Chapter VI

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SUMMARY, CONCLUSIONS AND SUGGESTIONS

The focus of the present study was to develop a Computer Based Instructional Package in Physics at the Higher Secondary Level and to ascertain the relative effectiveness of the package with the existing Activity Oriented Method of Instruction. The final step of a research process demands summarizing the findings of the study and comparing them with the hypotheses formulated in the beginning.

This chapter gives a brief summary of the study in retrospect which includes statement of the problem, objectives of the study, hypotheses formulated for the study, methodology in brief, variables in the study, tools used, procedure of data collection and the statistical techniques used. In the light of analysis and interpretation of the data, conclusions and generalizations have been formulated. The major part of this chapter deals with the conclusions drawn out of the analysis. The educational implications which are the contributions of the study and suggestions for further research are also included at the end of this chapter.

6.1 THE STUDY IN RETROSPECT

In the present study the Investigator has made an attempt to find out the relative effectiveness of Computer Based Instructional Package over existing Activity Oriented Method of Instruction on the achievement in Physics of the higher secondary school students.

6.1.1 Objectives of the Study

1. To prepare a Computer Based Instructional Package in Physics at Higher Secondary School Level.
2. To find out the Achievement of students when taught through Computer Based Instructional Package in Physics at Higher Secondary School Level.
3. To find out the Achievement of students when taught through Activity Oriented Method of Instruction in Physics at Higher Secondary School Level.
4. To compare the gain in Achievement of students when taught through Computer Based Instructional Package and Activity Oriented Method of Instruction.
5. To compare the effectiveness of Computer Based Instructional Package with the Activity Oriented Method of Instruction on the Total Achievement in the selected domains of students in Physics at Higher Secondary School Level.

6. To compare the effectiveness of Computer Based Instructional Package with the Activity Oriented Method of Instruction on the Achievement in Physics of Higher Secondary School students with respect to different domains such as
   a. Knowledge
   b. Application
   c. Process
   d. Attitude
   e. Creativity

7. To compare the difference in the Achievement of students in Physics of the Experimental Group in the different domains such as Knowledge, Application, Process, Attitude and Creativity.

8. To study the effect of Computer Based Instructional Package, Intelligence and their interaction on the Total Achievement in selected domains of students in Physics when pre-achievement was taken as co-variate.

9. To compare the effectiveness of Computer Based Instructional Package in three different modes of testing like Pre-Test, Post-Test and Delayed Post-Test.

6.1.2 Hypotheses of the Study

The hypotheses formulated for the present study were:-

1. Total Achievement in the selected domains in Physics of Higher Secondary School Students taught through Computer Based Instructional Package is significantly higher than those taught through Activity Oriented Method of Instruction.

2. The Achievement in Physics of Higher Secondary School Students taught through Computer Based Instructional Package is significantly higher than those taught through Activity Oriented Method of Instruction with respect to different domains of objectives such as
   a. Knowledge
   b. Application
c. Process  
d. Attitude  
e. Creativity

3. There is significant difference in the Achievement in Physics of students in the Experimental Group in different domains of objectives such as Knowledge, Application, Process, Attitude and Creativity.

4. There is significant effect of Computer Based Instructional Package, Intelligence and their interaction on Total achievement in selected domains of students when pre-achievement was taken as co-variate.

5. There is significant effect of Computer Based Instructional Package in three different modes of testing like Pre-Test, Post-Test and Delayed Post-Test.

6.1.3 Methodology in Brief

The Investigator intended to develop a Computer Based Instructional Package in Physics at the higher secondary school level and tried to find out its relative effectiveness with the existing Activity Oriented Method of Instruction. For the development of the Computer Based Instructional Package the Investigator selected the unit ‘Ray Optics and Optical Instruments’ from the standard XII Physics text book. The study was conducted in the Pre Test-Post Test, Non-equivalent group design, where there was one experimental group and one control group. The Experimental group was taught through the Computer Based Instructional Package and the Control group through existing Activity Oriented Method of Instruction. To compensate for the lack of equivalence among the groups, the technique of Analysis of Covariance (ANCOVA) was applied.

