CHAPTER VI

FINDINGS OF THE STUDY, DISCUSSION OF RESULTS, CONCLUSIONS, EDUCATIONAL IMPLICATIONS, SUGGESTIONS FOR FURTHER RESEARCH

6.1 FINDINGS OF THE STUDY

The present study explores the use of modern instructional techniques in the field of Science education for improving the quality of learning and developing favorable attitude of students towards Science. The investigator studied the relative effectiveness of Traditional Teaching method (TTM) and Multimedia Instructional Method (MMIM). A quasi-experimental pre-test post-test control group experimental group design was adopted for the study; in which the control and experimental groups were chosen from a CBSE affiliated English medium school of Delhi as two intact classes of class X equated on the basis of intelligence and socio-economic status. The control group was taught through TTM and the experimental group was exposed to MMIM. In MMIM the investigator used a self-developed and validated multimedia Instructional package (MMIP) to teach the students to teach two units of Science. In this quasi-experimental research effect of instructional treatment (TTM or MMIM) has been assessed on the Science achievement and Science attitude of students. The dependent variables of the study were Science achievement and Science attitude whereas the independent variables were Treatment type, gender and intelligence of students. Both the groups were given instructional treatment for eight weeks. The data collected using relevant tools at pre-test and post-test stage was analyzed by applying appropriate statistical technique in SPSS 20 software. The complete detail of analysis and interpretation is given in the previous chapter (Chapter-V).
The present chapter deals with the detailed description of data analysis and the inferences drawn in form of major findings which are given below:

**6.1.1 Findings related to the pre-test scores of control and experimental groups**

1. No significant difference was found between mean Sciences achievement scores of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before the experimental treatment.

2. No significant difference was found between mean Science achievement scores of male students of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before the experimental treatment.

3. No significant difference was found between mean Science achievement scores of female students of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before the experimental treatment.

4. No significant difference was found between mean Science achievement scores of male and female students of control group (to be taught through TTM) before the experimental treatment.

5. No significant difference was found between mean Science achievement scores of male and female students of experimental group (to be taught through MMIM) before the experimental treatment.

6. No significant difference was found between mean Science achievement scores of students having low intelligence of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before experimental treatment.

7. No significant difference was found between mean Science achievement scores of students having average intelligence of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before experimental treatment.

8. No significant difference was found between mean Science achievement scores of students having high intelligence of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before experimental treatment.
9. A significant difference was found among the students of different categories of intelligence (low, average and high) of control group (to be taught through TTM) with respect to Science achievement scores before the experimental treatment.

10. No significant difference was found among the students of different categories of intelligence (low, average and high) of experimental group (to be taught through MMIM) with respect to Science achievement scores before the experimental treatment.

11. No significant difference was found between mean Science attitude scores of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before the experimental treatment.

12. No significant difference was found between mean Science attitude scores of male students of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before the experimental treatment.

13. No significant difference was found between mean Science attitude scores of female students of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before the experimental treatment.

14. No significant difference was found between mean Science attitude scores of male and female students of control group (to be taught through TTM) before the experimental treatment.

15. No significant difference was found between mean Science attitude scores of male and female students of experimental group (to be taught through MMIM) before the experimental treatment.

16. No significant difference was found between mean Science attitude scores of students having low intelligence of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before the experimental treatment.

17. No significant difference was found between mean Science attitude scores of students having average intelligence of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before the experimental treatment”
18. No significant difference was found between mean Science attitude scores of students having high intelligence of control group (to be taught through TTM) and experimental group (to be taught through MMIM) before the experimental treatment.

19. No significant difference was found among the students of different categories of intelligence (low, average and high) of control group (to be taught through TTM) with respect to Science attitude scores before the experimental treatment.

20. No significant difference was found among the students of different categories of intelligence (low, average and high) of experimental group (to be taught through MMIM) with respect to Science attitude scores before the experimental treatment.

### 6.1.2 Findings related to the post-test scores of control and experimental groups

1. A significant difference was found between mean Science achievement scores of control group (taught through TTM) and experimental group (taught through MMIM) after the experimental treatment.

   The control and experimental groups were compared on the basis of their mean post-test scores in Science achievement and a highly significant difference between the means was observed in favor of experimental group, which was given treatment in form of teaching through MMIP. The results confirmed the effectiveness of MMIM as compared to the TTM in enhancing achievement of the students in Science.

