EFFECT OF COMPUTER ASSISTED INSTRUCTIONS ON SCIENCE ACHIEVEMENT OF NINTH GRADE STUDENTS

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ABSTRACT

The well-known aim of science education is to teach the science concepts meaningfully and make students become 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. Once traditional teaching methods are used in teaching science subjects, students understand subject at knowledge level and they usually memorize the science concepts without understanding the real meaning. As a result, they do not conceptualize the science concepts well as intended. Thus, all these factors influence student's attitudes, cognitive development and achievement in science and science education. In this study researcher studied effect of CAI on Science achievement of ninth grade students. The sample for the study comprised 115 class IX students. There were two sections of ninth class in Navjot Sr. Sec. School and Khalsa Public Sr. Sec. School situated in Amritsar. One section from each school was randomly assigned to experimental group and another section from each school constituted control group. The students of Experimental Group were taught through Computer Assisted Instructions. . Every day, 35 minutes' period was devoted for this purpose. This continued for 30 working days. The results of the study showed that Computer Assisted instructions were significantly superior to the Traditional Method in teaching and retention of Science.

INTRODUCTION

The well-known aim of science education is to teach the science concepts meaningfully and make students become 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, then meaningful learning would occur (Ausubel, 1968). It is important to know what prior knowledge students bring to a learning environment in order to help them construct new knowledge (Tsai, 2000).

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The 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. Difficult and hardly understandable concepts may be differently structured in students_ mind. It is reported that students may have developed ideas about certain events and concepts before any formal instruction in science education (Amir & Tamir, 1994). The students conceptions, which may not be defined as scientific are named as "Misconception", "Alternative Conception", "Naive

Theories", and "children science" in the literature (Barker & Carr, 1989; Simpson & Arnold, 1982; Treagust, 1988). Once traditional teaching methods are used in teaching science subjects, students understand subject at knowledge level and they usually memorize the science concepts without understanding the real meaning. As a result, they do not conceptualize the science concepts well as intended. Thus, all these factors influence student's attitudes, cognitive development and achievement in science and science education. It is obvious that alternative teaching approaches needed to teach this sort of difficult concepts in science education. Today's information and communication technologies can be applied to science education. Among these technologies, the use of computers is the most popular and well known in educational settings.

Computer-assisted instruction (CAI) plays an important role in contemporary teaching and learning of science concepts (Chang, 2001). Besides, it is evident that for effective use of computers in science classroom, CAI Ms need to be developed. Computers can be used as a supplementary tool in order to reach to educational goals (Bayraktar, 2000).

Computer-assisted instruction (CAI) : “Computer-assisted instruction” (CAI) refers to instruction or remediation presented on a computer. Computer-Assisted Instruction (CAI) is among the range of strategies being used to improve student achievement in school subjects, including Geometry.

CAI is
Interactive learning
Illustrative learning through animation, sound, and demonstration
Individualized learning
Learning at student's own pace
Immediate feedback
Cooperative learning

CAI provides differentiated lessons to challenge students who are at risk, average, or gifted. These programs tutor and drill students, diagnose problems, keep records of student progress, and present material in print and other manifestations. It is believed that they reflect what good teachers do in the classroom.

Based on the degree of interaction between student and computer, researchers have identified three levels of CAI:

Drill and practice: The computer provides the student with exercises that reinforce the learning of specific skills taught in the classroom, and supplies immediate feedback on the correctness of the response

Tutorial: Tutorial CAI provides some information or clarifies certain concepts in addition to providing the student with practice exercises.

Dialogue: With this type of computer use, the student takes an active role in interacting with the computer, giving instructions in the form of a computer language so as to structure the student's own curriculum.

