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CHAPTER V

SUMMARY OF THE STUDY, CONCLUSIONS AND SUGGESTIONS

In every research, the investigator aims to reach at sound conclusions and valid generalizations based on the analysis and interpretation of data collected. This chapter presents an overview of the study, the main findings of the study, suggestions of the study and suggestions for further research.

5.1 AN OVERVIEW OF THE STUDY

The present study is designed to find out the influence of certain selected psycho-social correlates in the acquisition of biological concepts of pupils at secondary level.

5.1.1 Statement of the Problem

The present study is entitled as “A STUDY OF THE INFLUENCE OF CERTAIN PSYCHO-SOCIAL CORRELATES ON PUPILS IN THE ACQUISITION OF BIOLOGICAL CONCEPTS AT SECONDARY LEVEL”

5.1.2 Objectives of the study

This study has the following objectives;

1) To identify whether there is significant difference between the sub samples of secondary school students with respect to the
selected psycho-social correlates such as intelligence, attitude
towards science, home environment and study habits.

2) To understand whether there is significant difference between
the sub samples of secondary school students with regard to
their acquisition of biological concepts.

3) To identify whether there exists any significant relationship
between the acquisition of biological concepts and the selected
psycho-social correlates such as intelligence, attitude towards
science, home environment and study habits for the total
sample, sub samples of secondary school students and sub
categories of the selected psycho-social correlates.

4) To find out whether there is significant relationship between the
acquisition of biological concepts and combined effect of the
four selected psycho-social correlates, for the total sample and
sub samples of secondary school students.

5) To compare the relationships between acquisition biological
concepts and each of the selected psycho-social correlates of
pupils at secondary level.

6) To understand the influence of background variables like sex,
location of school and type of management of school on the
acquisition of biological concepts as well as on the selected
psycho-social correlates of secondary school pupils.
7) To understand the influence of the selected psycho-social correlates on the acquisition of biological concepts of pupils at secondary level.

5.1.3 Hypotheses of the study

The hypotheses formulated for the study are the following:

**Hypothesis I**
There is significant difference between the sub samples of secondary school students with respect to the selected psycho-social correlates such as intelligence, attitude towards science, home environment and study habits.

**Hypothesis II**
There is significant difference between the sub samples of secondary school students with regard to their acquisition of biological concepts.

**Hypothesis III**
There exists significant and positive relationship between the acquisition of biological concepts and intelligence for the total sample and sub samples of secondary school students.

**Hypothesis IV**
There exists significant and positive relationship between the acquisition of biological concepts and the attitude towards science for the total sample and sub samples of secondary school students.
Hypothesis V

There exists significant and positive relationship between the acquisition of biological concepts and the home environment, for the total sample and sub samples of secondary school students.

Hypothesis VI

There exists significant and positive relationship between the acquisition of biological concepts and the study habits for the total sample and sub samples of secondary students.

Hypothesis VII

There exists significant relationship between acquisition of biological concepts and combined effect of the four selected psycho-social correlates, for the total sample and sub samples of secondary school students.

Hypothesis VIII

There is significant difference between the relationships of acquisition of biological concepts and each of the selected psycho-social correlates of pupils at secondary level.

Hypothesis IX

The background variables like sex, location of school, and type of management of school have significant influence on the acquisition of biological concepts as well as on the selected psycho-social correlates of secondary school pupils.
Hypothesis X

The selected psycho-social correlates have significant influence on the acquisition of biological concepts of secondary school pupils.

5.1.3 Variables of the study

For the present study ‘Acquisition of Biological concepts’ is taken as the dependant variable. The four selected psycho-social correlates such as ‘Intelligence’, ‘Attitude towards science’, ‘Study habits’ and ‘Home environment’ are taken as independent variables in this study.

5.1.4 Methodology of the study in brief

Normative survey method is used for the present study. The major tools used for the collection of data are

1) Test of biological concepts
2) Home environment questionnaire
3) Study habits inventory
4) Scale of attitude towards science
5) Intelligence test

For the selection of sample, stratified random sampling technique was adopted. 800 pupils of standard IX drawn from 20 secondary schools in Ernakulam revenue district were used as the sample for the study. In the selection of sample due representation is given to rural-urban locale of the schools of the subjects, type of management of school and geographical
distribution of schools. All the different tools were administered to the selected sample and the data was collected and analysed using appropriate statistical techniques. The major statistical techniques used were the two tailed test of significance of difference between means, ANOVA, Pearson's product-moment coefficient of correlation, test of significance of difference between coefficients of correlation, partial correlation, multiple correlation, multiple regression analysis and multiple classification analysis.

5.2 MAJOR FINDINGS OF THE STUDY

The major findings emerged from the study are given under appropriate heads as below.

