Efficacy Of Computer-Assisted Instruction (CAI) In Teaching Social Science To Upper Primary Students

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Abstract:
Academics face many obstacles in the 21st century. There is overwhelming pressure on today's educators to use cutting-edge methods of instruction to elevate and mould their students' intellectual abilities. The study aimed to determine the efficacy of Computer-Assisted Instruction (CAI) on students' conceptual understanding of Social Science of upper primary students. The study's objectives are to develop lesson plans with Computer-Assisted Instruction packages and determine the effect of CAI on students' conceptual understanding. The study utilised the experimental method. The study involved 50 sample students. The test of difference between the pre-test and post-test scores was determined. The study concluded a significant difference in conceptual understanding scores among the experimental and control groups, where instruction was given with CAI and without CAI.

Keywords:- Computer-Assisted Instruction (CAI), Conventional Method of Teaching (CMT), Academic Achievement, Social Science.

1. Introduction:

Regarding a country's economic and social progress, education is the weapon that works best. Second, it's true that education is crucial to a person's personal development and progress. The teacher employs various teaching methods and approaches to foster student learning. The instructor encounters a wide range of students with varying aptitude levels for grasping the material in the classroom. When dealing with pupils that are so diverse from one another, it can be a formidable obstacle for any educator. Students with unique needs are met in classrooms around the world through a variety of creative pedagogical approaches. Within this framework, numerous novel pedagogical strategies have been tested in various contexts to impart knowledge of various subjects. Commonly referred to as "Instructional Technology," this subfield of educational technology focuses on cutting-edge methods of instruction. Instructional technology was significantly advanced in 1955 by B. F. Sinner, Robert Glaser, and others. A novel PI system, Mathetics, was created by T. F. Gulbert in 1962. By proposing the concept of Computer-Assisted Instruction (CAI) in 1965, Lawrence Stolurow sparked a revolution in Programmed Instruction. The Personalised System of Instruction (PSI) was created by Fred S. Keller and colleagues in 1963. The Systematic Approach to Instruction (SAI), proposed by Popham and Baker in 1970, was yet another innovative teaching method.

Bloom (1971) put forth a similar approach in the form of Bloom's Mastery Learning Strategy (BMLS). A great deal of research has been conducted all around the globe to determine the efficacy of these new methods of instruction. The best curriculum and perfect syllabus are useless without appropriate teaching methods (Kochar, 1985). Currently, teaching-learning approaches are shifting from teaching to learning, resulting in a student-centred approach (Aggarwal, 2013). The goal is to improve the instruction system to maximise its efficacy continuously. Computer-assisted instruction is one of the newer methods of teaching-learning that has emerged in recent decades. According to Barnett et al. (2004), these methods are slowly making their way into classrooms across every level of schooling.

Computer-Assisted Instruction (CAI): Gordon Pask is credited with developing Computerised Aided Instruction (CAI), significantly contributing to its advancement in 1953. According to Collins, Deck, and McCrickard (2008), the origins of Computer-Assisted Instruction (CAI) in the United States can be traced back to a partnership between Stanford University and IBM in the mid-1950s. However, significant advancements and widespread adoption of CAI occurred mainly during the 1980s, coinciding with the increasing use of personal computers. The University of Illinois developed the Programmed Logic for Automated Teaching Operations (PLATO) in about 1961, marking a significant early endeavour in Computer-Assisted Instruction (CA). In 1966, Patrick Suppes of Stanford University significantly contributed to Computer-Assisted Instruction (CAI) by developing computerised tutorials in arithmetic and reading specifically designed for elementary school students. This breakthrough marked a pivotal moment in the advancement of CAI.

Computer-Assisted Instruction (CAI) is an emerging educational paradigm combining contemporary technology and pedagogical approaches to augment learning. Computer-Assisted Instruction (CAI) has emerged as a widely adopted instructional approach in contemporary society, owing to its seamless integration of technology with pedagogy. This integration facilitates a synergistic learning experience for students, enabling them to progress at their own individualised pace. Furthermore, CAI allows students to conveniently access Instruction al materials through various devices, including computers, mobile phones, and tablets. The progress and availability of technology have led to the emergence of many tools, methodologies, and contemporary instructional approaches, such as modular and computer-aided instruction. These resources enable educators to creatively and efficiently build learning materials. Computer-Assisted Instruction (CAI) is a pedagogical approach that offers the convenience of classroom instruction while providing customised learning opportunities.

