A Study of Effectiveness of Computer Aided Instructional Material (CAIM) on Chemistry for Gujarati Medium Students of Standard XI

JIGNESH J. PARMAR
Principal,
Saraswati College of Education,Viravada
Ta. Himatnagar, Dist. Sabarkantha
Gujarat (India)

Abstract:
The present experimental study was conducted to find out effectiveness of CAIM on chemistry for gujarati medium students of standard XI. The investigator used purposive sampling methods 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, mean, standard deviation and t-test was used to analyse 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.

Keywords: *Achievement, Chemistry subject Computer Assisted Instructional Material, Effectiveness, Reaction*

1. Introduction

Today at the higher secondary level lecture method is widely used. But, this method is not effective for explaining abstract concepts of Chemistry. There is a need of using different media for providing effective instruction. Computer is one of the effective media. It can present a wide variety of stimuli through graphics, text, colors and sound in a most friendly manner. Animation makes the instructional material quite interesting. Computer has a potential to enhance teaching-learning process and the nature of Chemistry subject is such that it makes it possible to use computer for instructional purpose. The Chemistry subject deals with abstract concepts, figures, and diagrams. This was easily explained by use of computer because computer has a potential to present effective instruction through combination of graphics, text, colors, sound, 3-D pictures, animation etc.

One of the ways for providing effective instruction through computer is CAIM. Computer aided instructional Material (CAIM) is totally an individualized instructional material. CAIM provides a lot of flexibility to the students. The student can take his own time to learn. The student can choose content, sequence and the difficulty level of the instruction that they requires. The computer becomes an interesting interactive medium. The topic of the study “shapes of orbitals” also has abstract nature. It required imagination about “shapes of orbitals”. 2-D figures of orbitals given in the text book do not form proper concept in the minds of students. Here, CAIM helps the students through animation, 3-D figures, and moving objects for making concept clear. From review of related literature the investigator found that CAIM is an effective way of

providing instruction and it increases the achievement of students. So the investigator found that there is a need of preparing CAIM on Chemistry for Gujarati medium by using power point package. All these reasons inspired the investigator to take up this study.

2. Objectives of the Study

1. To develop Computer Aided Instructional Material in Chemistry on "shapes of orbitals" for standard XI.
2. To study the effectiveness of CAIM in terms of achievement of students.
3. To study the reaction of the students towards the effectiveness of CAIM.
4. To study the reactions of the Chemistry teacher towards the effectiveness of CAIM.

3. Null Hypothesis

Ho_1 There will be no significant difference in the mean achievement scores of students on pre-test and post-test.

4. Operational Definition of terms

4.1 CAIM

CAIM is a programmed learning material which provides instruction through computer.

4.2 Achievement

Here, achievement means the marks obtained by the students in the pre-test and post-test conducted on "shapes of orbitals" for Gujarati medium students of standard XI.

4.3 Effectiveness

Here, effectiveness of CAIM is measured in terms of the difference of mean achievement scores of the students on post-test and pre-test.

4.4 Reactions

The response given by students and teacher on three point Reaction Scales to the different dimension of the CAIM.

5. Delimitation of the Study

The present study has been delimited to one of the Gujarati medium higher secondary school having computer lab facility at Baroda city. It is further delimited to one topic, i.e., shapes of orbitals from Standard XI Chemistry text book following GSEB syllabus.

6. Population

All Gujarati medium higher secondary schools having computer lab facility of Baroda city will constitute the population for the present study.

7. Sample

One school was selected purposively from all the Gujarati medium higher secondary schools having computer lab facility of Baroda city. It fulfilled the following requirement for the present study.

- ✓ A minimum 30 Computer with color monitor
- ✓ Networking of all Computers
- ✓ Availability of Microsoft Power Point software
- ✓ Easy access of Computer laboratory to students

All the 55 students from 'A' section of standard XI of the selected school constituted the sample for the study.

