

Effectiveness of Computer Assisted Instructional Technology Module (CAITM) in Learning Chemistry at Higher Secondary Level

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ABSTRACT

Modular instruction is one of the methods of individualized instruction. It helps the students to accomplish certain well defined objective through a module which is a self-contained Instructional package. The technology module gives opportunities for learning from animated objects. Multimedia simulations can penetrate more and leave permanent learning in the cognitive domain. The technology module provides self motivation to the learners, so that they can gain better knowledge with the best style of learning. Thus, a proper use of the technology module could stimulate effective learning among learners, the researcher has chosen the topic in order to help the learners to learn chemistry according to their own pace and ability.

Keywords

Individualized Instruction, Technology Module, penetrate, opportunities, animated objects.

INTRODUCTION

The present educational system becomes complex due to lack of individual attention in the classroom. The expansion of education in the form of greater enrolment of learners in school and colleges makes the system more rigid and complex. The best answer to this problem is the application of information and communication which endeavors to remove monotony, but at the same time, enhances motivation and interest among learners.

In the modern educational system, computers are used extensively and their impact on the social, economic, educational and scientific spheres is greatly recognized. The benefits of this type of learning include flexibility of scheduled instruction at locations continent to learners, reduced time, assumed skill development, increased achievement, increased retention continuous report to the learners' progress and accomplishments, good response and feedback. Hence, there is a need for greater application of computer supported devices in the form of course works and modules for the benefit of learners at all levels of education. The investigator used texts, video, audio, animation, virtual environment etc., to make the learning of chemistry

enjoyable. This study attempts in explains students conceptual understanding about chemistry and attitude towards computer in learning chemistry.

REVIEW OF LITERATURE

Kannaiah.N (2012) studied that the effectiveness of CAIM approach on teaching Zoology of the students of standard XI. The sample consisted of 100 students. The treatment given to control and Experimental group. Mean and Standard Deviation of achievement in Zoology was calculated. In this study, observed through experimentation that self learning package was an advantage point over the traditional method in teaching zoology effectively. The students also interested in learning zoology through self learning package.

JigneshJ.parmar (2013) studied the "Effectiveness of Computer Aided Instructional Material (CAIM) on chemistry for Gujarati English Medium Students of Standard XI," The investigator used Purposive sampling method for selecting sample. The effectiveness was measured by taking 55 students as sample using single group pre-test and post-test. After conducting experiment, reactions of students and chemistry teacher were collected using reaction scale. The descriptive statistical technique

like frequency, percentage analysis, mean, standard deviation and t-test was used to analyze the data. The study found that CAIM is effective for learning concept of chemistry and positive reactions are found towards CAIM of students and chemistry teacher.

Yogesh M.Nandurkar, B.B.Bahule (2014). “The Effect of Computer Assisted Instruction Material as Teaching Aid on Chemistry Learning of High School Students.” Two groups of 15 students were set for the study of chemistry. One group was set for lecture method while other was for CAI material method. Pre, post and additional tests are applied to quantify the achievement of students. Pre and post test are planned to know understanding level while additional test was designed to know understanding and application level, of the subject. Statistical analysis of data obtained implies that use of CAI material has more potential than lecture method. In the additional test, use of CAI material has progressive effect but at the same time improvement in the performance of control group noticeable.

Dhamija and Kumari (2016) found out the effect of Computer Assisted Instructional (CAI) and Lecture Method of teaching on the performance of IX class students in Mathematics. The significance of academic achievement scores for experimental group (using CAI) and control group (using lecture method) were examined in this study. A Pre-test - Post-test control group experimental design was used on forty five students of IX class. The results showed that the experimental group was significantly higher than the control group in academic achievement of students in Mathematics. Findings supported that experimental group (CAI) where students performed better than control group (lecture method) in Mathematics.