2. A significant difference was found between mean Science attitude scores of control group (taught through TTM) and experimental group (taught through MMIM) after the experimental treatment.

   The control and experimental groups were compared on the basis of their mean post-test Science attitude scores and a highly significant difference between the means was observed. Mean of experimental group, which was given treatment in form of teaching through MMIP was significantly higher as
compared to the control group which was taught through traditional method suggesting the effectiveness of multimedia package in developing favorable attitude towards Science among the students.

6.1.3 Findings related to the mean gain scores of control and experimental groups

To further confirm the effect of instructional treatment on the Science achievement and Science attitude of the students of both the groups were compared on the basis of their mean gain scores in Science achievement and Science attitude. Furthermore, the effect of instructional treatment (Traditional teaching vs Multimedia instructional package) on Science achievement and Science attitude of the students was explored with respect to the gender and intelligence of the students of control and experimental group. T-tests and ANOVA were used to analyze the data.

1. A significant difference was found between mean gain Science achievement scores of control group (taught through TTM) and experimental group (taught through MMIM) after the experimental treatment. Mean gain Science achievement scores of experimental group, was significantly higher as compared to the control group suggesting the effectiveness of the teaching using multimedia package as compared to the traditional method in Science achievement.

2. A gender wise comparison (between group and within group) of mean gain Science achievement scores of the control and experimental group was conducted.

   i. A significant difference was found between mean gain Science achievement scores of male students of control group and experimental group; and female students of control group and experimental group after the experimental treatment. The between group comparison (between control and experimental group) revealed that; both male and female students of experimental group scored significantly higher than control group
suggested that MMIM was found to be more effective as compared to TTM for both the genders.

ii. No significant difference was found between mean gain Science achievement scores of male and female students of control group (taught through TTM); and male and female students of experimental group (taught through MMIM) after the experimental treatment. The within group comparison (within control and experimental group) revealed that; male and female students of both the groups did not differ significantly in their mean gain Science achievement scores i.e. the male and female students of control group; and male and female students of experimental group did not differ significantly. Which further confirms that effect of teaching method is free from the gender biasness.

3. A comparison (between group and within group) of mean gain Science achievement scores of students in control and experimental groups with respect their intelligence was made using t-tests and ANOVA.

i. The between group comparison (between control and experimental groups) revealed that the students of experimental group belonging to all three categories of intelligence i.e. low, average and high have shown a significant higher mean gain in Science achievement as compared to their control group counterparts.

a. The students having low intelligence of experimental group (taught through MMIM) were found to have higher mean gain Science achievement scores as compared to their control group counterparts (taught through TTM).

b. The students having average intelligence of experimental group (taught through MMIM) were found to have higher mean gain Science achievement scores as compared to their control group counterparts (taught through TTM).

c. The students having high intelligence of experimental group (taught through MMIM) were found to have higher mean gain Science achievement scores as compared to their control group counterparts (taught through TTM).
ii. The within group comparison (within control and experimental groups) revealed that there was a significant difference among the mean gain Science achievement scores of all three category of intelligence groups for control as well as for experimental group.

a. A significant difference was found between mean gain Science achievement scores of control group (taught through TTM) with respect to intelligence of students after the experimental treatment. The students belonging to low and average intelligence category differed significantly suggesting that teaching through traditional method discriminates well between the low and average students. Also, observation of the means of different category intelligence groups revealed that by traditional teaching the average students were benefitted most, then high and it was least effective for the low category students in terms of mean gain Science achievement.

b. A significant difference was found between mean gain Science achievement scores of experimental group (taught through MMIM) with respect to intelligence of students after the experimental treatment. The students belonging to average and high intelligence category were differed significantly in terms of mean gain Science achievement scores, suggesting that teaching using MMIP significantly discriminated between students having average and high intelligence. The mean gain scores also suggested that MMIP was most effective for students having average intelligence and least effective for the students having high intelligence. So, it can be concluded that that the students of average intelligence learn and achieve more as compared to the high and low intelligence students when exposed to the multimedia instructional package.

4. A significant difference was found between mean gain Science attitude scores of control group (taught through TTM) and experimental group (taught through MMIM) after the experimental treatment. Mean gain Science attitude score of experimental group, was significantly higher as compared to the control group suggesting the effectiveness of the teaching using multimedia package as
compared to the traditional method in development of favorable attitude towards Science.