8. Tools
The following tools were constructed by considering objectives of the study.

9. Development of CAIM
The CAIM on "shapes of orbitals" for Gujarati medium students of standard XI was constructed by investigator. First the topic of "shapes of orbitals" was selected and further content analysis was done. The content was converted into small teaching points. All these teaching points were logically and sequentially arranged according to the content requirement figures, 3-D pictures was downloaded from the different Chemistry websites.

After collecting all the required information CAIM was constructed by following programmed learning material steps and using Microsoft Power point package. The CAIM was validated by experts in the field of education. A pilot study was conducted on a set of students who do not constitute the sample, to check the time required and instruction needed by the students.

9.1 Achievement Test
The achievement test was constructed by the investigator. The achievement test was used as pre-test and post-test for measuring achievement of students. The test was validated by experts in the field of education. A pilot study was conducted on a set of students who did not constitute the sample to check the time required by the students.

9.2 Reaction Scale
The reaction scale for teacher and students was constructed by investigator. The reactions of students and teachers were measured on three point scale. The reaction scale for students was constructed based on language, content, explanation, effectiveness of CAIM etc. The reaction scale for teacher was constructed based on explanation, content coverage, effectiveness of moving object etc. Both the reaction scales were validated by experts in the field of education.

10. Data Collection
The investigator was personally visited the principal of the school with an authority letter from the university authorities stating the purpose of the study. After getting the principal's approval for date and time for conducting study. First pre-test was administered then immediately CAIM was administered and post-test was administered one day after implementation of CAIM. The reaction scales for students and teachers was administered after giving post test.

11. Data Analysis and Interpretation
The data obtained through pre-test and post-test were analyzed quantitatively using correlated t-test. The data obtained through reaction scale were analyzed through percentage and frequency.

The investigator has formulated a null hypothesis for testing effectiveness of CAIM. For testing the hypothesis pre-test and post-test, were administered. The data were analyzed with the help of correlated t-test. The hypothesis was tested at 0.01 level.

Table 1 The calculated Pre-test and Post-test means, standard deviations (SDs), coefficient of correlation (r) and t-value

Type of test	N	df	MEAN	SD	r	t-value
Pre-test	55	58	8.98	3.0	0.5	8.75
Post-test			12.13	2.28		

From the table 1 result shows that the calculated value of't' is 8.75 for 54 degrees of freedom. The calculated't' value is significant at 0.01 level because the calculated value of 't', i.e., 8.75 is greater than the table value at 0.01 level of significance, i.e. 2.67 . So, the null hypothesis that there will be no significant in the mean achievement scores of students on pre-test and pot-test is rejected. From this it can be concluded that there is a significant difference in the mean achievement score of students on pre-test and post-test. It can also be observed form the Table.1 that mean achievement score on post-test is greater than the pre-test mean score. It can be attributed to learning through the CAIM. The reactions were analyzed by computing frequencies and percentages.

Table 2 Reactions of students towards CAIM

Sr.	Statements	Response		
		Agree	Disagree	Un Decided
1	The instructions given in the instructional manual were adequate.	35 (64%)	5 (9%)	15 (27%)
2	Language used in CAIM was easy to understand.	40 (73%)	4 (7%)	11 (20%)
3	The teaching points in CAIM were sequentially arranged.	38 (69%)	7 (13%)	10 (18%)
4	The explanation given in CAIM was easy to understand.	47 (85%)	6 (11%)	2 (4%)
5	The questioned asked in CAIM was not appropriate.	8 (14%)	43 (78%)	4 (8%)
6	The choices given in questions in CAIM were easy to understand.	44 (80 %)	4 (7%)	7 (13%)
7	The voice explanation, moving objects and learning points given in CAIM were appropriately used.	48 (87%)	2 (4 %)	5 (9 %)
8	The use of voice explanation, moving objects with learning points were not useful for learning.	4 (7%)	47 (86%)	4 (7%)
9	The combination of voice explanation, moving objects with learning points were not effective for learning.	5 (9 %)	45 (82 %)	5 (9 %)
10	The use of moving objects in CAIM helps to increase the understanding of "shapes of orbitals".	46 (84%)	5 (9 %)	4 (7%)
11	The size of fonts and moving objects was appropriate.	38 (69%)	4 (7%)	13 (24 %)
12	The colour combination in CAIM was appropriately used.	40 (73 %)	6 (10 %)	9 (17 %)