Qaisersuleman (2017) This paper was aimed to examine the effects of computer-assisted instruction (CAI) on the academic achievement of secondary school students in the subject of physics. A sample of 46 students of Grade-09 was selected randomly from Government High School, Hurrarak. For data collection, pre-test, post-test equivalent group design was used. Experimental group was taught through computer-assisted instruction technique whereas control group was taught through conventional teaching method. On the completion of six weeks’ experimental process, post-test was planned immediately to examine the level of students’ achievement of both groups. Two weeks later, retention test was arranged to examine their retention. Statistical tools such as mean, standard deviation and

independent samples t-test were employed through SPSS for analyzing data. The findings show that computer-assisted instruction has a significant positive effect on students’ academic achievement and retention in Physics. Based on findings, it was recommended that computer assisted instruction technique should be used by the science teachers for stimulating and boosting students’ academic achievement in Physics at secondary level.

COMPUTER ASSISTED INSTRUCTIONAL TECHNOLOGY MODULE (CAITM)

Computer assisted instructional technology module is an appropriate educational tool in the hands of competent teachers who can ensure a better teaching-learning process. The modern Indian classroom is crowded with a heavy amount of syllabi; the pupils are expected to gain knowledge to improve the level of understanding. To develop the interest of pupils, to enrich meaningful development of independent study habit and to create purposeful development of self confidence in learning, an alternative process of teaching has to be adopted.

The investigator found that the students in rural areas find it difficult to learn the fundamentals of chemistry. As a result, they could not score high marks when they complete the higher secondary stage. It is felt that the learners struggle to write chemical equations on their own and balance, because of their poor knowledge of basic chemistry; they cannot attain mastery in chemistry. The traditional methods of teaching chemistry cannot help the students to attain mastery. The computer assisted instructional Technology module is a special unique medium with features of quality audio visual recording and instant feedback. It can be conveniently used to convey well designed information with varying special effects.

NEED AND SIGNIFICANCE OF THE STUDY

An appropriate educational technology in the hands of competent teachers can ensure better teaching and learning process. The classrooms are overcrowded with heavy amount of syllabi and at the same time, the pupils are expected to gain knowledge to improve the level of understanding in order to develop the interests of pupils to enrich meaningful

development of independent study habit and to create purposeful development of self confidence in Learning alternative process of teaching has to be adopted.

The technology module helps to go out of four walls of the classroom. Everything can be viewed by just sitting in a room. Since, it provides animation pictures even the most difficult concepts can be taught easily to the students. It can be used for stimulate better teaching learning environment. The technology module can penetrate more deeply into the development of human cognitive system with an immediate excitement than any other medium. The student can work at his own pace. The present study is designed by taking one unit namely, "Basic concepts of Organic Chemistry" from the 11th standard chemistry textbook of Tamil Nadu State Board syllabus. The reactions and the diagrams given in the book, but the module gives texts, graphics, sound, animation and video to convey information. Module can prove to be useful because it provides meaning for every difficult word in each slide. As a result, the level of achievement of the learner will be also being greater. Hence, the technology module will be interesting and more meaningful for every learner and will bring about purposeful learning.

SCOPE OF THE STUDY

Computer assisted instructional technology module has a wider scope in the instructional process bringing the difficult concepts to validity. The learners will be able to understand the concepts very easily. The present study aims at developing computer assisted instructional technology module for individualized instruction in teaching chemistry at the higher secondary level and the study provides scope for the development of innumerable software, which can suit different categories of learners and subjects since the higher secondary learners are exposed to this type of instruction, it is worthwhile to study their attitude towards the computer supported technology module in order to find out its usefulness to them. It is maintained that any attitudinal change in favor of technology support module would lead to greater application in the teaching-learning process and stable the learners to attain mastery of subject.

OBJECTIVES OF THE STUDY

- To develop the computer assisted instructional technology module (CAITM) in learning chemistry at higher secondary level.
- To find out whether CAITM proves to be effective in learning chemistry at the higher secondary level.