REVIEW OF LITERATURE

Many science teachers, researchers and other educators have recommended using CAIM in science classrooms. Some researchers argued that student achievement increases with the use of computers in science education (Chang, 2001; Coye & Stonebraker, 1994; Ferguson & Chapmen, 1993; Lee, 2001; Powell, Aeby, & Carpenter-Aebyc, 2003; Rowe & Gregor, 1999; Tsai & Chou, 2002). In addition, it is reported that student abilities and skills in scientific investigations are affected positively by CAI (Bayraktar, 2000; Shute & Bonar, 1986). Moreover, it is also stated that the use of computers makes students feel confident and helps them to discover interactions among the components of a complex system (Ramjus, 1990).

OBJECTIVES

To compare the adjusted mean scores of Science achievement of experimental and control group students by considering Pre-Science achievement and intelligence as covariate.

To compare the adjusted mean scores of retention in Science of experimental and control group students by considering Science achievement and intelligence as covariate.

HYPOTHESES

There is no significant difference in the adjusted mean scores of Science achievement of experimental and control group students by considering Pre- Science achievement and intelligence as covariate.

There is no significant difference in the adjusted mean scores of retention in Science of experimental and control group students by considering Science achievement and intelligence as covariate.

SAMPLE

The sample for the study comprised 115 class IX students. There were two sections of ninth class in Navjot Sr. Sec. School and Khalsa Public Sr. Sec. School situated in Amritsar. One section from each school was randomly assigned to experimental group and another section from each school constituted control group. Navjot Sr. Sec. School was affiliated to PSEB whereas Khalsa Public Sr. Sec. School was affiliated to CBSE. New Delhi. The Medium of Instruction was Punjabi and English.

DESIGN

The study was designed on the lines of Non-equivalent Control Group Design. As per Campbell and Stanley (1963), the lay out of this design is given as under:

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TOOLS

Raven's Standard Progressive Matrices Test developed by Raven was selected for assessing Intelligence of students of the study.

Science Achievement Test was prepared by the researcher himself to assess student's achievement in geometrical concepts.

METHOD

One section of ninth class of each of the two schools constituted the experimental group whereas another section of ninth class of these schools formed control group. The permission was taken from the Principals of these schools. The students of Experimental Group were taught through Computer Assisted Instructions. The rapport was established with the students. The

students were explained the objectives of this study. To begin with, the Science Achievement Test and Raven's Standard Progressive Matrices were administered. After this, they were taught through the CAI. Every day, 35 minutes' period was devoted for this purpose. This continued for 30 working days. At the end, the Achievement test was administered again on the students in the same way as done at the start of the experiment. On the other hand, the students of the Control Group continued with their Routine Activities and they were taught through Traditional Method. The same tools were administered on the Control Group students in the same way as done in the Experimental Group. To check the retention level, the Achievement Test was re administered on both the groups after a span of two months.

ANALYSES

The objective-wise data analysis was given below :

The first objective was "to compare the adjusted mean scores of Science achievement of experimental and control group students by considering Pre-Science achievement and intelligence as covariate". The data related to this objective was analyzed with the help of Analysis of Covariance (ANCOVA).

The results are given in the Table 1

Table 1

Summary of ANCOVA of Science achievement by considering Pre- Science achievement and intelligence as Covariate

Source of Variance	$SS_{y.x}$	df	$MSS_{y.x}$	$F_{y.x}$
CAI	161.908	1	157.29	64.043**
Error	276.403	111	2.34	
Total		114		

**Significant at 0.01 levels

From the Table 1, it can be seen that adjusted F-Value is 64.04, which is significant at 0.01 levels with df=1/111. It indicates that the adjusted mean scores of Science achievement of group taught by CAI and group taught by

Traditional Method differs significantly when Pre- Science achievement and intelligence were considered as covariate. Thus, the first null hypothesis, namely, "There is no significant difference in the adjusted mean scores of Science achievement of experimental and control group students by considering Pre- Science achievement and intelligence as covariate", is rejected. Further, the adjusted mean score of Science achievement of Experimental Method Group was 16.43, which is significantly higher than that of Traditional Method Group whose adjusted mean score of Science achievement was 13.25. It reflects that CAI was found to be significantly superior to the Traditional Method in teaching Science when both groups were matched with respect to Pre- Science achievement and intelligence. It may, therefore, be concluded that the CAI was found to be superior to Traditional Method in teaching Science.