13	The CAIM helps to increase interest in chemistry.	49 (89 %)	4 (7%)	2 (4%)
14	The CAIM is helpful for self learning.	43 (78%)	7 (13%)	5 (9%)
15	The CAIM was not effective for teaching.	4 (7%)	42 (76 %)	9 (17%)

From the table 2 it can be seen that a majority (64%) of the students agreed to that the instructions given in the instructional manual were adequate. 9% disagreed, whereas, 27% students were found undecided.

A majority of the students (73%) agreed to that the language used in CAIM was easy to understand, 7% disagreed, whereas 20% students were found undecided.

A majority of the students (69%) agreed to that the teaching points in CAIM were sequentially arranged, 13% disagreed, whereas 18% students were found undecided.

A majority of the students (85%) agreed to that the explanation given in CAIM was easy to understand, 11% disagreed, whereas 4% students were found undecided.

A majority of the students(78%) disagreed to that the questioned asked in CAIM was not appropriate, 14% of students were agree and 8% students were found undecided.

A majority of the students (80%) agreed to that the choices given in questions in CAIM were easy to understand, 7% disagreed, whereas 14% students were found undecided.

A majority of the students(87%) agreed to that the voice explanation, moving objects and learning points given in CAIM were appropriately used, whereas 4% disagreed, 9% students were found undecided.

A majority of the students(86%) disagreed to that the the use of voice explanation, moving objects with learning points were not useful for learning, 7% of students were agree and 7% students were found undecided.

A majority of the students(82%) disagreed to that the combination of voice explanation, moving objects with learning points were not effective for learning, 9% of students were agree and 9% students were found undecided.

A majority of the students(84%) agreed to that the use of moving objects in CAIM helps to increased the understanding of “shapes of orbitals”, whereas 9% disagreed, whereas 7% students were found undecided.

A majority of the students (69%) agreed to that the size of fonts and moving objects was appropriate, whereas 7% disagreed, whereas 24% students were found undecided.

A majority of the students (73%) agreed to that the colour combination in CAIM was appropriately used. 10% disagreed, whereas 17% students were found undecided.

A majority of the students (89%) agreed to that the CAIM helps to increase interest in chemistry, 7% disagreed, whereas 4% students were found undecided.

A majority of the students (78%) agreed to that the CAIM is helpful for self learning, 13% disagreed, whereas 9% students were found undecided.

A majority of the students(76%) disagreed to that the CAIM was not effective for teaching, 7% of students were agree and 13% students were found undecided.

The investigator analyzed the responses of chemistry teacher towards CAIM and following are the reactions of the chemistry teacher regarding CAIM.

- All the teaching points were very well organized.
- The explanation and language were easy.
- The questions were based on explanation and according to the level of the students.
- The color pictures, moving objects, size of fonts were appropriate.
- The sound explanation was effective and helpful in teaching.
- CAIM is helpful to chemistry teacher.
- CAIM is helpful to increase student's interest in Chemistry
- Computer is an effective tool for learning Chemistry.

12. Findings

- CAIM was found to be effective for teaching-learning.
- CAIM was helpful to understand abstract concept like "shapes of orbitals".
- CAIM was helpful for increasing interest of students in Chemistry.
- The use of moving objects in CAIM increased the effectiveness.
- The reactions of students and teacher were found positive towards CAIM.

13. Suggestions for the Further Study

The areas and variables that are not covered in the present study may be taken for further study.

- To develop CAIM by taking all the chapters of chemistry of standard 11.
- To develop CAIM by taking chemistry of standard 12.
- To develop CAIM in all other subjects of science stream.
- To develop CAIM in all other stream, i.e., Arts and Commerce.
- CAIM may be developed by using branching programming.
- CAIM may be developed by using other computer software.

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