5. A gender wise comparison (between group and within group) of mean gain Science attitude scores of the control and experimental group was also conducted.

i. In between group comparison (between control and experimental group) the male students of experimental group (taught through MMIM) were found to have significantly higher mean gain Science attitude scores as compared to male students of control group (taught through TTM) after the experimental treatment, suggesting that multimedia package was very effective for the male students as compared to the traditional teaching method in the development of favorable attitude towards Science.

No significant difference was found between mean gain Science attitude scores of female students of control group (taught through TTM) and experimental group (taught through MMIM) after the experimental treatment. This confirms that traditional and multimedia supported teaching method, both are equally effective for female students in developing favorable attitude towards Science.

ii. In within group comparison (within control and experimental group) no significant difference was found between mean gain Science attitude scores of male and female students of control group (taught through TTM); and male and female students of experimental group (taught through MMIM) after the experimental treatment.; i.e. the male and female students of control group; and male and female students of experimental group did not differ significantly in terms of their Science attitude. Which confirms that the MMIM as well as TTM, both the teaching methods do not discriminate between male and female students in terms of development of favorable attitude towards Science.

6. A comparison (between group and within group) of mean gain Science attitude scores of students in control and experimental groups with respect their intelligence was made using t-tests and ANOVA.
i. The between group comparison (between control and experimental group) revealed the following:

   a. Mean gain Science attitude scores of experimental group (taught through MMIM) was found to be significantly higher as compared to control group (taught through TTM) for the students having low intelligence after experimental treatment, suggesting that teaching through multimedia package is more effective in developing favorable attitude towards Science as compared to the traditional method for the students having low intelligence.

   b. Mean gain Science attitude scores of experimental group (taught through MMIM) was found to be significantly higher as compared to control group (taught through TTM) for the students belonging to average intelligence category after experimental treatment, suggesting that teaching through multimedia package is more effective in developing favorable attitude towards Science as compared to the traditional method for the students belonging to average level of intelligence.

   c. No significant difference was found between mean gain Science attitude scores of high intelligence category students of control group (taught through TTM) and experimental group (taught through MMIM) after experimental treatment signifying that Science attitude of students belonging to high intelligence category is independent of the teaching intervention as the students taught by traditional method and exposed to MMIP have shown similar mean gain with respect to their Science attitude.

ii. A within group comparison (within control and experimental groups) among the mean gain Science scores of three different categories of intelligence for each group, i.e. control and experimental group was made by conducting one way ANOVA.

   a. A significant difference was found between mean gain Science attitude scores of control group (taught through TTM) with respect
to intelligence after the experimental treatment. In control group the students belonging to high and average intelligence category; and high and low intelligence category differ significantly in terms of their mean gain Science attitude scores at post-test stage. Further mean gain consideration for these categories suggested that TTM was found to be most beneficial for the students of high intelligence category and least for the low intelligence category.

b. No significant difference was found between mean gain Science attitude scores of experimental group (taught through MMIM) with respect to intelligence after the experiment.

6.1.4 Findings related to ANCOVA analysis

In the present study the sample selected was intact classroom groups so, it was possible that the results of the analysis of the data on the basis of mean gain score could have affected by the achievement of students at pre-test level. So, to further explore the effect of instructional treatment given to the students on Science achievement and Science attitude the investigator analyzed the data using ANCOVA.

Hence, the pre-test Science achievement scores were taken as covariate, and treatment type and intelligence of the students was taken as independent variables. Same way for the analysis of Science attitude scores the pre-test scores in Science attitude scale were taken as covariate. In this way the, effect of pre-test was partialled out and the resulting adjusted means of the post-test scores of Science achievement and Science attitude were compared.

1. Effect of Treatment, Gender and their interaction on Science achievement by considering pre-test Science achievement scores as co-variable.

i. Main effect of Treatment on Science achievement: The main effect of treatment on the post-test scores of students in Science achievement considering pretest Science achievement scores as covariate was found to be statistically significant. The higher adjusted mean score of experimental group as compared to control group suggested that multimedia instructional method was more
effective as compared to the traditional teaching method in improving achievement in Science.

ii. **Main effect of Gender on Science achievement:** The main effect of gender on the post-test Science achievement scores of students considering pre-test Science achievement scores as covariate was found to be statistically significant. The higher adjusted mean scores of Science achievement for males as compared to females indicated that males performed significantly better after being exposed to treatment in form of teaching through MMIP as compared to females.

iii. **Interaction Effect of Treatment and Gender (Treatment*Gender) on Science achievement:** The interaction effect of treatment and gender on post-test Science achievement scores by considering pre-test Science achievement scores as covariate was found to be statistically not significant. This result suggest that males and females both respond to the teaching strategy in the same way. In, other words it suggests that gender may not be kept in mind while selecting teaching strategy for Science.