The second objective was "to compare the adjusted mean scores of retention in Science of experimental and control group students by considering Science achievement and intelligence as covariate". The data related to this objective was analyzed with the help of Analysis of Covariance (ANCOVA).

The results are given in the Table 2

Table 2

Summary of ANCOVA of Retention by considering Science achievement and intelligence as Covariate

Source of Variance	$SS_{y.x}$	df	$MSS_{y.x}$	$F_{y.x}$
CAI	18.76	1	15.576	11.88**
Error	148.348	111	1.578	
Total		114		

**Significant at 0.01 levels

From the Table 2, it can be seen that adjusted F-Value is 11.88, which is significant at 0.01 levels with df=1/111. It indicates that the adjusted mean scores of retention in Science group taught by CAI and group taught by Traditional Method differs significantly when Science achievement (post) and intelligence were considered as covariate. Thus, the second null hypothesis, namely, "There is no significant difference in the adjusted mean scores of retention in Science of experimental and control group students by

considering Science achievement and intelligence as covariate"., is rejected. Further, the adjusted mean score of retention in Science of Experimental Method Group was 14.64, which is significantly higher than that of Traditional Method Group whose adjusted mean score of retention in Science was 12.13. It reflects that CAI was found to be significantly superior to the Traditional Method in retention of Science when both groups were matched with respect to Science achievement and intelligence. It may, therefore, be concluded that the CAI was found to be superior to Traditional Method in retention of Science.

RESULTS

Computer Assisted instructions were found to be significantly superior to the Traditional Method in teaching Science when both groups were matched with respect to Pre- Science achievement and intelligence.

Computer Assisted instructions were found to be significantly superior to the Traditional Method in retention of Science when both groups were matched with respect to Science achievement and intelligence.

DISCUSSION

The results of the study showed that Computer Assisted instructions were significantly superior to the Traditional Method in teaching and retention of Science. The results of this study regarding the effectiveness of Computer Assisted instructions in Science are consistent with findings of previous research Studies of Chang, 2001; Coye & Stonebraker, 1994; Ferguson & Chapmen, 1993; Lee, 2001; Powell, Aeby, & Carpenter-Aebyc, 2003; Rowe & Gregor, 1999; Tjaden & Martin, 1995; Tsai & Chou, 2002. The improved results on the achievement test in the experimental group may be explained by the instructional method used with this group. Individualistic, interactive, illustrative and Cooperative learning in the experimental group enhanced critical thinking and higher level processing skills of the students. At the same time, students in the control group learned individually without the use of these strategies. The lower achievement scores of the control group may be explained by this factor. Students in the experimental group, while working with CAI, were expected to use a discovery approach to accomplish the goals of the activity. Discovery learning encourages and increases participation, enthusiasm, and inquiry, and improves the students' ability to learn new content. Students learn quickly and deeply as they use cognitive and critical

thinking skills. They master learning skills and gain confidence in their own abilities. These factors explain higher achievement test scores in the experimental group.

EDUCATIONAL IMPLICATIONS

Computer Assisted Instructions were found to be significantly superior to the Traditional Method in teaching and retention of Science. Thus, Computer Assisted Instructions are an effective and efficient way to teach Science in the specified period of time given in the curriculum. With carefully developed lesson plans that consider effective use of Computer Assisted Instructions, this approach promises an interesting way for Science teaching. In order to use Computer Assisted Instructions in the Science classroom teachers need to be trained on using the same in Science lessons. Science teachers may be given a chance to experience Computer Assisted Instructions in teacher preparation courses and in service teacher training programs. Teachers should have enough experiences and knowledge about the use of Computer Assisted Instructions in Science classes. It is also suggested that Computer Assisted Instructions in Science should be included in the teacher education curriculum of Science teachers so that they can make use of them while teaching Science to their students.

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