CHAPTER-V

RESULTS, DISCUSSION OF THE RESULTS, CONCLUSION, EDUCATIONAL IMPLICATIONS AND SUGGESTIONS FOR FURTHER STUDY
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The present study was an exploration in the area of information and communication technology (CAI module development). The investigator studied the relative effectiveness of computer assisted instruction and conventional teaching in learning biology.

A sample of 50 students of class XII was drawn by using matched randomization technique. The research tools used for the data collection have already been described in the third chapter. In the same chapter, the statistical techniques used for analysis of data have also been given. In the fourth chapter, results and their interpretation have been given. The present chapter is devoted to the major findings of the study and discussion of the results obtained.

5.1.0 MAIN RESULTS

The purpose of the study was to develop CAI module and compare the effectiveness of computer assisted instruction with conventional strategy on students’ learning in biology, based on students’ achievement, gender, intelligence level, instructional objectives (knowledge, comprehension and application) and retention. Findings of the study are presented ahead in relation to each objective.
1. EFFECTIVENESS OF COMPUTER ASSISTED INSTRUCTION ON THE BASIS OF ACHIEVEMENT IN BIOLOGY

For this Mean, S.D. and t-value were computed. It has been found that mean achievement score of experimental group was significantly higher than that of the control group. Therefore, Computer Assisted Instruction was found to enhance achievement in biology, of students of experimental group.

2. COMPARATIVE EFFECTIVENESS OF COMPUTER ASSISTED INSTRUCTION AMONG GIRLS AND BOYS

For this Mean, S.D. and t-value were computed. It has been found that experimental group girls and boys performed significantly better than the control group girls and boys. Though enhancement is significant as a result of Computer Assisted Instruction in both the cases i.e. boys and girls, yet enhancement in achievement in biology is comparatively better in the case of girls.

3. COMPARATIVE EFFECTIVENESS OF COMPUTER ASSISTED INSTRUCTION IN TERMS OF INTELLIGENCE LEVEL OF STUDENTS OF EXPERIMENTAL AND CONTROL GROUPS

For this Mean, S.D. and t-value were computed. It has been found that experimental group performed significantly better in case of above average, average and below average intelligent students. Though enhancement is significant as a result of Computer Assisted Instruction in all the three cases i.e. above average, average and below average intelligent students, yet it is highest in the case of average intelligent students followed by below average intelligent students and is least in the above average intelligent students.
4. COMPARATIVE EFFECTIVENESS OF COMPUTER ASSISTED INSTRUCTION IN TERMS OF ACHIEVEMENT OF INSTRUCTIONAL OBJECTIVES IN LEARNING BIOLOGY, OF STUDENTS OF EXPERIMENTAL AND CONTROL GROUPS

For this Mean, S.D. and t-value were computed. It has been found that experimental group performed better in case of learning objectives of knowledge, comprehension, and application. Though enhancement is significant as a result of Computer Assisted Instruction in all the three cases i.e. learning objectives of knowledge, comprehension, and application, yet it is highest in the case of comprehension objectives, which is followed by application and knowledge objectives.

5. COMPARATIVE EFFECTIVENESS OF COMPUTER ASSISTED INSTRUCTION IN TERMS OF RETENTION OF STUDENTS OF EXPERIMENTAL AND CONTROL GROUPS

For this Mean, S.D. and t-value were computed to know the comparative effect of Computer Assisted Instruction and conventional strategy of teaching in terms of retention. It has been found that Computer assisted instruction is comparatively more effective in terms of retention.