This method lets students acquire study materials quickly, promoting a more personalised educational experience. According to Chhabra and Dharmija (2013), Computer-Assisted Instruction (CAI) is a widely used educational approach in industrialised nations employed by educators across various levels of education. The efficacy of Computer-Assisted Instruction (CAI) in the field of education has been examined in prior research conducted by Lone & Singh et al. (2021), Khan (2019), Dickson (2018), and Pillai & Sharma (2018). These studies have found that CAI is a more effective tool for enhancing student achievement across various disciplines and levels of schooling.

2. Review of Related Literature:

A few studies on the efficacy of Computer-Assisted Instruction in the Indian context are given below:

Jeymani (1991) examined the effectiveness of Computer-Assisted Instruction with a Simulation Model in teaching eleventh-graders physics. This study aimed to compare Computer-Assisted Instruction to traditional teaching techniques. Experimental students performed much better than control pupils. Academic performance results were not statistically different between Tamil and English medium schools or between boys and girls.

Khirwadkar (1998) compared a Computer-Assisted Instruction package to traditional chemistry instruction for ninth-graders. Thus, the researcher created a three-chapter Computer-Assisted Instruction software programme. According to the study, experimental students scored much higher than control students.

Kaousar et al. (2008) tested Computer-Assisted Instruction against classroom lectures. The study used pre-and post-tests. Computer-assisted instruction (CAI) improves students' application and evaluation skills more than lecture-based training. Patel (2008) tested the impact of Computer Assisted Instruction (CAI) on male and female students' academic performance compared to traditional teaching approaches. The survey found no statistically significant gender gap in academic attainment.

Khan (2010) conducted experimental research to compare Computer-Assisted Instruction to the lecture method. The research examined Aligarh, India, class nine secondary school pupils. The research showed that Computer-Assisted Instruction was more effective than traditional instruction.

Vasanthi and Hema (2003) compared Computer-Assisted Instruction versus lecture in chemistry instruction. The experimental and control groups had significantly different average scores. There was little difference in post-test outcomes between experimental and control groups.

Ramani and Patadia (2012) compared Computer-Assisted Instruction (CAI) to traditional mathematics instruction. Math's abstract nature makes learning difficult for pupils. The researchers tested combining lectures with Computer-Assisted Instruction (CAI) to improve student performance. The study found that students used this tactic better than the standard one.

Chhabra and Dhamija (2013) compared Computer-Assisted Instruction to traditional teaching techniques for B.Ed. Student teachers. The research examined teaching English language approaches. No statistically significant difference was found between groups in the pre-test. The post-test showed that Computer-Assisted Instruction was more successful than traditional instruction.

Dange (2013) compared Computer-Assisted Instruction to traditional science instruction for ninth-graders. A sixty-person sample was obtained from the experimental and control groups of thirty each. The study found that Computer-Assisted Instruction (CAI) works better. However, gender, geography, and socio-economic status did not significantly affect Computer Assisted Instruction study habits.

Parmar (2013) used a pre-test and post-test experimental design to compare Computer Assisted Instruction Material to lecture for ninth-grade chemistry. Students in the experimental group who got Computer-Assisted Instruction performed far better than those in the lecture group.

Nazimuddin (2015) compared Computer-Assisted Instruction to lectures in education. Computer Assisted Instruction (CAI)'s effects on student learning were the focus of this study. Non-traditional teaching methods improved academic achievement compared to lecture-based methods. The author also suggested using Computer Assisted Instruction. The study summarised the main benefits and few downsides of Computer Assisted Instruction in school.
Ruby and Sivakumar (2015) tested CAI and traditional teaching approaches. They found CAI more successful than traditional methods. Tutorials outperformed simulation, drill, and practice in Computer-Assisted Instruction. The report also recommended educating teachers in user-friendly software development.

Ramar and Jeyabalakrishnan (2015) found that Computer Assisted Instruction (CAI) is more effective than lectures for teaching Physics to higher secondary students from diverse backgrounds, including socially, culturally, and academically disadvantaged students. Statistically significant differences were seen in control and experimental pupils' pre-and post-test scores. The study also found that experimental students performed better on the retention exam than control students.
Banik and Biswas (2017) used an experimental methodology to examine how computers aid classroom education. This study examined how Computer-Assisted Instruction (CAI) compares to traditional higher-secondary physics Instruction. Post-test findings showed that Computer-Assisted Instruction students scored higher than traditional pupils.

Pillai and Sharma (2018) examined how Computer-Assisted Instruction affects high school English language students' academic performance. The findings showed statistical significance in favour of Computer-Assisted Instruction over conventional education.

Lone et al. (2021) tested seventh-graders from Jammu & Kashmir's SMIE Institute of Education (Vessu). The research showed that Computer-Assisted Instruction pupils performed far better academically than Traditional Instruction students. This present study aims to compare the efficacy of Computer-Assisted Instruction (CAI) with that of more conventional methods of teaching Social Science with special reference to two chapters of History of Class VIII to students in upper-primary schools.