The Investigator adopted simple random sampling technique for the sample selected. 120 students from Standard XII of T.R.K.H.S.S. Vaniyamkulam, Palakkad were selected for the study. These students were divided into two groups; each consists of 60 students, based on their previous achievement. Then one group was randomly selected as experimental group and the other as control group.

In the present study, instruction through Computer Based Instructional Package and Activity Oriented Method of Instruction were the independent variables. The dependent variables selected for the present study was the achievement in Physics of higher secondary school students in different domains of testing.
The tools and materials used for the present study were
1. Questionnaire for Students on Computer Awareness & Learning Difficulties (Developed by the Investigator)
2. Computer Based Interactive Learning Package (Developed by the Investigator)
3. Rating Scale to Teachers for Assessing the Effectiveness of the Computer Based Instructional Package (Developed and Standardized by the Investigator)
4. Lesson Transcripts and Learning Materials Based on Activity Oriented Method of Instruction (Developed by the Investigator).
5. Achievement Test in Physics (Developed and Standardized by the Investigator).
6. Process Skill Assessment Test (Developed and Standardized by the Investigator).
7. Scale of Scientific Attitude (Developed and Standardized by the Investigator).
8. Scientific Creativity Test (Adapted version of the Test Developed and Standardized by Hu and Adey (2002).
9. Intelligence Test (Raven’s Progressive Matrices Test)

6.2 CONCLUSIONS BASED ON FINDINGS

The major conclusions based on the statistical analysis of data obtained from the comparison of the effectiveness of Computer Based Instructional Package and the existing Activity Oriented Method of Instruction are comprehended below under the following subheads.

1. **Computer Based Instructional Package significantly enhanced the Achievement in Physics of the higher secondary school students.**

This conclusion is substantiated by the following findings of the study.

The correlated t- value obtained as a result of paired sample t- test of the pre test and post test scores of the experimental group is 3.55, which is significant at 0.01 level. The mean score of Achievement in Physics of the experimental group at the post stage is 198.08, which is significantly higher than that of the pre stage, where the mean score is 185.00. It may therefore be concluded that Computer Based
Instructional Package could significantly enhance the Achievement in Physics of the higher secondary school students.

2. **There is no significant improvement in the Achievement of students who were taught through Activity Oriented Method of Instruction.**

This conclusion is substantiated by the following findings of the study.

The correlated t- value obtained as a result of paired sample t- test of the pre test and post test scores of the control group is 1.46, which is not significant. The mean score of Achievement in Physics of the control group at the post stage is 184.55, which is not significantly higher than that of the pre stage, where the mean score is 179.37. It may therefore be concluded that existing Activity Oriented Method of Instruction could not significantly enhance the Achievement in Physics of the higher secondary school students.

3. **The gain in Achievement of the experimental group students who were taught through Computer Based Instructional Package is greater than that of the Control group students who were taught through the Activity Oriented Method of Instruction.**

This conclusion is substantiated by the following findings of the study.

The Critical Ratio obtained as a result of the independent sample t- test of the gain scores of the experimental and control groups is highly significant (CR = 2.63, P < 0.01). That is, the mean of the gain scores of the experimental group (17.18) is significantly greater than that of the control group (4.52). Thus it can be concluded that the gain in Achievement of the experimental group students who were taught through Computer Based Instructional Package is greater than that of the control group students who were taught through the Activity Oriented Method of Instruction.

4. **Computer Based Instructional Package is more effective than existing Activity Oriented Method of Instruction on the Total achievement in the selected domains of students in Physics at the higher secondary school level.**

This conclusion is substantiated by the following findings of the study.
The mean post test scores of the experimental group (198.08) that was taught through Computer Based Instructional Package is found to be higher than that of the control group (184.55) that was taught through the existing Activity Oriented Method of Instruction. The Critical Ratio of mean value of post test scores of experimental and control groups (CR=3.14, p<0.01) shows that the experimental group has significant improvement in the Total achievement in Physics after the experiment.

The Gain scores of the experimental and control groups when subjected to mean difference analysis (CR=2.63, p<0.01) showed that there was significant difference between their achievement in the mean gain scores. The mean of the gain scores of the experimental group is 17.18 and that of the control group is 4.52.