2. **Effect of Treatment, Intelligence and their interaction on achievement in Science by considering pre-test scores of Science achievement as co-variable**

i. **Main Effect of Treatment on Science achievement:** The main effect of Treatment on post-test scores of students in achievement in Science by controlling the pre-test Science achievement scores was found to be statistically highly significant leading to the inference that instructional treatment yielded difference in Science achievement scores of school students. The higher adjusted mean score of experimental group as compared to control group suggested that MMIM is more effective in enhancing achievement in Science as compared to the TTM.

ii. **Main effect of Intelligence on Science achievement:** The main effect of Intelligence on post-test scores of students in Science by considering the pre-test Science achievement scores as covariate was found to be statistically significant. It indicates that intelligence of students has a significant main effect on achievement in Science. Since, the main effect for Intelligence on post-test scores of students in Science achievement was found to be statistically
significant, investigator conducted Bonferroni test for pairwise comparisons to interpret it.

Difference between adjusted means of post-test scores of students of High and Average intelligence was found to be statistically significant leading to the inference the students who were in Average Intelligence category scored significantly higher in Science achievement test as compared to High Intelligence category.

Also the difference between adjusted means of post-test Science achievement scores of students having low and average intelligence was found to be statistically significant in favor of average intelligence category indicating significantly good performance by the students in Science achievement test by the students possessing average intelligence as compared to low intelligence.

iii. Interaction Effect of Treatment and Intelligence (Treatment*Intelligence) on Science achievement: The interaction effect of Treatment and Intelligence on post-test scores of students in achievement in Science by considering the pre-test Science achievement scores as covariate was found to be statistically not significant. It indicates that these two independent variables i.e. treatment and intelligence of students do not interact with each other, hence there is no interaction effect of Treatment and Intelligence. This result suggest that overall students having different intelligence levels respond to the teaching strategy in the same way.

3. Effect of Treatment, Gender and their interaction on Science Attitude scores by considering pre-test Science Attitude scores as co-variable.

i. Main Effect of Treatment on Science Attitude: The main effect of Treatment on post-test scores of students in Science attitude by considering the pre-test Science attitude scores as covariate was found to be statistically highly significant leading to the inference that instructional treatment yielded difference in Science attitude scores of school students. The adjusted mean difference between adjusted means of the treatment groups i.e. control and experimental was statistically significant. The higher adjusted mean score of experimental group as compared to control group
suggested effectiveness of the MMIM over TTM for the X class students in the development of positive attitude towards Science.

ii. **Main effect of Gender on Science Attitude:** The main effect of gender on post-test Science attitude scores of students by considering the pre-test Science attitude scores as covariate was found to be statistically not significant indicating that there is no significant main effect of gender on Science attitude of students. By this result it can be inferred that development of favorable attitude towards Science is independent of gender.

iii. **Interaction Effect of Treatment and Gender (Treatment*Gender) on Science Attitude:** The interaction effect of treatment and gender on post-test Science attitude scores by considering the pre-test Science attitude scores as covariate was found to be statistically not significant. It indicates that these two independent variables do not interact with each other, hence there is no interaction effect of Treatment and Gender on attitude of students in Science when pre-test scores in Science attitude were taken as co-variate.

4. **Effect of Treatment, Intelligence and their interaction on Science Attitude scores by considering pre-test Science Attitude scores as co-variable.**

   i. **Main Effect of Treatment on Science attitude:** The main effect of Treatment on post-test Science attitude scores considering the pre-test Science attitude scores as covariate, was found to be statistically significant, leading to the inference that instructional treatment yielded difference in Science attitude scores of school students. The adjusted mean difference between adjusted means of the control and experimental groups was statistically significant. The higher adjusted mean score of experimental group as compared to control group suggested more effectiveness of the MMIP over TTM as the control group was given treatment in form of TTM whereas the experimental group in form of MMIM using MMIP.

   ii. **Main effect of Intelligence on Science attitude:** The main effect of Intelligence on post-test Science attitude scores of students by controlling the pre-test Science attitude scores was found to be statistically significant.
It indicates that Intelligence has a significant main effect on attitude of students in Science.

