

# Effectiveness of teaching mathematics through computer assisted instruction and traditional method at higher secondary level in Murshidabad

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**Abstract:** The rapid developments in the instructional technology are Programmed Instruction (PI), Computer Based Instruction (CBI), Computer Based Learning (CBL), Modular Approach, Web Based Learning (WBL) and Computer Assisted Instruction (CAI). These can be used to take care of the individual differences. All of these methods can be adjusted to the individual's pace of learning and useful for imparting individualized instructions. Among these self-learning methods, Computer Assisted Instruction (CAI) has influenced the teachers to use it for teaching. Now days, CAI is being used for providing instructions to the students at different levels to update their knowledge. The objectives are to compare the learning effects of two groups of learners studying the same Mathematics curriculum. One group is taught through traditional method and the other group is taught using CAI format instruction. To develop computer assisted instructional package on the topic complex number of Mathematics curriculum. To compare the mean scores related to the achievement of the control group and experimental group in their pre test. To study whether there is significant difference in the scores related to the achievement of pre test and post test of the control group. To find out whether there is significant difference in the scores related to the achievement of pre test and post test of the experimental group. To compare the scores related to the achievement obtained by the control group and experimental group in their post test.

**Keywords:** computer assisted instruction, traditional method, mathematics teaching, experimental group, control group.

## INTRODUCTION

The main aim of education is to preserve, transmit and advance knowledge. In the past, this aim was achieved with the help of teachers, books and some audio visual aids. However, a number of problems were encountered in the promotion of education. These include problems of large classes, heterogeneous classes with individual differences, lack of textbooks and source materials etc. Moreover, due to information explosion the objectives of Education have become multidimensional. It is difficult to achieve those objectives by using lecture method only. There is a need of some flexible methods of teaching. The solution of these problems can only be tackled by the use of technology in the education system.

The rapid developments in the instructional technology are Programmed Instruction (PI), Computer Based Instruction (CBI), Computer Based Learning (CBL), Modular Approach, Web Based Learning (WBL) and Computer Assisted Instruction (CAI). These can be used to take care of the individual differences. All of these methods can be adjusted to the individual's pace of learning and useful for imparting individualized instructions. Among these self-learning methods, Computer Assisted Instruction (CAI) has influenced the teachers to use it for teaching. Now days, CAI is being used for providing instructions to the students at different levels to update their knowledge. CAI is one of the most useful methods of providing individualized and self-paced instructions to the learners in classroom situations. It covers a wider range of individual differences. It is used for presenting the instructional material automatically to the learners.

In recent years, a number of factors have prompted change in the teaching of mathematics, particularly at upper secondary and undergraduate levels. Changes have been made in the development of courses and curricula and in the teaching methods. Advancing technology has opened many doors in mathematics education. The use of computer-based teaching in mathematics provides number of alternatives to students such as visualization of abstract concepts that will foster student understanding. These alternatives would be complementary to traditional teaching. Computer assisted instructional materials are more effective in developing favourable attitude, and in capturing interest towards learning mathematics. The computer simulations prepared to be used in teaching activities are able to create a teaching atmosphere like laboratories where students are active. A variety of visual representations of mathematics concepts in the computer simulations make concepts visible that are otherwise invisible to students.

## BACKGROUND OF THE STUDY:

Computer Assisted Instruction (CAI) has been proving an effective medium of education in the advanced countries for formal and non-formal education at all the levels. The use of computers in the classroom has boomed since the 1980s but studies within the past 15-20 years have focused on the relationship between CAI and academic achievement in many different subject areas. Number of studies has been carried out to find the effectiveness of CAI at different levels. Tambade and GobjiWagh (2011), Meltzer & Manivannan (2002), Azar & Sengulec (2011), Perkins et al. (2006), Finkesteinet. et al. (2005) carried out the studies to find out the effectiveness of CAI in

teaching learning of Physics at different levels. They found a good increase in scores of the learners by using CAI. It was found that secondary students exposed to CAI showed higher academic achievement than the students exposed to traditional instructions did.

## EMERGENCE OF THE PROBLEM

Drastic development in Information and Communication Technology change the methodology of teaching and learning process of Mathematics. Knowledge using CAI is an important segment of Mathematics learning. At present situation students are less interest about mathematics subject. They are engaging themselves in computer games, social networking sites, detached from their daily life activity. In a new situation they don't know how to behave, how to act, how to perform, how to express their feelings, actually they are not aware about what they are doing. In this context the study will find out the Effectiveness of teaching Mathematics through computer assisted instruction and traditional method at higher secondary level.