The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups on the Total achievement in selected domains in Physics showed that there was a significant difference between the means of the post test scores of the two groups (F-ratio = 8.08, p<0.01). That is the adjusted mean of the post test scores of the Total achievement in Physics of the experimental group (197.30) is significantly higher than that of the control group (185.33). Thus students of the experimental group taught through Computer Based Instructional Package gained significantly higher scores than those taught through the existing Activity Oriented Method of Instruction.

5. **Computer Based Instructional Package is more effective than existing Activity Oriented Method of Instruction on the Achievement in Physics of the higher secondary school students with respect to the Knowledge domain**

This conclusion is substantiated by the following findings of the study.

The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups with respect to the Knowledge domain shows that there is a significant difference between the means of the post test scores of the two groups (F-ratio = 7.56, p<0.01). That is the adjusted mean of the post test scores of the achievement in the Knowledge domain of the experimental group (7.63) is significantly higher than that of the control group (7.17). This implies that the
experimental group is superior to the control group on the Achievement in Physics with respect to the Knowledge domain.

6. **Computer Based Instructional Package is more effective than existing Activity Oriented Method of Instruction on the Achievement in Physics of the higher secondary school students with respect to the Application domain**

This conclusion is substantiated by the following findings of the study.

The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups with respect to the Application domain shows that there is a significant difference between the means of the post test scores of the two groups (F-ratio = 57.94, p<0.01). That is the adjusted mean of the post test scores of the achievement in the Application domain of the experimental group (12.23) is significantly higher than that of the control group (6.10). This implies that the experimental group is superior to the control group on the Achievement in Physics with respect to the Application domain.

7. **Computer Based Instructional Package is more effective than existing Activity Oriented Method of Instruction on the Achievement in Physics of the higher secondary school students with respect to the Process domain**

This conclusion is substantiated by the following findings of the study.

The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups with respect to the Process domain shows that there is a significant difference between the means of the post test scores of the two groups (F-ratio = 18.24, p<0.01). That is the adjusted mean of the post test scores of the achievement in the Process domain of the experimental group (12.87) is significantly higher than that of the control group (11.33). This implies that the experimental group is superior to the control group on the Achievement in Physics with respect to the Process domain.
8. **Computer Based Instructional Package is more effective than existing Activity Oriented Method of Instruction on the Achievement in Physics of the higher secondary school students with respect to the Attitude domain**

This conclusion is substantiated by the following findings of the study.

The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups with respect to the Attitude domain shows that there is a significant difference between the means of the post test scores of the two groups (F-ratio = 6.68, p<0.01). The adjusted mean of the post test scores of the achievement in the Attitude domain of the experimental group (108.65) is significantly higher than that of the control group (106.48). This implies that the experimental group is superior to the control group on the Achievement in Physics with respect to the Attitude domain.

9. **Effectiveness of Computer Based Instructional Package and the Activity Oriented Method of Instruction on the Achievement in Physics of the higher secondary school students with respect to the Creativity domain is more or less the same.**

This conclusion is substantiated by the following findings of the study.

The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups with respect to the Creativity domain shows that there is no significant difference between the means of the post test scores of the two groups (F-ratio = 0.02, p>0.05). That is the adjusted mean of the post test scores of the achievement in the Creativity domain of the experimental group (54.50) is not significantly differs from that of the control group (54.04). This implies that the experimental group and the control group are more or less same in the Achievement in Physics with respect to the Creativity domain.

10. **The Achievement of students in Physics of the experimental group in different domains such as Knowledge, Application, Process, and Attitude are different.**

This conclusion is substantiated by the following findings of the study.
The F-ratio of the mean squares of variance between groups and within groups obtained as a result of one-way Analysis of Variance of achievement of students in different domains of learning is 87.87, (table value is 3.88) which is significant at 0.01 level with df= 3/236. This shows that the mean scores of achievement of students in various domains differ significantly. That is, the mean scores of achievement of higher secondary school students in Knowledge, Application, Process, and Attitude, which are 38.42, 55.63, 42.27 and 80.52 respectively, differ significantly. The scores of the creativity domain were not used for this analysis as there is no significant difference in the creativity domain.