3. Objectives of the study:
The researcher formulated the following objectives:
i) To study the efficacy of Computer-Assisted Instruction (CAI) on upper-primary students' immediate performance in Social Science.
ii) To study the efficacy of Computer-Assisted Instruction (CAI) and Conventional Method of Teaching (CMT) on upper-primary students' immediate performance in Social Science.
iii) To study the efficacy of Computer-Assisted Instruction (CAI) and Conventional Method of Teaching (CMT) on upper-primary students' two-week delayed performance in Social Science.

4. Hypotheses of the study:
The following hypotheses were formulated by the researcher keeping in view the nature of the objectives of the study:
$H_0 1$: There will be no significant difference in the Pre-Test achievement score between the students following the Computer-Assisted Instruction (CAI) and the Conventional Method of Teaching (CMT) in Social Science at the upper-primary level.
$H_0 2$: There will be no significant difference in the Post-Test immediate achievement score between the students following the Computer-Assisted Instruction (CAI) and the Conventional Method of Teaching (CMT) in Social Science at the upper-primary level.
$H_0 3$: There will be no significant difference in the two weeks delayed achievement score between the students following the Computer-Assisted Instruction (CAI) and the Conventional Method of Teaching (CMT) in Social Science at the upper-primary level.

5. Method and Material:
Computer technology has recently been used to teach upper-primary students social science. Research shows that Computer-Assisted Instruction (CAI) may improve learning for children of all ages and in many curriculum areas, but it is restricted to social science idea development. Some academics believe Computer-Assisted Instruction (CAI) may improve social science concepts. Does Computer-Assisted Instruction (CAI) of social science help these students, or does the Conventional Method of Teaching (CMT) work better?

Research Design: The research is true-experimental in nature because the random assignment of subjects to experimental and control treatments provides the equivalence of the control and experimental groups. The experimental groups were instructed with Computer-Assisted Instruction (CAI), and the control group was instructed with the conventional method of teaching (CTM). The design is illustrated graphically below:

$$CG \rightarrow O_1 \rightarrow CMT \rightarrow O_2 \rightarrow O_3$$
$$EG \rightarrow O_1 \rightarrow CAI \rightarrow O_2 \rightarrow O_3$$

where,

     CG = Control Group,   EG = Experimental Group

     O_1 = Pre-Test, O_2 = Post-Test, O_3 = Delayed-Test

     CMT = Conventional Method of Teaching,   CAM = Concept Attainment Model

Population:

The population for this study consists of all elementary school students registered in the Unakoti District of Tripura. They are Government and Private schools with the same academic calendar and curriculum enrolled in the school year 2021-22.

Sample and Sampling Technique:

The schools for the experiment were selected based on feasibility and willingness to cooperate on the part of the school authorities. Thus, purposive sampling was employed to choose the schools for experimental and control groups. The control and experimental groups comprised 25 students from two sections of Class VIII of Tilabazar HS School, Kailashahar, Unakoti, Tripura.

Table 1: The Study Sample

Sl. No.	Name of School	Groups	No. of samples taken
1	Tilabazar HS School	Experimental Group	25
2	Tilabazar HS School	Control Group	25
Total			50

Tools Used:

- Lesson Plans prepared by the researcher on CAI were used.
- The Achievement Test developed by the researcher was employed for collecting data for both Pre-tests, Post-Tests and Delayed Tests.

Experiment Description: The researcher followed these procedures for the experimental study:

- **Step 1**: In the first stage of the investigation, the Achievement Test was used to obtain Pre-Test Scores from both groups. These ratings showed participants' knowledge and attitudes about sample students' Class VIII in the selected Social Science chapters.
- **Step 2**: Implementing Lesson Plan: The Experimental Group received ten nos. of CAI-based lesson plans one by one. The Conventional Method of Teaching (CMT) was delivered in the Control Group.
- **Step 3**: Post-Test Score: After lesson plans were presented, the Achievement Test was given to the Experimental and Control Groups to determine the Post-Test Score.
- **Step 4**: Delayed Performance Score: Researchers allow a 2-week interval between the instant execution of experimental and control group pupils. The 2-week Delayed performance will be calculated by re-administering the Achievement Test to three groups of students after two weeks. The score was a 'Delayed Score'.

Delimitations: The experimental study has the following delimitations:

- The study is delimited in the Unakoti district of Tripura.
- The study is also delimited to class VIII students.
- The study is also delimited to schools affiliated with the Bengali medium SCERT syllabus.