## REVIEW OF RELATED LITERATURE:

Tambade and GobjiWagh (2011) studied on the effectiveness of CAI in physics at undergraduate level and found that students had acquired a good general

understanding in the area of verbal, vector and diagrammatic representation of the abstract physics concepts.

Kausar, Choudhry and Gujjar (2008) have done a comparative study to evaluate the

effectiveness of CAI versus Classroom lecture for computer science at ICS level and found that total gain in cognitive domain by CAI was significantly superior to the total gain in cognitive domain by CRL teaching method.

Ramani and Patadia (2012) studied the effectiveness CAI in teaching Arithmetic. They found

that CAI with simultaneous discussion is more effective than traditional method.

Mahmood (2004) conducted a study on CAI and traditional method of instruction. This study

examined the effect of computer-assisted instruction on student achievement in general science as compared to traditional method of instruction. The result revealed that the experimental group outperformed the control group in all achievement areas i.e. overall, by levels of cognitive domain and by type of content. Students like the CA program and benefited from it. They found it better mode of instruction than the traditional method.

Mintz (2000) and Campbell (2000), as quoted by Mahmood (2004), compared computerized

and traditional instruction in the area of elementary Mathematics and elementary reading. It was found that there was significant difference in critical thinking skills between students who received CAI and students that did not.

Azar & Sengulec (2011) reflected the effectiveness of Computer assisted instructional

materials in developing favorable attitude, and in capturing interest towards learning physics. The activities that aid student the visualization of abstract concepts will foster their conceptual understanding.

## STATEMENT OF THE PROBLEM:

Some research was done on the teachers' involvement to teach teaching mathematics skill development using CAI. Few researches had been done on teaching mathematics skill development at primary and secondary level of students. No research found on attitude towards effectiveness of teaching mathematics through computer assisted instruction and traditional method at higher secondary level especially at Murshidabad district. So, in this respect their effectiveness of teaching mathematics is an important task for understanding their performance in near future.

So the problem is stated as to measure the- **Effectiveness of teaching mathematics through computer assisted instruction and traditional method at higher secondary level**

## OBJECTIVES OF THE STUDY:

The objectives are to compare the learning effects of two groups of learners studying the same Mathematics curriculum. One group is taught through traditional method and the other group is taught using CAI format instruction. The objectives are

1. To develop computer assisted instructional package on the topic complex number of Mathematics curriculum.
2. To compare the mean scores related to the achievement of the control group and experimental group in their pre test.

3. To study whether there is significant difference in the scores related to the achievement of pre test and post test of the control group.
4. To find out whether there is significant difference in the scores related to the achievement of pre test and post test of the experimental group.
5. To compare the scores related to the achievement obtained by the control group and experimental group in their post test

#### **HYPOTHESIS OF THE STUDY:**

Depending on the objectives of the study, the following hypotheses are formulated below:

$H_{01}$  : There is no significant difference between the mean scores related to achievement of experimental and control group in the pre test.

$H_{02}$  : There exist no significant difference between the mean scores related to achievement of pre test and post test of the control group.

$H_{03}$  : There is no significant difference between the pre test and post test gain scores of achievement of the experimental group.

$H_{04}$  : There is no significant difference between the post test scores of achievement of control group and experimental group.

#### **SIGNIFICANCE OF THE STUDY:**

In a Modern world, where our synthesized voice tells us when to turn to get from one point to another point, a question arises now days. Do student really need to learn how to acquire knowledge in teaching mathematics using CAI? The answer is yes. Because,

- (i) We have many skills inherently; some of them became obsolete in the digital age.
- (ii) CAI with Discussion: The learners will learn arithmetic unit with the help of CAI along with the simultaneous discussion led by the investigator with students where ever and whenever needed.
- (iii) Reaction of Students: The belief of the students of experimental groups regarding the learning mode of arithmetic unit.

So, in this context to measure the Effectiveness of teaching mathematics through computer assisted instruction and traditional method and their achievement is important. Because after the school level they are enter into a broad world where they need to develop some skills on the basis of prior knowledge for their better future.

