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THE EFFECT OF COMPUTER ASSISTED INSTRUCTION MATERIAL AS EACHING AID ON CHEMISTRY LEARNING OF HIGH SCHOOL STUDENTS

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Abstract

In the contemporary era, use of computer applications in teaching field is approved. Present study investigates the potential of Computer Assisted Instruction Material as teaching aid in comparison with traditional lecture method. Two groups of 15 students were set for the study of chemistry. One set was for lecture method while other was for CAI (Computer Assisted Instruction) material method. Achievement of students was compared through evaluation of pre, post and additional tests. Pre and post test probes the information and understanding level while additional test probes 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 shown progressive effect but at the same time improvement in the performance of control group is noticeable. In conclusion, for achieving good results at all the three levels viz. information, understanding and application, hybrid instruction method comprising of traditional lecture and CAI method can prove to be best.

Keywords: *chemistry education; chemistry knowledge; chemistry awareness; computer-assisted education*

1. Introduction

One of the common teaching methods that chemistry teachers prefer today is the lecture method. In this the teacher transmits knowledge to the students who sit passively in the classroom and listen. Another common method is the question-and-answer approach, which was

developed in order to avoid the boredom caused by lectures and to provide a more efficient learning environment. On the other hand, case studies allow the students to face the problems that occur in real life. They help to fill the gap between theory and practice through putting the previously learnt concepts and principles into use. The best part of this method is that it enables the students to apply what they have learnt to what they are living through (Sönmez V. 1986, p287). A useful part of instructions in science is performing of experiments. In this method teacher actively demonstrates the experiments.

The well-known aim of science education is to teach the science concepts meaningfully and make students aware of how these concepts can be used in their daily lives. In this process, learning the basic concepts during the primary and secondary education is very crucial, in terms of learning the advanced concepts. It was argued that if new concepts were compatible with previous concepts, the meaningful learning would occur (Ausubel, D. 1968). It is important to know that, what prior knowledge students bring to a learning environment in order to help them construct new knowledge (Tsai, C.-C. 2000, p285). Concepts are not materials, events or creatures but they are units of thought assembled into certain groups. They exist in ideas and only the examples of the concepts are found in the real world (C. epni, S., Ayas, A., Johnson, D., & Turgut, M. F. 1997).

During past decades, personalized (i.e. individual) instruction by experiment or even fully autonomous learning has been developed for teaching in all areas (Boland R.G.A. 1977, p233) Beneficial feature claimed for student-centered methods is that they allow more time to be spent by the teacher tutoring individual or very small groups of students. This has been claimed, in particular, by the advocates of computer-assisted instruction learning (Hinchliffe P.R., 1982, p 588).

In Computer-Assisted Instruction (CAI), the teacher can use computers at different times and places according to the characteristics of the subject matter, the students, and the available software and hardware. Computer programs can be used for practice, revision, one-to-one instruction, problem solving, or simulations during the applications (Brooks, D.W., Lui, D., & Walter, J.L. 1997). With CAI, there is a form of one-to-one instruction (or two students together at each computer), plus the opportunity for the students to proceed at their own pace, repeating parts of the exercise as they wish. None of these features are easily available in a didactic classroom situation. In addition, there is added variety and, perhaps, novelty in CAI, along with

the potential to use vivid and animated graphics, enabling three dimensional aspects, and other features to be viewed more realistically. Of course, not all computer programs have these features, but the potential is certainly there. However, computers lack the human dimension and the ability to provoke thought by spontaneous questions and answers. A good teacher can respond to the way a class is reacting to a lesson by the skillful use of such spontaneous questions and answers. This flexibility is not easy to develop in a computer program and the style of presentation will depend on the ingenuity of the program developer and his/her own understandings of the subject matter (Inci M, Soner Y, Ozge O.O. and Secil A 2004, p52)

II. Purpose of the Study

Since 2012 Department of Education, Government of Maharashtra has introduced Information Communication Technology (ICT) as a regular subject for IX and X class students. Therefore it is necessary to know the effects of use of computer in teaching. In the present study, chemistry has been selected for experiment. Chemistry is a one of the fundamental science subject. It also has dimensions of environmental and biological sciences. As mentioned above, there are mixed responses to the use of traditional (lecture) method and computer assisted instruction method. To identify the appropriate method of teaching, these two methods were compared by using pre and post test designs (Jackman, L. & Moellenberg, W. 1987. P 794). This method of analysis is proved to be appropriate in many studies.