HYPOTHESES

- There exists significant difference between the mean scores of the pre-test and progressive-test I of the control group.
- There exists significant difference between the mean scores of the pre-test and progressive-test I of the experimental group.
- There exists significant difference between the mean scores of the progressive-test I and progressive-test II of the control group.
- There exists significant difference between the mean scores of the progressive-test I and progressive-test II of the experimental group.
- There exists significant difference between the mean scores of the Progressive-test I of the control group and the experimental group.
- There exists significant difference between the mean scores of the progressive-test II of the control group and the experimental group.
- There exists significant difference between the mean scores of the post-test of the control group and the experimental group.
- There exists significant difference between the mean scores of the progressive-test II and post-test scores of the experimental group.
- There exists significant difference between the mean scores of the pre-test and post-test of the experimental group.

SAMPLE AND SAMPLING TECHNIQUE

The investigator chose the XI standard first group students from Alagappa Model Higher Secondary School, Karaikudi for the investigation. There were 80 students in the XI standard first group students (XI A & XI B), out of that the investigator selected 40 students as sample. 20 samples from XI A and 20 samples from XI B have been taken based on their marks obtained in their pre-test. For the selection of the students, Purposive Sampling Technique was adopted.

EXPERIMENTAL DESIGN OF THE STUDY

The investigator has chosen the experimental method for the present study. In this study, pre-test post-test control group design was employed.

EXPERIMENTATION

First step in the experimentation is the administration of a pre-test to both the control and experimental group to assess the entry behavior. The second step is the application of the experimental treatment to the experimental group and traditional approach to the control group. The third step is the administration of Progressive Tests and the final step is the administration of Post-Test to assess the terminal behavior the students of the control and experimental group. The differences due to the application of the experimental treatment are determined by comparing the Pre-Test, Progressive-Test I, Progressive-Test II and Post-Test scores.

RESEARCH TOOL FOR THE STUDY

The investigator used the following tool for the study.

Achievement Tests (pre-test, progressive test-I and progressive Test-II, Post-Test)

This tool was developed by the investigator to find out the effectiveness of the CAITM.

STATISTICAL TECHNIQUES USED

- Mean
- Standard Deviation
- t- test

TESTING OF HYPOTHESES

HYPOTHESIS 1

There exists significant difference between the mean scores of the Pre-test and Progressive-test-I of the control group.

Table 1: Comparison of the mean scores of the pre-test and progressive-test-I of the control group

S.No	TEST	N	Mean	SD	t-value	Level of significance
1	Pre-Test	20	18.55	3.36	8.396	Significant at 0.05 level
2	Progressive – Test- I	20	23.20	2.93		

The above table shows that the mean scores of the control group in Pre-test is 18.55 and the progressive-test-I is 23.2 for N=20. It is understood that the mean score of progressive-test-I is greater than the pre-test of the control group. Also, the obtained t-value 8.396 is greater than the table value 1.96 and is significant at 0.05 level. Thus, the hypothesis of the study is verified and showing that the control group has improved achievement in learning chemistry.

HYPOTHESIS 2

There exists significant difference between the mean scores of the Pre-test and Progressive-test-I of the experimental group.

Table 2: Comparison of the mean scores of the pre-test and progressive-test-I of the experimental group

S.No	TEST	N	Mean	SD	t-value	Level of significance
1	Pre – Test	20	18.55	23.36	10.798	Significant at 0.05 level
2	Progressive-Test I	20	26.3	2.69		

The above table reveals that the mean score of the pre-test is 18.55 and the progressive-test I is 26.3 of the experimental group for N=20. This shows that the mean score of the experimental group in progressive-test I is greater than the mean score of the Pre-test. Also the obtained t-value 10.798 is greater than the table value 1.96 and is significant at 0.05level. This shows that there is a positive impact in learning chemistry through CAITM.

HYPOTHESIS 3

There exists significant difference between the mean scores of progressive-test I and Progressive-Test II of the control group.