6. Results and Discussion:

The samples were compared by testing the significance of the difference between the mean pre-test scores of experimental and control groups using t-tests. The results are presented in the following tables:

Analysis of Hypothesis-1

H_o1: There will be no significant difference in the Pre-Test achievement score between the students following the Computer-Assisted Instruction (CAI) and the Conventional Method of Teaching (CMT) in Social Science at the upper-primary level.

Table 2: Showing t-value of mean pre-test scores of CMT and CAI groups

Groups	N	Mean	SD	t-value	Level of significance
CAI Group	25	20.40	6.009	0.363	Not significant at 0.05 level of significance
CMT Group	25	19.82	5.262		

Table 2 reveals that the mean pre-test scores of the CMT and CAI groups are 19.82 and 20.40, and their SDs are 5.262 and 6.009, respectively. When the t-test was applied to compare the mean pre-test scores of both groups, the t-value was found to be 0.363, which is non-significant at a 0.05 level of significance. This shows no significant difference exists between the mean pre-test scores of the control and experimental groups. Hence, the null hypothesis, **H₀1,** is accepted.

Analysis of Hypothesis-2
H₀2: There will be no significant difference in the Post-Test immediate achievement score between the students following the Computer-Assisted Instruction (CAI) and the Conventional Method of Teaching (CMT) in Social Science at the upper-primary level.

Table 3: Showing the t-value of mean post-test scores of CMT and CAI groups

Groups	N	Mean	SD	t-value	Level of significance
CAI Group	25	37.16	6.96	4.66	Significant at 0.05 level of significance
CMT Group	25	29.64	4.07		

Table- 3 reveals that the mean post-test scores of the CMT and CAI groups are 29.64 and 37.16, and their respective SDs are 4.07 and 6.96. When the t-test was applied to compare the mean post-test scores of both groups, the t-value was found to be 4.66, which is significant at the .05 level of significance, favouring the Computer-Assisted Instruction (CAI). It can, thus, be inferred that the experimental group is more encouraged and enthusiastic in learning, applying and correlating the concepts simultaneously, resulting in their better achievement who were taught with Computer-Assisted Instruction (CAI). This result aligns with prior research conducted by Lone & Singh et al. (2021), Khan (2019), Dickson (2018), and Pillai & Sharma (2018). Hence, the null hypothesis, **H₀2,** is rejected and may be reframed as there is a significant difference in achievement in the mean post-test scores of CAI and CMT groups of upper-primary school students in social science teaching.

Analysis of Hypothesis-3:
H₀3: There will be no significant difference in the two weeks delayed achievement score between the students following the Computer-Assisted Instruction (CAI) and the Conventional Method of Teaching (CMT) in Social Science at the upper-primary level.

Table 4: Showing t-value of mean delayed-test scores of CMT and CAI groups

Groups	N	Mean	SD	t-value	Level of significance
CAI Group	25	33.04	4.95	2.27	Significant at 0.05 level of significance
CMT Group	25	30.24	3.68		

Table- 4 reveals that the mean delayed-test scores of the CMT and CAI groups are 30.24 and 33.04, and their respective SDs are 3.68 and 4.95. When the t-test was applied to compare the mean post-test scores of both groups, the t-value was found to be 2.27, which is significant at the 0.05 level of significance, favouring the Computer-Assisted Instruction (CAI). Hence, the null hypothesis, **H₀3**, is rejected.

Findings of the study:
- No significant difference is found in achievement in the mean pre-test scores of upper-primary students taught with Computer-Assisted Instruction (CAI) and the Conventional Method of Teaching (CMT) in social science.
- A significant difference is found in achievement in the mean post-test scores of upper-primary students taught with Computer-Assisted Instruction (CAI) and the Conventional Method of Teaching (CMT) in social science. The upper-primary students taught with Computer-Assisted Instruction (CAI) outperformed those taught to upper-primary students with the Conventional Method of Teaching (CMT) in social science.
- A significant difference is found in achievement in the mean delayed-test scores of upper-primary students taught with Computer-Assisted Instruction (CAI) and the Conventional Method of Teaching (CMT) in social science. The upper-primary students taught social science with Computer-Assisted Instruction (CAI) showed more retention of lessons in delayed performance than those taught with the Conventional Method of Teaching (CMT).

Conclusion:
The NPE-1986, PoA-1992, and NEP-2020 all envision fundamental reforms in the school system. Modern teaching methods are needed to achieve educational paradigm changes. In this study, the researcher investigated the efficiency of Computer Assisted Instruction in upper-primary Social Science teaching and learning in Tripura. Finally, Computer-Assisted Instruction (CAI) improved upper-primary students' academic performance in social science, especially in History, immediately after the teaching-learning process compared to the Conventional Method of Teaching. Second, Tripura's upper-primary social science performance had been benefited by CAI on the two-week delayed performance.

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