III. Experimental Details

A. The Subjects

The experiment was carried out in Lokmanya Tilak High school, Pune (one of the school affiliated to S.S.C. Board, Maharashtra). Students of IX class were selected randomly. Two groups; control and experimental, each consisting of 15 students, were formed. It has been taken care, that student could handle computers satisfactorily.

B. Subject Knowledge Test

The Subject Knowledge test is the source of statistical data for the present work. The test consisted of 15 questions each in pre and post tests. The questions were designed after discussion with experts of the subjects. The questions follow Bloom's taxonomy. A fair of information, understanding and application based questions was incorporated. The questions asked were open ended so that students would express themselves satisfactorily. In post test also same pattern was implemented. Along with post test, one additional test also implemented. This additional test

was designed to know the understanding of the subject and enhancement in other skills like presentation of thoughts.

C. Application of instructions

Two groups were formed which were control group (CG) and experimental group (EG). Control group was set for lecture method. Experimental group was set for computer assisted instruction method. CAI includes video clips, animations, documentaries and self explanatory slide shows. Reinforcement of instructions of both the groups was achieved by daily sessions of one and half hour. Apart from instructions, students of both the groups were allowed to use other information sources like family, teachers and library. For experimental group, CAI material was made available through CDs also, so that they could view them as per their convenience other than session schedule. For CG, the lecturer has gone through the CAI material and same was delivered effectively by regular chalk and blackboard (lecture) method along with participation of students through discussion.

D. Test Procedure

The Subject Knowledge Test was applied two times i.e. pre and post test. Along with this one additional test in post session was also applied. Between pre and post test there was period of 15 days for reinforcement of knowledge.

The answer papers were evaluated and the marks were compiled. The averages (Avg.), standard deviations (sd.) and differences in marks were calculated. The graphs representing their performance changes in terms of marks were plotted. This data is compiled below.

IV. Results

Compiled data is as mentioned above. Pre test performances of CG and EG are comparable but not same as sample was selected randomly. Standard deviations indicate appreciable variations in control group as compared to the experimental group. Difference in pre and post test performances, for both the groups is positive. This implies that students can learn the subject by both the methods i.e. lecture and CAI material but at the same time effectiveness of the method also clearly emphasized.

	Control Group		
	N	Avg.	Sd
Pre test	15	12.16	5.08
Post test	15	13.66	7.90
% change		(+) 12.33	(+) 55.51

	Experimental Group		
	N	Avg.	Sd
Pre test	15	16.63	2.76
Post test	15	20.86	3.14
% change		(+) 25.43	(+) 13.76

	Control Group			Experimental Group		
	N	Avg.	sd	N	Avg.	sd
Pre Test	15	12.16	5.08	15	16.63	2.76
Additional Test	15	15.8	8.19	15	22.92	5.28
% Change		(+) 29.93	(+) 61.22		(+) 37.82	(+) 91.3

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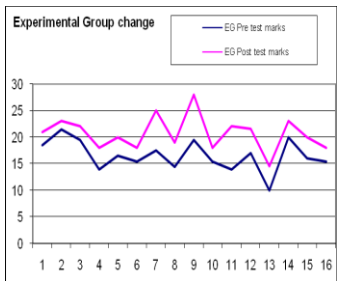