Since there exist a significant difference in the mean scores of achievement of students between any of the four domains, the data were further analyzed with Scheffe post hoc analysis which shows that

10 (a) Attitude and Application domains have got higher achievement compared to Knowledge and Process domains. The achievement in the Process Domain is similar to the Knowledge Domain whereas the achievement in the Attitude domain is greater than the Application domain.

This conclusion is substantiated by the following findings of the study.

i. The mean scores of achievement of students in the Knowledge domain and the Application domain differ significantly (F ratio= 17.217). The mean score of achievement of students in the Knowledge domain is 38.42 and that of the Application domain is 55.63.

ii. The mean scores of achievement of students in the Knowledge domain and the Attitude domain differ significantly (F ratio =42.100). The mean score of achievement of students in the Knowledge domain is 38.42 and that of the Attitude domain is 80.52.

iii. The mean scores of achievement of students in the Knowledge domain and the Process domain do not differ significantly (F ratio =3.850). The mean score of achievement of students in the Knowledge domain is 38.42 and that of the Process domain is 42.27.
iv. The mean scores of achievement of students in the Application domain and the Attitude domain differ significantly (F ratio = 24.833). The mean score of achievement of students in the Application domain is 55.63 and that of the Attitude domain is 80.52.

v. The mean scores of achievement of students in the Application domain and the Process domain differ significantly (F ratio = 13.267). The mean score of achievement of students in the Application domain is 55.63 and that of the Process domain is 42.27.

vi. The mean scores of achievement of students in the Attitude domain and the Process domain differ significantly (F ratio = 38.250). The mean score of achievement of students in the Attitude domain is 80.52 and that of the Process domain is 42.27.

11. Computer Based Instructional Package significantly enhanced the total achievement of the students in comparison to the Activity Oriented Method of Instruction. But there seems to be no significant effect of intelligence and interaction between the treatment and intelligence on the achievement of students.

This conclusion is substantiated by the following findings of the study.

i. The adjusted mean scores of Achievement of students learned through Computer Based Instructional Package and Activity Oriented Method of Instruction differ significantly (adjusted F-value is 7.109, table value is 6.88 which is significant at 0.01 level with df=1/115). That is the adjusted mean score of Achievement of experimental group (197.36) is significantly higher than that of control group (185.87). It may, therefore, be concluded that the Computer Based Instructional Package significantly enhanced the total Achievement of the students in comparison to Activity Oriented Method of Instruction when Pre-Achievement was considered as covariate.

ii. The adjusted mean scores of Achievement of students belonging to above average intelligence and below average intelligence groups do not differ significantly (the adjusted F-Value for intelligence is 0.533; table value is 3.93 which is not significant). That is the adjusted mean score of Achievement of students belonging to above average intelligence group (193.182) is almost
equal to that of below average intelligence group (190.06). It may, therefore, be concluded that intelligence do not influence the total Achievement of students when Pre-Achievement was taken as covariate.

iii. The adjusted mean scores of Achievement of students belonging to above average and below average intelligence when taught through Computer Based Instructional Package and Activity Oriented Method of Instruction did not differ significantly when groups were matched in respect of pre-Achievement (the adjusted F-Value for interaction between treatment and intelligence is 0.32 which is not significant). So there was no significant effect of interaction between treatment and intelligence on Achievement of students when Pre-Achievement was considered as covariate. It may, therefore, be concluded that the Achievement was found to be independent of interaction between treatment and intelligence when Pre-Achievement was taken as covariate.

iv. The main effect of treatment is significant at 0.01 level. That is the F-ratio for the effect of treatment (7.109), which is the influence of the Computer Based Instructional Package is significant at 0.01 level. Another main effect intelligence (F ratio = 0.533) and the interaction effect (F-ratio =0.32), of treatment and intelligence are not significant. The decrease in F-ratio of Achievement from 8.084 to 7.109 is due to the interaction of intelligence. This indicates that the main effect Computer Based Instructional Package contribute positively for enhancing Achievement whereas another main effect and the interaction between treatment and intelligence have no significant effect on Achievement in Physics of the higher secondary school students.

12. **There is retention in the achievement of higher secondary school students while using Computer Based Instructional Package.**

This conclusion is substantiated by the following findings of the study.