Table 3: Comparison of the mean scores of the progressive-test I and progressive – test II of the control group

S.No	TEST	N	Mean	SD	t-value	Level of significance
1	Progressive-Test I	20	23.2	2.93	12.350	Significant at 0.05 level
2	Progressive – Test II	20	30	2.83		

The above table reveals that, mean score of progressive-test I is 23.2, and the progressive-test II is 30 for N=20. This shows that, the mean score of the control group in Progressive-Test II is greater than the mean score of the progressive-test I. Also the obtained t-value of 12.350 is greater than the table value of 1.96 and is significant at 0.05 level. This significance reveals that the control group has also improved in learning chemistry.

HYPOTHESIS 4

There exists significant difference between the mean scores of the progressive-test I and progressive-test II of the experimental group

Table 4 : Comparison of the mean scores of the progressive-Test I and Progressive –Test II of the experimental group

S.No	TEST	N	Mean	SD	t-value	Level of significance
1	Progressive-Test I	20	26.3	2.69	14.405	Significant at 0.05 level
2	Progressive-Test II	20	33.8	3.03		

The above table reveals that the mean score of progressive-test I is 26.3 and in the Progressive-Test II is 33.8 of the experimental group for N=20. This shows that the mean score of the experimental group in Progressive-Test II is greater than the mean score of the in Progressive-Test I. Also the obtained t-value of 14.405 is greater than the table value of 1.96 and is significant at 0.05level. This shows that, there is a positive impact in learning chemistry through CAITM.

Effect Size (d) for the difference between Means of the sample with respect to progressive –Test I and progressive-test II scores of the experimental group.

Table 5

S.No	TEST	N	Mean	SD	$S_1 + S_2$ $\bar{2}$	E.S(d)	Effect size(d)
1	Progressive-Test I	20	26.3	2.69	2.86	2.62	Large size effect
2	Progressive-Test II	20	33.8	3.03			

According to the broad guidelines created by Cohen (1988) for interpreting d , $d=0.8$ or more shows large effect size. Therefore, the obtained $d=2.62$ which is greater than 0.8 shows a large effect size. Thus, the effect size shows that the CAITM has significantly improved and enhanced learning in chemistry.

HYPOTHESIS 5

There exists significant difference between the mean scores of Progressive-Test I of the control group and the experimental group.

Table 6: Comparison of the mean scores of progressive-test I of the control group and the experimental group

S.No	Group	N	Mean	SD	t-value	Level of significance
1	Control	20	23.2	2.93	8.396	Significant at 0.05 level
2	Experimental	20	26.3	2.69		

This table reveals that, the mean scores of the control group is 23.2 and the experimental group is 26.3 for $N=20$ in progressive-test I. Also, the obtained t-value 8.396 is greater than the table value of 1.96 and is significant at 0.05 level. From the result, it is understood that the experimental group has achieved better than the control group. This shows that the effectiveness of teaching and learning through CAITM over the conventional method.

HYPOTHESIS 6

There exists significant difference between the mean scores of the Progressive-Test II of the control group and the experimental group.

Table 7: Comparison of the mean scores on progressive –test II of the control group and the experimental group

S.No	Group	N	Mean	SD	t-value	Level of significance

1	Control	20	30.0	2.82	7.933	Significant at 0.05 level
2	Experimental	20	33.8	3.03		

This table reveals that, the mean scores of the control group is 30.00 and the experimental group is 33.80 for $N=20$ in progressive- Test II. Also, the obtained t-value of 7.933 is greater than the table value of 1.96 and is significant at 0.05 level. The experimental group has achieved better than the control group. This shows that, the effectiveness of teaching and learning through CAITM over the conventional method.

HYPOTHESIS 7

There exists significant difference between the mean scores on post-test of the control group and the experimental group.

Table 8: Comparison between the mean scores on post-test of the control group and the experimental group.

