IMPACT OF COMPUTER-ASSISTED LEARNING ON HIGHER SECONDARY STUDENTS' PERFORMANCE IN SCIENCE

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Abstract

Education is the culmination of all processes that enable someone to acquire skills and other behaviours that are beneficial to the society in which they live. The methodical process of assessing how well the general population has learned can be summed up as education. The arrangement of the living state depends heavily on the work, which is one thing that can be realised through education. The four components of a proper education are virtue, wisdom, breeding, and learning. The core of Locke's educational theory—providing high-quality education to an intolerably large portion of the population—can be found in this phrase.

***Keywords**: Education Technology, Achievement, Higher Secondary Students, Computer Assisted Learning.*

Introduction

Using both human and non-human resources, educational technology is the process of harnessing all of the information currently accessible regarding human learning and communication. The methodical and scientific process of creating tools and approaches for improving the teaching and learning process is known as educational technology.

Both the "population explosion" and the "explosion of information" aim to alter the web of life. They refer to the dissemination of a significant amount of knowledge to a sizable population, which in turn creates the spiralling issue of opening more schools and hiring more teachers.

There are several fronts where quick, planned, and coordinated action must be made in order to modernise and improve the quality of education in general and science education in particular. The two most important aspects of teaching are being able to work with each student individually and recognising differences. Teachers that are aware of their students' unique learning preferences continuously work to introduce ideas through a variety of techniques.

The use of computer-assisted training is becoming more and more of a potent teaching and learning tool. There haven't been many studies on computer assisted instruction in India. It also focuses primarily on the application of CAI as a substitute for traditional teaching methods. The effectiveness of CAI as a supporting system for teaching physics at the higher secondary school level is now being examined.

Methodology

Research Questions

To learn the answers to the following questions, an investigation was conducted.

1. What is the degree of achievement for the XI Standard students in the Physics Electricity Unit?
2. How effective was the Programmed Learning Method and Evaluation in teaching the Physics Unit on Electricity?

Objectives of the Study

1. To examine how the Programmed Learning Method's Electricity Unit affects the teaching of Physics at the secondary level.
2. To determine the level of achievement of Standard XI students in the Physics Electricity Unit
3. To create a programmed learning method module for the upper primary level physics class Electricity Unit.

Hypotheses

1. The mean achievement scores for the Physics Electricity Unit on the pre-test will not significantly differ between the experimental and control groups.
2. For the control group, there will be no discernible variation in the mean achievement scores for the Physics Electricity Unit between the pre-test and post-test.
3. For the experimental group, there will be no discernible variation in the mean scores for the Physics Achievement in the Electricity Unit between the pre-test and post-test.
4. The mean achievement scores in the physics achievement test for the electricity unit will not significantly differ between the experimental and control groups.
5. Experimental groups will close gaps faster than the control group.

Tools Used in the Study

The achievement test questionnaire was created and adopted by the researcher to gather the data for the current study.

Criterion Referenced Test

A test known as a "criterion referenced test" is one that was created with very narrow content requirements to fulfill a small number of very specific objectives. The test's objective is to ascertain the examinee's position in relation to specific educational goals.

- The test item should be created with the assessment of the behaviorally established instructional objectives in mind.
- Each instructional aim should have a minimum of two test items, if possible.

- The investigator should employ objective-type questions wherever possible in the test item style.
- Item analysis should be performed on each test item. The researcher must ensure that the items' internal consistency, reasonable discriminating power, and lack of linguistic ambiguity.
- The researcher should make an effort to prove the test's validity and reliability.

The researcher created a Criterion Referenced Test to measure the impact of learning "Physics" using conventional teaching methods and reinforcement acquired through PIM and CAIM. The test took into account the aforementioned criteria. The CRT's multiple-choice items evaluate cognitive abilities like knowledge, understanding, and application. The investigator prepared the multiple-choice questions in accordance with the advice from Aiken (1998), which is given below:

Taking into account the aforementioned recommendations, the CRT's initial draught, which consists of 100 multiple-choice questions drawn from each learning module, is created. Expert review and a pilot study are applied to this draught CRT in order to validate the items using item analysis.

Pilot Study

Thirty students in grade XI participated in a pilot research. It was intended to validate the things built using the CAI, computer-aided materials, and draught CRT software. The CRT, Computer Assisted Materials, and CAI software packages were adjusted based on the results of the pilot study by eliminating some items and recasting and rewording several statements and items in the item as well as in the instructional materials. In order to validate CRT, the investigator additionally used the following process.

Data Analysis and Interpretation

Experimental Group and Pre-Test Performance Control Group

Group	N	Mean	SD	"t" value	Significance
Control	30	25.83	9.83	1.46	NS
Experimental	30	25.50	7.74		

df=98 $t_{(0.05)} = 1.96$ $t_{(0.01)} = 2.58$

The table makes the following details clear.

The calculated "t" value is below the value in the table. At any level, "t" value is not relevant. Consequently, the research premise is disproved, and the null hypothesis is accepted. Neither the experimental group nor the control group significantly differed from one another on the achievement test for the physics Achievement in Electricity Unit.

Hypothesis 2

Research Hypothesis (H_R)

Pre-test and post-test results for the control group in the Physics Achievement in Electricity Unit will differ significantly.

Null Hypothesis (H_O)

In the Achievement in Electricity Unit of Physics, there won't be a discernible difference between pre-test and post-test performance for the control group.