The F ratio (9.533) for the three different adjusted cases of Factor 1, obtained as result of one way repeated measures ANOVA of the pre test, post test, and delayed post test scores of the experimental group is significant at 0.01 level. Thus it can be concluded that there is significant difference in both post test and delayed post test scores as compared to the pre test. This can be interpreted as there is retention in the
achievement of higher secondary school students while using Computer Based Instructional Package.

6.3 TENEBILITY OF THE HYPOTHESES

The study provides sufficient evidences to affirm the validity of hypotheses set for it. An attempt has been made to examine the validity of the hypotheses.

1. The first hypothesis formulated by the Investigator states that “total achievement in the selected domains in Physics of Higher Secondary School Students taught through Computer Based Instructional Package is significantly higher than those taught through Activity Oriented Method of Instruction.” The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups on the total achievement in selected domains in Physics shows that the means of the post test scores of the experimental group is significantly higher than that of the control group. The findings of the study substantiate the first hypothesis and this hypothesis stands accepted.

2(a). The hypothesis (2a) formulated by the Investigator states that “the achievement in Physics of Higher Secondary School Students taught through Computer Based Instructional Package is significantly higher than those taught through Activity Oriented Method of Instruction with respect to the Knowledge domain”. The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups with respect to the Knowledge domain in Physics shows that the mean of the post test scores of the experimental group is significantly higher than that of the control group. The findings of the study substantiate the hypothesis (2a) and this hypothesis stands accepted.

2(b) The hypothesis (2b) formulated by the Investigator states that “the achievement in Physics of Higher Secondary School Students taught through Computer Based Instructional Package is significantly higher than those taught through Activity Oriented Method of Instruction with respect to the Application domain”. The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups with respect to the Application domain in Physics shows that the mean of the post test scores of the experimental group is significantly higher than that of the
control group. The findings of the study substantiate the hypothesis (2b) and this hypothesis stands accepted.

2(c) The hypothesis (2c) formulated by the Investigator states that “the achievement in Physics of Higher Secondary School Students taught through Computer Based Instructional Package is significantly higher than those taught through Activity Oriented Method of Instruction with respect to the Process domain”. The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups with respect to the Process domain in Physics shows that the mean of the post test scores of the experimental group is significantly higher than that of the control group. The findings of the study substantiate the hypothesis (2c) and this hypothesis stands accepted.

2(d) The hypothesis (2d) formulated by the Investigator states that “the achievement in Physics of Higher Secondary School Students taught through Computer Based Instructional Package is significantly higher than those taught through Activity Oriented Method of Instruction with respect to the Attitude domain”. The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups with respect to the Attitude domain in Physics shows that the mean of the post test scores of the experimental group is significantly higher than that of the control group. The findings of the study substantiate the hypothesis (2d) and this hypothesis stands accepted.

2(e) The hypothesis (2e) formulated by the Investigator states that “the achievement in Physics of Higher Secondary School Students taught through Computer Based Instructional Package is significantly higher than those taught through Activity Oriented Method of Instruction with respect to the Creativity domain”. The Analysis of Covariance of the pre test and post test scores of students in the experimental and control groups with respect to the Creativity domain in Physics shows that there is no significant difference between the means of the post test scores of the two groups. The findings of the study do not substantiate the hypothesis (2e) and this hypothesis is not accepted.

3. The third hypothesis formulated by the Investigator states that “there is significant difference in the achievement in Physics of students in the Experimental Group in
different domains of objectives such as Knowledge, Application, Process, Attitude and Creativity.” One- way Analysis of Variance of achievement of students in different domains of learning shows that the mean scores of achievement of students in various domains differ significantly. The findings of the study substantiate the third hypothesis and this hypothesis stands accepted.

4. The fourth hypothesis formulated by the Investigator states that “There is significant effect of Computer Based Instructional Package, Intelligence and their interaction on Total achievement in selected domains of students when Pre-Achievement was taken as co-variate.” When analysis of 2x2 factorial design ANCOVA was done to find out the effect of treatment, intelligence and their interaction on Total Achievement by taking pre-achievement as covariate, the main effect of treatment, Computer Based Instructional Package is (F Ratio = 7.109) Significant at 0.01 level and the main effect intelligence (F Ratio = 0.533) and the interaction effect of treatment with intelligence (F-ratio=0.320) are not significant. The findings of the study partially substantiate the sixth hypothesis and this hypothesis stands accepted to some extent.