The difference between adjusted means of post-test scores of Science attitude of students having high and average intelligence was found to be statistically significant. So, by this result it can be inferred that based on the post-test Science attitude scores adjusted for pre-test Science attitude scores, the students who were in high intelligence category exhibited significantly higher favorable attitude towards Science as compared to average intelligence category.

The difference between adjusted means of post-test scores of students of average and low intelligence was statistically not significant suggesting no difference in Science attitude of students having high and low intelligence.

The difference between adjusted means of post-test scores of Science attitude of students having low and high intelligence was found to be statistically significant indicating significantly good performance of the students in Science attitude test having high intelligence as compared to low intelligence.

### iii. Interaction Effect of Treatment and Intelligence (Treatment*Intelligence) on Science Attitude:

The interaction effect of treatment and intelligence on post-test Science attitude scores by considering the pre-test Science attitude scores as covariate was found to be statistically not significant indicating that these two independent variables do not interact with each other, hence there is no interaction effect of Treatment and Intelligence on attitude of students in Science when pre-test scores in Science attitude were taken as co-variate. This result suggest that overall students having different intelligence levels respond to the teaching strategy in the same way.
6.1.5 Findings related to opinion of students of experimental group regarding MMIP analysis

1. Overall opinion of students of experimental group regarding MMIP was found to be positive as they showed a good percentage of agreement i.e. 90% towards the effectiveness of the MMIP.

2. No significant difference was found between the opinion of male and female students of experimental group regarding the effectiveness of MMIP.

6.2 DISCUSSION OF THE RESULTS

The present study was conducted to develop and validate a multimedia instructional package (MMIP) for X standard students in Life Science and find out the effectiveness of multimedia instructional method -MMIM (Teaching using developed MMIP) over traditional teaching method (TTM) in improving Science achievement and developing favorable attitude towards Science. Findings of the study clearly indicated that MMIM can be perceived as a very effective method for improving students’ achievement in Science as well as attitude towards Science as compared to traditional method.

6.2.1 Effectiveness of Multimedia Instructional Package (MMIP) on achievement in Science:

The results of present study revealed that teaching through MMIP enhanced the achievement of students in Science. Several studies have been conducted on the effectiveness of multimedia instructional package. The teaching through multimedia packages were compared to the traditional / conventional teaching. In majority of studies it was found that developed multimedia programs or packages were significantly superior in terms of mean achievement scores obtained by the students in various subjects. Various researches conducted abroad on effectiveness of developed multimedia program other than Science subjects like; Morrison and frick (1993), Meskill (1996), Callaway (1997), Boeglin et. al. (1999), Watkins (1999), Hong e.t.


Some studies depicted no significant difference between the effectiveness of the multimedia and traditional method, like Da’lij (2008).
6.2.2 Comparative effectiveness of Multimedia Instructional Package (MMIP) on achievement in Science with respect to gender of students:

When compared on the basis of mean gain scores, male and female students of experimental groups found to have no significant difference suggesting that multimedia package was equally effective for both the genders in terms of Science achievement. But when the post-test scores of control and experimental groups were compared by considering pre-test Science achievement scores as covariate the main effect of gender was found to be significant. The male students mean scores were significantly higher than female students. This suggested that the multimedia instructional method was more effective for the male students as compared to the female students.

A few researchers have compared gender wise effectiveness of multimedia packages. Like Premila (2001), Lata (2014), Bhutak (2014) found that there is no difference of achievement between the male and female students when exposed to multimedia package. While Ercan (2014) concluded that females are more significantly benefitted by the multimedia package as compared to the males. In the study by Rani (2013), both male and female students were found to have similar achievement in Science when matched on the basis of their Pre-test Science achievement scores.

6.2.3 Comparative effectiveness of Multimedia Instructional Package (MMIP) on achievement in Science with respect to intelligence categories of students:

A comparison of mean gain Science achievement scores of students in control and experimental groups with respect to their intelligence was made using t-tests and found that the students of average intelligence learn and achieve more as compared to the students having high and low intelligence when exposed to the multimedia instructional package.