SIGNIFICANCE OF DIFFERENCE IN MEAN SCORES OF SELECTED PSYCHO-SOCIAL CORRELATES - Based on test of significance of difference in means

1) When the mean scores of intelligence were compared, the sub samples based on sex, location of school and management of school showed significant difference. That is, mean scores for intelligence test showed difference between boys and girls (t=2.552; p<0.05) and girls were found to be the high scorers. Similarly the mean scores of intelligence test showed difference between urban school pupils and rural school pupils (t=4.472; p<0.01) and urban school pupils were the high scorers. There was
also difference in the scores of intelligence test between private school pupils and government school pupils (t=3.181; p<0.01) and private school pupils were found to be the high scorers. It is also found that 32.375% of the total sample is low scorers in intelligence (scores below mean - standard deviation), 39.5% of the total sample is medium scorers in intelligence (scores between mean + standard deviation and mean - standard deviation) and 28.125% of the sample is high scorers in intelligence (scores above mean + standard deviation).

2) When the mean scores of attitude towards science were compared, the sub samples based on sex, location of school and management of school did not show significant difference. That is, scores for scale of attitude towards science, for boys and girls, for urban school pupils and rural school pupils, for government school pupils and private school pupils are almost the same. It is also found that 31.625% of the total sample is low scorers in attitude towards science (scores below mean - standard deviation), 35.125% of the total sample is medium scorers in attitude towards science (scores between mean + standard deviation and mean - standard deviation). 33.25% of the sample is high scorers in attitude towards science (scores above mean + standard deviation).

3) When the mean scores of home environment were compared, the sub samples based on sex and location of school showed
significant difference. While the sub samples based on type of management of school did not show any significant difference. That is, mean scores for home environment questionnaire showed difference between boys and girls \( (t=2.523; \ p<0.05) \) and girls were found to be the high scorers. Similarly the mean scores for home environment questionnaire showed difference between urban school pupils and rural school pupils \( (t=2.954; \ p<0.01) \) and rural school pupils were the higher scorers. But the mean scores for home environment questionnaire of private school pupils and government school pupils are almost the same. It is also found that 33.375% of the total sample are low scorers in home environment\( (\text{scores below mean - standard deviation}) \) 39.375% of the total sample are medium scorers in home environment \( (\text{scores between mean + standard deviation and mean - standard deviation}) \) and 27.25% of the total sample are high scorers in home environment\( (\text{scores above mean + standard deviation}) \).

4) In the comparison of mean scores of study habits inventory, the sub samples based on sex and type of management of school showed significant difference. While sub samples based on locale of school did not show any significant difference. That is, mean scores for study habits inventory showed difference between boys and girls \( (t=3.257; \ p<0.01) \) and girls were found to be the high scorers. In the same way the mean scores for study habits inventory showed difference between government school pupils
and private school pupils (t=3.088; p<0.01) and private school pupils were the higher scorers. But the mean scores for of urban school pupils and rural school pupils are almost the same. It is also found that 35.375% of the total sample are low scorers in study habits (scores below mean - standard deviation) 36.25% of the total sample are medium scorers in study habits (scores between mean + standard deviation and mean - standard deviation) and 28.375% of the total sample are high scorers in study habits (scores above mean + standard deviation).

SIGNIFICANCE OF DIFFERENCE IN MEAN SCORES OF ACQUISITION OF BIOLOGICAL CONCEPTS- Based on test of significance of difference in means

5) When mean scores test of biological concepts were compared, the sub samples based on sex and location of school showed significant difference. While sub samples based on type of management of school did not show any significant difference. That is, mean scores for test of biological concepts showed difference between boys and girls (t=3.554; p<0.01) and girls were found to be the high scorers. Similarly the mean scores test of biological concepts showed difference between urban school pupils and rural school pupils (t=3.25; p<0.01) and rural school pupils were the higher scorers. But the mean scores for test of biological concepts of private school pupils and government school pupils are almost the same.
6) There is significant difference in the mean scores of biological concepts between low and medium scorers in intelligence, low and high scorers in intelligence, and between medium and high scorers in intelligence. The 't' values of the tests of significance of difference in mean scores of biological concepts obtained between low and medium intelligence group (22.103), between low and high intelligence group (40.583) and between medium and high intelligence group (22.371), are showing significance at 0.01 level. Hence the acquisition of biological concepts by each of these groups compared is significantly different and among these groups, medium intelligence group, high intelligence group and high intelligence group respectively are the high scorers in these comparisons.

7) There is significant difference in the mean scores of biological concepts between low and medium scorers in attitude towards science, low and high scorers in attitude towards science, and between medium and high scorers in attitude towards science. The 't' values of the tests of significance of difference in mean scores of biological concepts between low and medium attitude towards science group (17.42), between low and high attitude towards science group (38.064) and between medium and high attitude towards science group (21.24) are showing significance at 0.01 level. Hence the acquisition of biological concepts by each of these groups compared is significantly different and among these groups medium attitude towards science group, high attitude towards science group and high
attitude towards science group respectively are the high scorers in these comparisons.