6. EXPERIMENTAL GROUP STUDENTS’ REACTION TOWARDS COMPUTER ASSISTED INSTRUCTION

Mean and coefficient of variance were calculated to know the reaction of experimental group students’ towards developed Computer Assisted Instruction module on Genetics. It has been found that experimental group students have favourable reaction towards various aspects of Computer Assisted Instruction.
5.2.0 DISCUSSION OF THE RESULTS

In a research study, the results become more meaningful if they have relevance. Therefore, it is important to show the relevance of the results. The decision about the hypotheses was also being taken on the basis of results. Thus, the present study has been discussed in the following manner:

1 Effectiveness of computer assisted instruction on the basis of achievement:

In some other studies the traditional method of teaching was found to be more effective in comparison to CAI; (Hulick (1987),Oates(1988), Cosmos (1988), Benson (1989), Park (1990), and Clem (1990))


On the basis of the discussion we can conclude that CAI is more effective than the traditional teaching.

2 Comparative effectiveness of computer assisted instruction among girls and boys: The present study reveals that enhancement in achievement as a result of CAI was found significant among girls and boys of experimental and control group. It is more in case of girls. Further, In 1988 meta-analysis of 82 studies of Computer Based Education conducted by Roblyer, et al.^{100} concluded that effectiveness of CAI/CBE slightly favour boys over girls, with differences falling short of statistical significance. Research carried out by Joy, B.H.H. and Shaiju, S.L. (2004), Ponraj, P. and Sivakumar, R.(2010) implies that there is no impact of gender on learning through CAI or through traditional strategy. Such comparison on the basis of sex was not addressed by enough researches to draw firm conclusion.

3 Comparative effectiveness of computer assisted instruction in terms of intelligence level of students of experimental and control groups: The present study results that experimental group performed significantly better in case of above average, average and below average intelligent students with CAI. CAI is more beneficial with average intelligent students than below average intelligent students which are further followed by above average intelligent students. The research confirms that the students have different levels of learning. Computer Assisted Instruction makes learning more effective, involving more senses in a multimedia content. It encourages learning at one’s own pace. A number of self-assessment exercises allow the learner to assess


himself/herself without an exam stress. Involvement of pictures, videos, animations and graphics in colours make learning easier and pleasurable for average and below average students also. The CAI offers many coloured, animated, and fully voiced and interactive sequences that makes the learning more facilitating than the learning through traditional teaching. Different studies carried out in the past shows that CAI is more effective with lower achieving students than with higher achieving ones like (Bangert-Drowsn, et al. 1985; Edwards, et al. 1975; Kinnaman 1990; Roblyer 1988)\textsuperscript{101}. Therefore, past studies support the finding of the present study.

4 Comparative effectiveness of computer assisted instruction in terms of achievement of instructional objectives in learning of students of experimental and control groups: In the present study, achievement of experimental group was found significantly better in terms of learning objectives of knowledge, comprehension and application. It was highest in the case of comprehension objectives followed by application and knowledge objectives. In a research Mustafa, Aslıhan , Turgay, (2011)\textsuperscript{102} found that computer assisted instruction is more feasible than the traditional approach in terms of cognitive and affective behaviours. Ponraj, P. and Sivakumar, R. (2010) also observed that the difference between the students’ achievement scores in learning objectives- Knowledge, Understanding, Application and Skill is significant; CAI group performed better, which supports the finding of the present study.

5 Comparative effectiveness of computer assisted instruction in terms of retention of students of experimental and control groups: While comparing the effectiveness of computer assisted instruction in terms of retention of students of experimental and control groups, it was found that the students retain better what they


have learnt with CAI than with conventional instructions alone. The researches carried out by Desai, B.Y. 2004\textsuperscript{103}, have not found significant difference between CAI and traditional teaching in terms of retention. The study done by Uplane, Megha M., Sonawane, Sanjeev A. and Padmini, M.S. (2011) reflected positive impact of CAI on retention, which support the finding of the present study.