Similar results were found when the post-test scores of control and experimental groups were compared by considering pre-test Science achievement scores as covariate. The main effect of intelligence was found to be statistically significant. The results indicated that the students in average category were benefitted most by the multimedia
package and there was no difference between low and high intelligence category students.

Tyagi (2011) also found that by learning through CAI module students having average intelligence were benefitted the most in Biology. Similarly, Rani (2013) also compared the students of above and below intelligence groups on the basis of their post-test scores by controlling pretest scores and found no significant difference between the mean scores of the two groups.

6.2.4 Interaction Effect of Treatment and Gender (Treatment*Gender) on Science achievement

The interaction effect of treatment and gender on post-test Science achievement scores by considering pre-test Science achievement scores as covariate was found to be statistically not significant suggesting that males and females both respond to the teaching strategy in the same way. These Results are in agreement with the Rani (2013) who conducted a study entitled “Relative effectiveness of e-content strategy and conventional strategy of teaching Science” and found no interaction between treatment and gender. Similarly Rajaswaminathan (1998) also found no interaction between treatment and gender in his study “Impact of multimedia package on teaching of commerce with reference to selected variables”.

6.2.5 Interaction Effect of Treatment and Intelligence (Treatment*Intelligence) on Science achievement:

The interaction effect of Treatment and Intelligence on post-test scores of students in achievement in Science by considering the pre-test Science achievement scores, was found to be statistically not significant indicating that these two independent variables i.e. treatment and intelligence of students do not interact with each other, hence there is no interaction effect of Treatment and Intelligence. This result suggest that overall students having different intelligence levels respond to the teaching strategy in the same way.

Rani (2013) also showed similar results in her study in which she compared effectiveness of e-content strategy with conventional one. Khirwadkar (1999) and
Rose and Stella (1992) also found no interaction effect of treatment and intelligence of students in their studies related to effectiveness of CAI modules.

6.2.6 Effectiveness of Multimedia Instructional Package (MMIP) on Science attitude of students:

The results of present study discovered that teaching through multimedia enhanced the attitude of students towards Science. A very few studies have been conducted on the effectiveness of multimedia instructional package on Science attitude of students. These results are in agreement with the study of Shah and Khan (2015) and Eracan (2014). Shah and Khan (2015) reported a significant impact of multimedia aided teaching on students’ attitude towards Science and Eracan (2014) also concluded that teaching through multimedia improves students’ attitude towards Science.

6.2.7 Effectiveness of Multimedia Instructional Package (MMIP) on Science attitude with respect to gender of the students:

When compared on the basis of mean gain scores of Science attitude, male and female students of experimental group were found to have no significant difference suggesting that multimedia package was equally effective for both the genders in terms of Science attitude. Which confirms that multimedia instructional package was found to be equally beneficial for both male and female students in developing favorable attitude towards Science.

Similar results were found, when the post-test scores of control and experimental groups were compared by considering pre-test Science achievement scores as covariate, i.e. the main effect of gender was found to be not significant. Hence it confirms that there is no main effect of gender on attitude of students towards Science when pre-test scores in Science attitude were taken as co-variate.
6.2.8 Effectiveness of Multimedia Instructional Package (MMIP) on Science attitude on the basis of intelligence:

The mean gain Science attitude scores of students in control and experimental groups were compared with respect to their intelligence using ANOVA and it was found that there is no significant difference among the students of different intelligence categories in terms of Science attitude. Whereas the main effect of Intelligence on post-test Science attitude scores of students by controlling the pre-test Science attitude scores was found to be statistically significant and the high intelligence group was found to have highest mean Science attitude score. It indicated that Intelligence has a significant main effect on achievement of students in Science when pre-test Science attitude scores are taken as covariate and students in high intelligence group were benefited the most by the multimedia package in terms of development of favorable attitude towards Science.

6.2.9 Interaction Effect of Treatment and Gender (Treatment*Gender) on Science Attitude:

The interaction effect of treatment and gender on post-test Science attitude scores by considering the pre-test scores Science attitude scores as covariate was found to be statistically not significant indicating that these two independent variables do not interact with each other, hence there is no interaction effect of Treatment and Gender on attitude of students in Science when pre-test scores in Science attitude were taken as co-variate.