S.No	Group	N	Mean	SD	t-value	Level of significance
1	Control	20	32.6	2.062	19.052	Significant at 0.05 level
2	Experimental	20	44.7	2.48		

The above table reveals that, the mean scores of the control group is 32.6 and the experimental group is 44.7 for $N=20$. This shows that, the mean score of the experimental group is greater than the control group. Also, the obtained t-value of 19.052 is greater than the table value of 1.96 and is significant at 0.05 level. The result shows that the experimental group has achieved better than the control group. It shows that

the effectiveness of teaching and learning through CAITM over the conventional method.

HYPOTHESIS 8

There exists significant difference between the mean scores of the progressive-test II and post-test scores of the experimental group

Table 9: Comparison of mean scores of the progressive – test II and post-test Scores of the experimental group

S.No	TEST	N	Mean	SD	t-value	Level of significance
1	Progressive-Test II	20	33.8	3.03	18.374	Significant at 0.05 level
2	Post-Test	20	44.7	2.48		

The above table reveals that, the Progressive-Test II and Post-Test scores of the experimental group, which shows a significant difference when compared with the table value of 1.96, and it is inferred that the t-value of 18.374 is significant at 0.05 level. The greater deviation of scores between progressive-test II and the Post-test shows that the exposure of CAITM. Thus, the hypothesis of the study is verified and showing that the CAITM has significantly enhanced learning of chemistry.

HYPOTHESIS 9

There exists significant difference between the mean scores of pre-test and post-test of the experimental group.

Table10: Comparison of mean scores on Pre-test and Post test scores of the experimental group

S.No	TEST	N	Mean	SD	t-value	Level of significance
1	Pre-	2	18.5	3.3		

	Test	0	5	6	39.263	Significant at 0.05 level
2	Post-Test	20	44.7	2.48		

From the above table, it is understood that the table value of 1.96 is inferred that the t-value of 39.263 is significant at 0.05 level. The greater deviation of scores between the pre-test and the post-test of the experimental group shows that the exposure of the CAITM to the learners for a longer period would ensure better learning outcomes. Thus, the hypothesis of the study is verified showing that the CAITM has significantly enhanced learning of chemistry.

Table 11

Effect size(d) for the difference between Mean of the sample with respect to Pre-Test and Post- Test scores of the experimental group

S.No	TEST	N	Mean	SD	$S_1 + S_2$ \bar{Z}	E.S(d)	Effect size(d)
1	Pre-Test	20	18.5	3.36	2.92	8.96	Large size effect
2	Post-Test	20	44.7	2.48			

According to the broad guidelines created by Cohen (1988) for interpreting d, d=0.8 or more shows large effect size. Therefore, the obtained d=8.96 which is greater than 0.8 shows a large effect size.

Thus, the large effect size shows that the CAITM has significantly improved and enhanced learning in chemistry.

GAIN RATIO

Mc.Guin and Peters (1965) suggested that best criterion of a programmed effectiveness is the gain ratio between the amount learned and the amount that could be learnt.

Gain ratio = $\frac{\text{Mean of (post-test scores - pre-test scores)}}{\text{Mean of (Full-scores - Pre-Test scores)}}$

Gain Ratio for the Experimental Group = $\frac{26.2}{31.45} = 0.8330$

Gain = 83.30%

Gain ratio of 83.30% of the experimental group shows that the experimental group learners have indeed benefited through CAITM.

Gain Ratio for the control group = $\frac{14.05}{31.45} = 0.4467$

Gain = 44.67%

CONCLUSION

The present study was undertaken to find out the “effectiveness of computer assisted instructional technology module for enhancing the learning of chemistry at higher secondary level”. The present piece of research may contribute to alleviation of fear in approaching chemistry concepts, infuses interest and enthusiasm among them. As the present teaching learning process at the higher secondary level is rigid, time bound and out molded, it was proposed to device learning tasks in the form of multimedia courseware, so that the learners could spend their time with the computer and feel motivated through personal involvement in the process of learning. The present study clearly demonstrates that the module have provided ample scope for learner motivation and user friendliness, in learning through CAITM.

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