5.3.0 CONCLUSION

The present study was conducted to develop CAI module and assess the effectiveness of CAI as compared to Conventional strategy of teaching in learning biology. The study was conducted on students of class XII. The purpose of the study was dual, firstly the development of CAI module and secondly to assess the effectiveness of the developed module. Comparison of CAI and conventional strategy of teaching was not only a comparison of two modes of instructions but of two theoretical paradigms. Conventional strategy represents a paradigm whereby knowledge is transmitted from teacher to learner and learner is a passive recipient of knowledge. Teacher plays an active role in this mode of instruction. CAI content represents a paradigm where knowledge is constructed and sought by the learner. Learner plays an active role in learning process. Learning is individualized, self-paced and hands on. Since the past

decade, the use of computer programs is widely available for individual and classroom use. However, there has been very little research reported on the effectiveness of such use. The findings of present study clearly suggest that the inclusion of CAI strategy in biology for class XII students is very effective.

On the basis of discussions, following conclusions are framed to generalize the results:

- The Computer Assisted Instruction has enhanced the achievement of experimental group students in comparison to traditional instructions.
- CAI is more beneficial with average intelligence level students than lower ones which are further followed by high intelligence level students.
- Comparative enhancement in achievement as a result of CAI was found significantly more among girls than boys.
- The Computer Assisted Instruction has enhanced the achievement of experimental group students in the learning objectives of knowledge, comprehension and application.
- Students retain what they have learnt better with CAI than with conventional instruction alone.
- Researcher found that experimental group students have favourable reaction towards various aspects of Computer Assisted Instruction module and hence, towards CAI.

Precisely, it can be said that Computer Assisted Instruction provides greater opportunities for the students to learn. It is better than the traditional method of learning. It brings an enhancement in achievement and provides new multisensory learning experiences.
5.4.0 EDUCATIONAL IMPLICATIONS OF THE STUDY

Computer seems to be highly promising educational tool, but it is the way computers are used rather than the actual machines themselves that contribute to learning. Researcher is of the opinion that effectiveness of CAI enhanced the learning as demonstrated by the present study, may be attributed to the module used in the experiment and the way it was used. The CAI module used in the study was developed by the researcher as no CAI module was available to serve the purpose. Thus, the technology has demonstrated the great impact on the young minds. This research was an attempt to find out an innovative way of teaching biology and to check the effectiveness of CAI. Following are some of the suggested implications of the present study on the basis of the major findings:

For Teachers:

The results will be helpful-

-in selecting the appropriate instructions for better outcomes of teaching learning process.

-in achieving teaching-learning objectives by imparting education through CAI.

-to develop the learning climate for better adjustment of learners.

-to develop CAI for different topics in different subjects.

-in using this kind of package for slow learners, low achievers as per the need.

-in reducing the workload of the teachers.

-in becoming techno-savvy.

For learners:

The results will be helpful-

-in creating awareness towards CAI.

-in developing interest in the subject matter through CAI.
-in reducing the burden of studies on the students.

-in increasing the curiosity towards such packages.

-in enhancing the retention of the learnt content.

**For Educational institutions:**

The results will be helpful-

- for preparing CAI to enhance the learning of the students.

- for providing facilities to develop CAI.

**For Educational Planners:**

The results will be helpful-

- for providing computer laboratory facilities in educational institutions to develop CAI.

- for making provision to provide training to the teachers for the development of CAI.

**5.5.0 SUGGESTIONS FOR FURTHER STUDY**

The present study throws light on a good number of new areas to be studied by the future researchers. The areas and variables which are not covered by this study may be put to test to enlighten the factors associated with the achievement in different subjects. The findings of the present study have some suggestions for the researchers who want to work in this area. So, the researchers may think of the following areas to study further:
• The present study was confined to the class XII only. Similar researches can be carried out on other classes of school education.
• The present study was confined to the subject ‘Biology’. Other subjects can be considered to develop effective CAI modules to enhance learning of the students.
• The content (Unit-Genetics) of the class XII Biology was according to C.B.S.E curriculum. Further, studies can be extended to the content of other boards of school education like I.C.S.E and various state boards.
• Similar experiments can be done with more variables like locale (rural and urban), medium of instruction (regional and national/English) etc.
• The present study was confined to a small sample; it can further be extended with large sample.
• This kind of study may be conducted in the field of special education to enrich the learning of special students.