6.2.10 Interaction Effect of Treatment and Intelligence (Treatment*Intelligence) on Science Attitude:

The interaction effect of treatment and intelligence on post-test Science attitude scores by considering the pre-test Science attitude scores as covariate was found to be statistically not significant indicating that these two independent variables do not interact with each other, hence there is no interaction effect of Treatment and Intelligence on attitude of students in Science when pre-test scores in Science attitude were taken as co-variate.
6.3 CONCLUSIONS

The main aim of the present study was to develop a Multimedia Instructional Package (MMIP), and assess its effectiveness as compared to the traditional teaching method. The MMIP was prepared for two topics of Life Science (Life processes; and Control and Coordination) for X standard students based on CBSE curriculum. The developed MMIP was validated through a rigorous process with the help of various educationists, technology experts and subject experts. To compare the effectiveness of the MMIP a quasi-experimental pre-test post-test control group and experimental group design was adopted. The control group was taught through TTM and the experimental group through MMIM. The comparison of TTM and MMIM is not only comparison of two modes of instructions but two theoretical paradigms. In the traditional teaching method the learner is a passive recipient of the knowledge given by the teacher whereby making teacher a very important component of this strategy. Whereas MMIM represents a paradigm where the learner is the creator and innovator of knowledge. Thus role of a learner is very active in MMIM and the learning is self-paced. Since the past decade, the use of computers in educational field has been increased dramatically and it is now being considered as very effective for better learning and retention of the subject knowledge. The present study was conducted to find an empirical proof that, whether multimedia package was effective in enhancing achievement of X standard students in Science and how far this was helpful in developing favorable attitude of students towards Science.

On the basis of discussion of results following conclusions can be derived:

1. Teaching using MMIP improved the Science achievement of the students of experimental group as compared to the control group which was taught through traditional teaching method.

2. MMIP was found to be more beneficial for the male students as compared to the female students in terms of achievement in Science when pre-test Science achievement scores were taken as covariate.
3. MMIP was found to be most effective for the students belonging to average category of intelligence in terms of Science achievement when pre-test Science achievement scores were taken as covariate.

4. The interaction effect of treatment and gender on post-test Science achievement scores by considering pre-test Science achievement scores was found to be not significant.

5. No interaction effect of Treatment and Intelligence was found on post-test Science achievement by considering pre-test Science achievement scores as covariate. This result suggest that overall students having different intelligence levels respond to the teaching strategy in the same way.

6. Teaching using MMIP improved Science attitude of the students of experimental group as compared to the control group which was taught through traditional teaching method when pre-test Science achievement scores were taken as covariate.

7. MMIP was found to be equally beneficial for male as well as for female students in developing favorable attitude towards Science when pre-test Science attitude scores were taken as covariate.

8. MMIP was found to be most effective for the students of high intelligence category when pre-test Science attitude scores were taken as covariate in terms of Science attitude i.e. students in high intelligence group were benefited the most by the multimedia package in terms of development of favorable attitude towards Science.

9. No interaction effect of Treatment and Gender on attitude of students towards Science was found when pre-test scores in Science attitude were taken as co-variate.

10. No interaction effect of Treatment and Intelligence on attitude of students towards Science was found when pre-test scores in Science attitude were taken as co-variate.

11. Overall the students of experimental group were found to have favorable attitude towards developed MMIP.

12. Male and female students of experimental group were found have similar attitude towards the developed MMIP.
Precisely, it has been concluded by the researcher that use of multimedia technology in the field of education can enhance capacity of the teacher as well as of learner. If the multimedia is used with balance it can revolutionize the sphere of Science education by giving more and more space to the learner for exploration and self-paced learning. As, Science achievement and Science attitude both were found to have positively impacted through the use of multimedia package, it can also be concluded that the appropriately developed multimedia package in Science subjects may contribute to prepare a sole new generation of learners having positive attitude towards Science and having high achievement in Science.