Pre-Test / Post – Test Performance for Control Group

Type	N	Mean	SD	"t" value	Significance
pre	30	25.83	9.83	1.53	NS
Post	30	29.83	10.49		

df= 98 $t_{(0.05)}$ = 1.96 $t_{(0.01)}$ = 2.58

The table shows the following information.

The estimated "t" value is not more than the table value, and it has no bearing on the outcome. As a result, the null hypothesis is accepted and the research hypothesis is rejected. For the control group, there is no discernible variation in performance between the pre-test and post-test.

Hypothesis

Research Hypothesis (H_R)

In the Physics Achievement in Electricity Unit, there will be a considerable discrepancy between the experimental group's pre-test and post-test results.

Null Hypothesis (H_O)

The experimental group's performance on the physics achievement test for the electricity unit will not significantly differ from its performance on the post-test.

Pre-Test / Post – Test Performance for Experimental Group

Type	N	Mean	SD	"t" value	Significance
Pre	30	25.50	7.74	4.73	S
Post	30	36.18	9.66		

df=80 $t_{(0.05)}$ = 1.96 $t_{(0.01)}$ = 2.58

The table shows the following information.

The estimated "t" value exceeds the value in the table; it is significant at the 0.01 level. As a result, the null hypothesis is rejected and the research hypothesis is accepted. The

experimental group's performance differs significantly between the pre-test and post-test periods.

Hypothesis 4

Research Hypothesis (H_R)

Achievement in Physics post-test results between the experimental group and control group will differ significantly.

Null Hypothesis (H_O)

Achievement in Physics post-test results between the experimental group and control group will differ significantly.

Post-Test Performance Control Group and Experimental Group

Group	N	Mean	SD	"t" value	Significance
Control	30	29.83	10.49	2.44	S
Experimental	30	36.18	9.66		

df=78 $t_{(0.05)}$ = 1.96 $t_{(0.01)}$ = 2.58

The table shows the following information.

The estimated "t" value exceeds the table value and is statistically significant at the 0.01 level. As a result, the null hypothesis is rejected and the research hypothesis is accepted. Performance on the post-test was significantly different between the experimental group and the control group.

GAP Closure

Gap closure is the difference between the group's mean score and the top score, often known as the perfect score. The percentage that a group closes the gap to perfection is known as the gap closure score. A variable that may be called the percentage of ignorance gap closed and expressed as a percentage defines the percent gap closed.

Table 4.5 Gap Closure for Control Group and Experimental Group

S.No	Group	Gap Closure
1	Control	16.55
2	Experimental	43.59

The mean of the gap closing in the unit test falls within the range for the control group, as shown by a review of the aforementioned table.

Hypothesis 5

Research Hypothesis (HR)

The experimental group will close the gaps more completely than the control group.

Null Hypothesis (HR)

There won't be a noticeable difference in gap closing between the experimental and control groups (unit wise) The research hypothesis is accepted and the null hypothesis is rejected based on the analysis of the provided data.

Interpretation

This research is experimental and uses an analogous group design for the pretest and posttest. In order to examine the prerequisite knowledge, an entry behaviour test was used to differentiate the control and experimental groups. Since both groups were identical before the test, this indicated that they were identical in nature. Pre-test 't' values for the control and experimental groups consistently show no statistically significant difference between the two groups. This demonstrates their similarity and the lack of any noteworthy advancement in their prerequisite knowledge.

Both the control and experimental groups' pre-test and post-test means differ significantly (at the 0.01 level), with the post-test mean being higher than the pretest mean. This implies that the traditional approach in the control group and PROGRAMMED Learning Method in the experimental group both contributed to an increase in the level of acquisition of the fundamental physics skills.

The post-test results of the experimental group and control group are significantly different. The experimental group's mean score is higher than that of the control group.

Summary

The standard of living in any country is directly or indirectly correlated with the quality of its educational system. Therefore, the educational system needs to undergo a drastic overhaul, especially in terms of teaching methods. Our educational objective should be to produce something that has never been done before and of which the preceding generation could only have dreamed. We must create an educational system devoted to the pursuit of intellectual brilliance if we are to meet the requirements of today and tomorrow. The pressure to reform has been mounting on the schools as the rate of social change quickens. The civil rights movement made public education realise that an intolerably huge portion of the population was not receiving a high-quality education.

Findings

In the pretest, there was no discernible difference between the performance of the control group and experiment group. This demonstrates that the experimental group and control group were matched.

Both the control group and the experimental group performed significantly differently after the test. This is because testing, exposing pupils to test questions, and raising awareness among them are excellent ways to reinforce learning.

The experimental group performed significantly better than the control group during the post-test. This demonstrates the value of computer-assisted instruction.

The experimental group's gap closure was greater than the control group's. This increases the efficiency of planned instruction and learning.

It was clear that the PLM was superior to the conventional technique for teaching the Higher Secondary Physics Electricity Unit.

Limitations of the Study

The following are the study's limitations.

1. Only students in standard XI were included in this investigation.
2. Sample selection is not random.
3. The experimental was only conducted for a short while.

Suggestion for Further Research

1. Various levels may be used to conduct the experiment.
2. The experiment could be carried out to hone other physics-related abilities.
3. Comparative research can be done between slow and fast learners enrolled in various types of schools, as well as between rural and urban, low and high socioeconomic status.
4. Additional training materials for using the programmed learning method may be provided.
5. The teacher may be exposed to PLM development.

Conclusion

Experiments revealed that using computer-assisted education was superior to the conventional approach for efficiently teaching the physics unit on electricity. For the remaining modules, applicable knowledge may have been incorporated into computer-assisted education.

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