5. The fifth hypothesis formulated by the Investigator states that “there is significant effect of Computer Based Instructional Package in three different modes of testing like Pre-Test, Post-Test and Delayed Post-Test.” One way repeated measures ANOVA of the pre test, post test, and delayed post test scores of the experimental group is significant at 0.01 level. Thus the findings of the study substantiate the eighth hypothesis and this hypothesis stands accepted.

6.4 CONCLUSIONS

1. Computer Based Instructional Package significantly enhanced the Achievement in Physics of the higher secondary school students.
2. There is no significant improvement in the Achievement of students who were taught through Activity Oriented Method of Instruction.
3. The gain in Achievement of the experimental group students who were taught through Computer Based Instructional Package is greater than that of the Control group students who were taught through the Activity Oriented Method of Instruction.
4. Computer Based Instructional Package is more effective than existing Activity Oriented Method of Instruction on the Total achievement in the selected domains of students in Physics at the higher secondary school level.

5. Computer Based Instructional Package is more effective than existing Activity Oriented Method of Instruction on the Achievement in Physics of the higher secondary school students with respect to the Knowledge domain.

6. Computer Based Instructional Package is more effective than existing Activity Oriented Method of Instruction on the Achievement in Physics of the higher secondary school students with respect to the Application domain.

7. Computer Based Instructional Package is more effective than existing Activity Oriented Method of Instruction on the Achievement in Physics of the higher secondary school students with respect to the Process domain.

8. Computer Based Instructional Package is more effective than existing Activity Oriented Method of Instruction on the Achievement in Physics of the higher secondary school students with respect to the Attitude domain.

9. Effectiveness of Computer Based Instructional Package and the Activity Oriented Method of Instruction on the Achievement in Physics of the higher secondary school students with respect to the Creativity domain is more or less the same.

10. The Achievement of students in Physics of the experimental group in different domains such as Knowledge, Application, Process, and Attitude are different. Attitude and Application domains have got higher achievement compared to Knowledge and Process domains. The achievement in the Process domain is similar to the Knowledge domain whereas the achievement in the Attitude domain is greater than the Application domain.

11. Computer Based Instructional Package significantly enhanced the Total achievement of the students in comparison to the Activity Oriented Method of Instruction. But there seems to be no significant effect of intelligence and interaction between the treatment and intelligence on Achievement of students.

12. There is retention in the achievement of higher secondary school students while using Computer Based Instructional Package.
6.5 EDUCATIONAL IMPLICATIONS

1. The findings of the study revealed that Computer Based Instructional Package is more effective than the existing Activity Oriented Method of Instruction on the achievement in Physics of the higher secondary school students. It is found that students enjoy learning through this package. Hence teachers must be encouraged to incorporate Computer Based Instruction in terms of techniques, methods and materials in the teaching-learning process.

2. From this study it is clear that an individualized system of instruction helps students to attain scientific concepts at their own pace. The study focuses on innovative and democratic classrooms where the child is given freedom to discover, ask questions, etc. Also a variety of learning experiences can be provided in this approach where the child learns to construct his own knowledge through hands-on experience, simulations, drill and practice, etc. When the learner goes through such learning situations, he can plan, monitor and evaluate his own learning and could do necessary corrections in his learning styles. By adopting such an approach in the teaching-learning process, a teacher can make his student an expert learner.

3. The study revealed that Computer Based Instructional Package is effective in the realization of objectives in various domains of science education. Hence while commencing the learning task with regard to its objectives and its nature, appropriate strategy necessary to master it should be selected. For that, the prospective teachers as well as the teachers in service should be sensitized to the need for incorporating such innovative methods or strategies. Also curriculum designers and authorities concerned should also develop awareness on such methods and strategies so that they can arrange materials, which is the need of the hour in the teaching-learning process.

4. Teachers could be given orientations about how Computer Based Instructional materials can be developed through in service training so that they can apply it effectively in the classroom. This will pave the way for optimum human resource development.

5. Keeping the results of the study in mind the agencies responsible for improving the quality of education such as DIET, SCERT, NCERT, UGC, etc.
could take up the task of developing Computer Based Learning Materials for all subjects at all levels.