6.4 EDUCATIONAL IMPLICATIONS

At school level or higher level, giving information to the students is emphasized which is not the sole objective of teaching. Along with giving information about various concepts of the topics given in the text books the other objectives of the Science education include: developing understanding, power of expression, reasoning and thinking power, value concepts and value clarification, tolerance, risk taking capacity and scientific temper among students etc. With the limitation of the infrastructure of the schools, large class size, non-availability of teachers, quality of teachers and their inadequate training it is difficult to achieve all the major and minor objectives of teaching. The traditional teaching method does not have potential to achieve majority of the objectives. Whereas it has been observed that by teaching using these multimedia packages a teacher can successfully achieve most of the teaching objectives efficiently. The learners are no more passive rather they become active and explore the knowledge with their own pace by understanding each and every minute concept. When the complexities of the Science subject become easily understandable by the simple explanation with relevant examples and interesting because of the element of animation, video and narration etc. students gradually start taking interest in Science. This interest slowly develops their positive attitude towards Science. So, multimedia
package not only improves Science achievement but it also contributes towards the development of positive attitude towards Science.

The present study has a wide range of implications in the field of education. Some of them are given as follows:

1. Multimedia packages make teaching and learning process more interesting and interactive for the teachers as well as for learners.

2. The multimedia instructional package changes the role of a teacher, as it is no longer only dispenser of information but has got transformed as a facilitator for the better learning and understanding of concepts by the students.

3. The results of the study indicate that by using multimedia package as an aid the achievement of the students in Science improved significantly. Thus, teachers are suggested that they should create a suitable environment in the classroom which could motivate and support the students to participate in the learning by understanding. Appropriate guidelines should also be provided to the teachers about the effective use of the multimedia package.

4. Multimedia instructional packages should be introduced as an essential aid in schools for teaching Science as they have a significant effect on students’ achievement as well as on their attitude towards Science.

5. The use of computers in education is gaining momentum in present era. Government of India has also initiated various projects at national and state level and has set up labs for higher and senior secondary schools. But the infrastructure is of no use without the appropriate courseware of multimedia packages. So, in the field of education development of packages should be also given consideration. Government should also take initiative to get the packages developed in collaboration with different agencies like NCERT, SCERT, IGNOU, and CIET etc.

6. Teachers should also be given training in development of multimedia packages so as it will help them to create customized packages according to the need of their students and according to their situational requirements. In this way they will not be dependent on the external agency or aid for the multimedia package. So, in-service programs can also be planned for the training of the teachers.
7. Pre-service programs should also be devised so as the future teachers can equip themselves with the necessary skills required for the planning and development of need based multimedia packages.

8. The Department of Education of each state should organize workshops and seminars for teacher educators so that they can persuade the pupil teachers for developing and using multimedia programs for making their classroom teaching more effective.

9. Private organizations should also be encouraged to develop appropriate multimedia programs, softwares and packages in various subjects for the students and teachers.

10. Local subject and technical experts should also be encouraged to contribute towards development of quality multimedia packages of various subjects and for various standards.

6.5 SUGGESTIONS FOR FURTHER RESEARCH

All the aspects of the present problem could not be covered due to scarcity of time and resources. The study can be further elaborated on various aspects, as given below:

1. The present study was confined only to Science subject; so further researches may be directed for various other subjects.

2. The present study was delimited to the X standard only, so further researches may be conducted for other standards also.

3. The present study was confined to only two topics of Life Science. So, further studies may be conducted by developing multimedia packages for various other topics of Science.

4. The sample of the present study was confined to 80 students only from one school. Studies may also be conducted by taking larger samples from various schools.

5. The present study was delimited to only one type of school i.e. private, so further research may be conducted by taking different types of schools like government, Kendriya Vidalaya, Navodaya Vidalaya etc.
6. A comparative study between different types of schools may also be conducted.
7. The sample school was taken from urban area of Delhi, so further researches may be conducted by taking sample from rural area.
8. A comparative study of effectiveness of multimedia package on achievement of urban and rural Science students may also be conducted.
9. The present study was conducted to compare the effectiveness of the teaching using multimedia package and traditional method. Further comparative studies may be conducted with various other modern teaching methods like project, discussion and tutorial etc.
10. The present study was confined to studying the effect of multimedia package on Science achievement and Science attitude only, further studies may be conducted to see the effect of multimedia package on various other variables like self-concept, creativity, problem solving, decision making etc.
11. Studies may also be conducted to see the effect of multimedia package on the various dimensions of objectives i.e. knowledge, understanding, application etc.
12. Further studies may also be conducted to know the cost benefit analysis of educational multimedia packages, their development and use.
13. The study was conducted using quasi-experimental design. Further researches may be conducted by employing true-experimental designs using randomized sample.