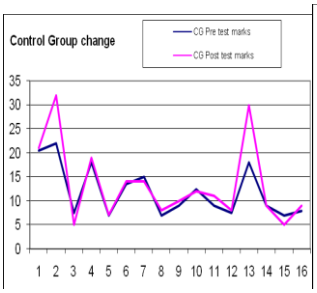

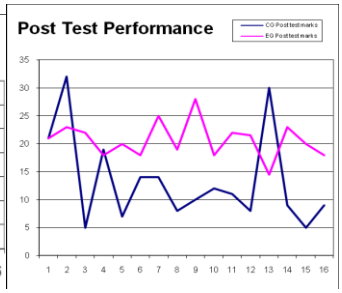

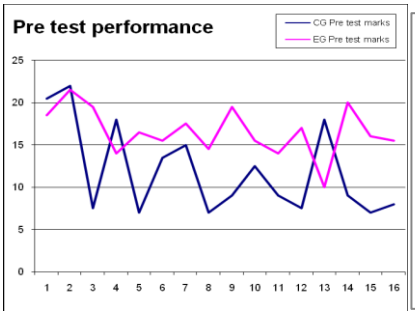

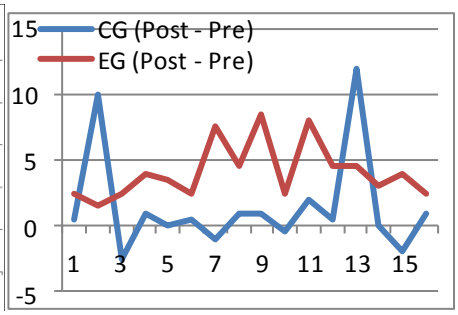

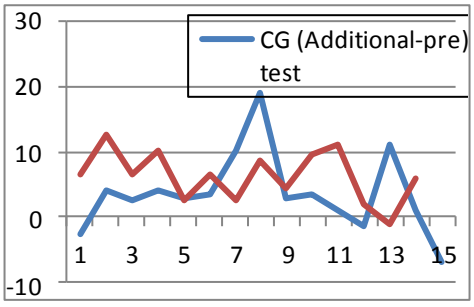

Additional test performance is found to be significant to know enhancement in various skills. The questions for this test were based on understanding of concepts and application of the knowledge. In this test, performances of both the groups are positive. Here too, the role of instruction method is momentous. But standard deviations indicate that there is appreciable variation of performances of students of experimental group as compared to control group.

V. Conclusion

Through the evaluation of statistical data obtained from subject knowledge pre-post and additional tests interpretations were made which are listed below. Also through discussions with students after post test some of their responses could be interpreted more accurately.

1. Overall improvement observed in pre and post tests for both the groups is noticeable. Difference for experimental group is more than for control group.
2. This implies that both the methods are useful for teaching, but comparatively CAI material was found to have more potential.
3. Use of video clips, animation, graphical tools has tremendous impact on students to understand and visualize the concepts which are strengths of CAI material.
4. Effectiveness of lecture method depends on the competency of a teacher to deliver the knowledge. But at the same time, lecture method is live and can be made interactive so that students can be made to take initiative in learning process.
5. Comparing the change (12.33% for CG and 25.43% for EG) observed for (post-pre) test performance with change (29.93% for CG and 37.82% for EG) observed for (additional – pre) test, the progressive development is found in later.
6. Better performance in additional test unearthed the refinement of some important skills viz. precise expression of thoughts, application of knowledge and its implementation in day to day life.
7. Achievement in pre, post and additional tests of two students of control group was comparable with average performance of experimental group. This suggests that different opinion. Such bright students can do well if they are exposed to CAI material method along with lecture method.
8. CAI material increases the information level of students but there is no increase in the ability of application of subject knowledge. Hybrid method comprising of use of CAI material and lecture method is therefore expected to give maximum results.
9. Present study is confined to chemistry. But the field is open for such experiments for other science subjects and different age group students.
10. The larger value of standard deviation observed in the control group can be attributed to the two sample elements much above normal. The small values of sd for experimental group indicates their similar response patterns. The authors are confident that if the number of sample is greatly increased such minor inconsistencies would get ironed out.
11. In spite of this , the performance changes are quite consistent

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