6. For the development of Computer Based Learning Materials, the NCERT, and SCERT can make use of the service of outstanding teachers at the National as well as the State level so that the expertise of the meritorious teachers can be made available even to the students in far flung areas.

7. The study provides an excellent evidence of the effectiveness of Computer Based Instructional Package based on certain concepts in Physics at the higher secondary level. Generally students are unable to understand a phenomenon just because they have not understood the basic concepts behind it. The study gives importance to learner centeredness where children are given opportunity to explore and discover things on their own and thereby improve their knowledge and understanding in any subject. Even in the absence of the teachers these types of programmes can engage students and prevent wastage of their time. Therefore the potential of Computer Based Instruction should be utilized to enhance the quality of education at school level.

8. National and State level curriculum framers could take steps to make educators aware of the potential of Computer Based Instructional Materials by arranging workshops and seminars.

9. Teacher education institutions could introduce courses to prepare prospective teachers equipped with pedagogy and computer programming skills for the implementation of Computer Based Instruction in education. Also pre service and in service teacher training programmes have to focus on the importance of developing cost effective Computer Based Learning Materials for all levels of students in order to make our school better institutions.

10. The findings of the study implies that this is a self learning style in which immediate feedback is possible, which will motivate the students to regulate and manage their own learning styles and thereby to create an interest among the students as they are free to learn at their own pace.

11. The study revealed that application of proper Computer Based Learning Materials in the classroom would facilitate better learning and retention power of the students. Therefore such approaches should be made available to the learners for the improvement of their learning process.
12. Teachers can utilize the educational software and reduce their time spent in reviewing the lesson.

13. The study has also implications for administrators, principals, teachers, and students for better planning the entire teaching learning process.

14. Educators and the educational officials at every level could move forward with the development and implementation of technology based curriculum.

15. Chalk and talk methods of teaching science could be avoided and new instructional techniques using multimedia package could be put into practice.

16. Parents have to know that they can get rid of substandard guide books by utilizing suitable educational software.

17. In this electronic world Computer is a boon to the field of education at all levels. The resources, therefore has to be utilized fully for maximizing the learning process.

6.6 SUGGESTIONS FOR FURTHER RESEARCH

On the basis of the findings and conclusions of the study, the following suggestions and recommendations are made. Related studies may extend the scope of the present one and further generalizations would be possible.

1. Since the developed Computer Based Instructional Package significantly enhanced the achievement in Physics of the higher secondary school students, the development of such packages are to be encouraged by every teacher at higher secondary level.

2. Since there is no significant improvement in the achievement of students who were taught through Activity Oriented Method of Instruction, teachers can adopt additional inputs so as to make Activity Oriented Method of Instruction more effective.

3. Since the package is not found to be effective with respect to creativity domain, teachers have to provide enough freedom for students for original thinking and for thinking beyond boundaries for development of creativity domain. Learning activities are to be provided in support favouring unique ways of thinking among higher secondary school students.
4. Since intelligence is found to have no significant effect on the achievement of students while using the package, it can be suggested for students of moderate intelligence so as to bring changes in outcome variables.

5. The schools should be equipped with ample facilities to use the technological resources in classrooms.

6. Since the students in the experimental group experienced the difficulty in carrying out various activities stipulated in the package, additional laboratory facilities in terms of time and resources may be provided.

7. Self learning among higher secondary students may be encouraged utilizing the resources of such learning packages.

8. A training programme for higher secondary school teachers for developing and utilizing the Computer Based Learning Material may be organized.

9. The initial survey revealed that students are aware of the use of computers for general purpose. But they are deficient in using computers for study purposes. Therefore students are to be trained along these lines too.

10. The present study has been limited to one school. Investigations could be attempted in respect of other institutions incorporating large sample size and more number of experimental and control groups for more reliable results.

11. A survey can be carried out to find out the awareness of development of Computer Based Instructional Materials among teachers of different educational field.

12. A survey can be undertaken to find out the opinion of pupils towards Computer Based Instructional Package.

13. Studies can be conducted to find out the extent of utilization of modern approaches by teachers in our classroom situations.

14. Studies can be conducted to find out the scope and limitations of utilizing the innovative approaches while implementing the existing curriculum in schools at various levels.