#### **DELIMITATION OF THE STUDY:**

1. This study has not examined alternatives of CAI such as internet or distance learning.
2. Computer use is limited to the presentation of curriculum only.
3. The higher secondary schools under W.B.C.H.S.E. are selected for the research work.
4. The subjects of the study are limited to higher secondary level Mathematics only.
5. The sample include girls and boys as study subjects; average age of 17-18 years, of different ethnic backgrounds from 10 different higher secondary schools.
6. Learners use Bengali/English as an instructional medium

#### **OPERATIONAL DIFINATION OF IMPORTANT TERMS IN THE STUDY:**

**Teaching Mathematics:** In contemporary education, **mathematics education** is the practice of teaching and mathematics, along with the associated scholarly research. Researchers in mathematics education are primarily concerned with the tools, methods and approaches that facilitate practice or the study of practice; however, mathematics education research known on the continent of Europe as the didactics of pedagogy of mathematics, has developed into an extensive field of study, with its own concepts, theories, methods, national and international organisations, conferences and literature. This article describes some of the history, influences and recent controversies.

**CAI:** A self-learning technique, usually offline/online, involving interaction of the student with programmed instructional materials. Computer-assisted instruction (CAI) is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. CAI uses a combination of text, graphics, sound and video in enhancing the learning process. The computer has many purposes in the classroom, and it can be utilized to help a student in all areas of the curriculum. CAI refers to the use of the computer as a tool to facilitate and improve instruction. CAI programs use tutorials, drill and practice, simulation, and problem solving approaches to present topics, and they test the student's understanding.

**Traditional Method:** Traditional Method (or *méthode traditionnelle*) is a wine word associated with the production of Champagne and other bottle-fermented sparkling wines. It is an official, technical term denoting a specific method and process. It is sometimes referred to as the 'Classic Method' (*méthode classique*), while it used to be called the 'Champagne Method.'

#### **METHODOLOGY OF THE STUDY:**

In the context of research, methodology considered as an important field. It describes the various steps of the plan to be adopted in solving a research problem.

#### **DESIGN OF THE STUDY:**

The research is true- experimental in nature because the equivalence of the control and experimental groups are provided by random assignment of subjects to experimental and control treatments. The research design followed by researcher is the Pre-test – Post test Equivalent groups Deign.

#### **POPULATION AND SAMPLE:**

**Population:** The researcher will select the Murshidabad District of West Bengal for area survey. Researcher will select the area because it is easy to access to collect data for the research. The investigator will decide to collect data from Bengali medium school affiliated by W.B.C.H.S.E only. Researcher will also select five urban and five rural schools generally located in Murshidabad District.

**Sample:** The researcher will select the students of class 11<sup>th</sup> standard only who studies Mathematics in Science/Arts stream. The total number of sample will be 300. For the collection of sample he will follow the cluster sampling technique. The sample was divided into two groups namely Experimental and Control group. The experimental group was taught complex number of Mathematics curriculum by computer assisted instruction and the control group was taught the same part by traditional method of teaching. The independent variable is the mode of instruction, and the dependent variable will be the achievement of students as measured by the post test.

#### **SAMPLING PROCEDURE:**

The investigator will collect the data from Bengali medium school affiliated to W.B.C.H.S.E. To select school he will use the simple stratified sampling technique.

#### **TOOLS:**

The investigator constructed an achievement test in Mathematics on the topic of complex number. The achievement test containing 30 multiple choice question (MCQ) type items was constructed and pilot tested. Item analysis was done by measuring the difficulty level and item discrimination index. Difficulty level from 0.5 to 0.7 and discrimination index from 0.35 to 0.50 was considered the appropriate. The reliability was established by the split half method and the reliability coefficient was found to be 0.81, which were, depicted the reliability of the tool. The final form of the scale containing 25 items was used as an achievement test. The same test was used in pre-test as well as in post-test.

#### **DEVELOPMENT OF CAI:**

The contents were taken from the 11<sup>th</sup> standard of state board on Mathematics. The computer assisted instruction materials were developed by dividing the whole content into different tasks, which were presented in the form of Microsoft power point. Question was also there to test the understanding and learning of the students. Appropriate background, colouring and pictures were used to make the instruction more interesting.

