01 confidence level that is 2.60. Therefore, it can be interpreted that the null hypothesis is rejected, hence there exists a significant difference between the means of two groups. Therefore it can be safely concluded that for male students, C.A.I emerged as a superior teaching strategy then the traditional method of teaching in science at secondary level.

Table 4: Showing the significance of difference between means of female students in post-test achievement scores of experimental and control group

Group	N	Mean	S.D	df	t-value	Level of Significance
Experimental	45	20.8	1.90	88	4.72	0.01
Control	45	18.6	2.48			

For the post-test of both the female groups, the score of total female students of experimental group were compared with that of the total female students of control group.

The Table 3 shows that the calculated t-value is 4.72 which is greater than the table value at .01 confidence level that is 2.60. Therefore, it can be interpreted that the null hypothesis is rejected, hence there exists a significant difference between the means of two groups. Therefore it can be safely concluded that for female students, C.A.I emerged as a superior teaching strategy then the traditional method of teaching in science at secondary level.

Main Findings

- The study shows that CAI is more effective than traditional method of teaching for secondary students, in terms of their academic achievement in science.
- The study shows that CAI is more effective than traditional method of teaching for secondary male students, in terms of their academic achievement in science.
- The study shows that CAI is more effective than traditional method of teaching for secondary female students, in terms of their academic achievement in science.

CONCLUSION

The computer assisted instruction is more effective than the traditional teaching approach in terms of achievement score in science. Scientific discoveries of technological advancement have changed the pattern of life of all human beings. Education is also forced to make a note of technology for improving the quality of a pace of activity as well as productivity in the teaching learning process. with communication technology resounding in the environment, the sound made by the teacher are no longer insulted. Computer is supposed to be the most powerful medium of communication which has revolutionized the teaching learning process in many ways. CAI packages designed specifically for class room teaching, were used in the study to create an interest on the ground which can't normally be dealt with success in the classroom teaching by a teacher.

CAI packages were employed in the present study variously to inform, to instruct, to entertain and to motivate the students for better understanding and longer retention of the knowledge. The CAI programmes are not to supplant the teacher from classroom but to enhance the learning the teacher provides.CAI used in schools helps to provide up-to-date knowledge of content. It is not a neglected a role of teacher but to assist the teacher to provide more authentic and comprehensive knowledge of content among the students more confidently. As we all know the well said proverbs- "Seeing is believing" and "A picture is worth a thousand words."

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