#### **DATA COLLECTION PROCEDURE:**

In order to avoid the inter personal and intra personal variation of two different teachers for CAI and Traditional Instruction groups, it is decided to conduct the both classes by a single teacher having a competence to conduct both CAI and traditional instructions side by side on the same dates. The CAI format lessons were installed on the hard disks of the personal computers. A selected room with desks, chairs, paper, clock, and a white board was used for the traditional instruction. The experimental group was exposed to CAI and the control group was instructed by the traditional method of teaching.

**DATA COLLECTION:**

Data Collection At the end of teaching by CAI and by traditional method, a post-test was administered to all the students of both groups. Data were collected from both the groups by giving them a test consisted of 25 items, which will focus the achievement of students.

**RESULTS**

The following findings are obtained from the study-

1. The result of present study reveals that both the experimental and control group has nearly the same score in the pre-test.
2. The result of the present study clearly point out the significant increase in the mean scores that has been found in the post-test scores of the experimental group.
3. Significant differences have been found between the control and experimental group on post-test scores.
4. The experimental group, which was taught by CAI, showed better learning.
5. It is evident that the CAI is an effective media of instruction of teaching physics than traditional method at higher secondary level.

**DISCUSSION**

Statistical techniques serve the fundamental purpose of the description and inferential analysis. Collected data are analyzed in terms of mean scores and standard deviation. To find the significance of the difference between pre and post-test scores t-test was applied. The results obtained in the experiment were tabulated and have been presented in the form of table and discussed below.

**Table 1: Experimental and control group in the pre-test**

Group	N	Mean	S.D.	t-value	Remark
Experimental	30	12.12	1.73	1.43	Not significant
Control	30	12.82	2.05		

The above table reveals that the mean achievement score in the pre test are 12.12 and 12.82 for experimental and control group respectively. The 't' value is 1.43, which is not significant at 0.05 level. Hence it can be concluded that there is no significant difference between experimental and control group in the pre-test achievement. Both the group has nearly the same score in the pre-test. Hence, the first null hypothesis has been accepted.

**Table 2: Control group in the pre and post-test**

Group	N	Mean	S.D.	t-value	Remark
Pre-test	30	12.82	2.05	0.66	Not significant
Post-test	30	12.58	2.58		

The above table shows that the mean scores obtained by control group in pre and post test are 12.82 and 12.58 respectively. The t-value is calculated as 0.66, which is not significant at 0.05 level of significance. Control group has showed no significant change in their achievement scores in pre and post-test. Hence, the second hypothesis is accepted.

**Table 3: Experimental group in the pre and post-test**

Group	N	Mean	S.D.	t-value	Remark
Pre-test	30	12.12	1.73	19.14	Significant at 0.05 level
Post-test	30	18.36	2.61		

The above table shows that the mean scores obtained by experimental group in pre and post-test are 12.12 and 18.36 respectively. The t-value is 19.14, which is statistically significant at 0.05 level of significance. Hence, it can be safely concluded that experimental group has achieved significantly higher score in the post-test. This evidently shows the positive impact of CAI on achievement of students. Hence, the third null hypothesis is rejected.

**Table 4: Experimental and control group in the post-test**

Group	N	Mean	S.D.	t-value	Remark
Experimental	30	18.36	2.61	12.87	Significant at 0.05 level
Control	30	12.58	2.58		

The table shows the mean scores of the experimental and control group are 18.36 and 12.58 respectively in the post test. The t-value is 12.87, which is significant at 0.05 levels. Hence it is interpreted that the experimental and control group differ significantly in the post test and the difference is in favour of experimental group. Conclusion is evident that the students who are taught by the computer-assisted instruction learned more and so higher achievement is obtained than the traditional method of teaching. This is due to the favourable impact of CAI on achievement of the students. Hence, the fourth null hypothesis of the study is rejected.

## CONCLUSION

This paper has specially emphasized on computer literacy. The entry of computers in the classroom has changed the entire scenario. The computer is now regarded as the super teaching machine. Its use in education has been tried as an innovation and it has proved its teaching efficiency in different subject areas. The present study has established that CAI significantly improves the performance and learning achievements of students in physics. In present time, the computer education has been introduced at the school level. The teacher should use computer as a media of instruction in classroom. CAI can be arranged to be presented in large classroom as it provides maximum amount variety and flexibility by maintaining the quality and quantity of education.

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