8) There is significant difference in the mean scores of biological concepts between low and medium scorers in home environment, low and high scorers in home environment and between medium and high scorers in home environment. The 't’ values obtained between low and medium home environment group (22.037), between low and high home environment group (35.949) and between medium and high home environment group (18.3) are showing significance at 0.01 level. Therefore the acquisition of biological concepts by each of these groups compared is significantly different and among these groups, medium home environment group, high home environment and high home environment group respectively are the high scorers in these comparisons.

9) There is significant difference in the mean scores of biological concepts between low and medium scorers in study habits, low and high scorers in study habits and between medium and high scorers in study habits. The 't’ values of the tests of significance of difference in mean scores of biological concepts obtained between low and medium study habits group (25.667), between low and high study habit group (45.811) and between medium and high study habit group (23.24) are showing significance at 0.01 level. Hence the acquisition of biological concepts by each of these groups compared is significantly different and among these groups, medium study habits group, high
study habits group and high study habits group respectively are the high scorers in these comparisons.

10) In the comparison of mean scores of test of biological concepts, the sub samples based on sex, location of school and type of management of school of sub categories of intelligence such as high, medium and low showed significant difference in certain comparisons while no significant difference was seen in other comparisons. These comparisons can be summarized as follows.

**Significant difference:**
- Between sub samples based on management of school of Medium Intelligence group (MI.G), where government school pupils are the high scorers ($t = 2.676$).
- Between the sub samples based on sex of High Intelligence Group (HI.G), where girls are the high scorers ($t = 5.497$).

**No significant difference:**
- Between the sub samples based on sex, locale and type of management of school of Low Intelligence Group (LI.G)
- Between sub samples based on sex and locale of school of Medium Intelligence Group (MI.G).
- Between sub samples based on locale and type of Management of school of High Intelligence Group (HI.G)
11) When mean scores of test of biological concepts were compared, the sub samples based on sex, location of school and type of management of school of sub categories of attitude towards science such as high, medium and low showed significant difference in certain comparisons while no significant difference was seen in other comparisons. These comparisons can be summarized as follows.

Significant difference:

Between sub samples based on sex (t=2.181) and locale of school (t=4.999) of Low Attitude towards science Group (LAs.G), where, girls, urban school pupils respectively are the better scorers.

Between the sub samples based on sex (t=7.747), locale of school (t=7.978) of Medium Attitude towards science Group (MAs.G), where girls, urban school pupils respectively are the high scorers.

Between sub samples based on sex (t=7.354) and locale of school (t=4.913) of High Attitude towards science Group (HAs.G), where, girls, urban school pupils respectively are the better scorers.
No significant difference: Between the sub samples based on type of management of school of Low Attitude towards science Group (LAs.G)

Between the sub samples based on type of management of school of Medium Attitude towards science Group (MAs.G)

Between sub samples based on type of management High Attitude towards science Group (HAs.G)

12) In the comparison of mean scores of test of biological concepts, the sub samples based on sex, location of school and type of management of school of sub categories of home environment such as high, medium and low showed significant difference in certain comparisons while no significant difference was seen in other comparisons. These comparisons can be summarized as follows.

Significant difference: Between sub samples based on locale (t=3.78) and type of management of school (t=3.653) of Low Home environment group (LHe.G), where urban school pupils, private school pupils respectively are the high scorers.
Between the sub samples based on sex (t=1.966) of Medium Home environment Group (MHe.G), where girls are the high scorers.

Between sub samples based on sex (t=4.337) and type of management of school (t=3.298) of High Home environment group (HHe.G), where, girls, private school pupils respectively are the high scorers.

No significant difference: Between the sub samples based on sex of school of Low Home environment Group (LHe.G)

Between sub samples based on locale and type of management of school of Medium home environment Group (M.He.G).

Between sub samples based on locale of school of High Home environment Group (HHe.G)

(13) When mean scores of test of biological concepts were compared, the sub samples based on sex, location of school and type of management of school of sub
categories of study habits such as high, medium and low showed significant difference in certain comparisons while no significant difference was seen in other comparisons.

These comparisons can be summarized as follows.

**Significant difference:**
- Between sub samples based on sex \(t=2.626\) and locale of school \(t=4.062\) of Low Study habits Group (LSh.G), where, boys, urban school pupils respectively are the better scorers.
- Between the sub samples based on locale \(t=4.761\) and type of management of school \(t=2.993\) of Medium Study habits Group (MSh.G), where urban school pupils, government school pupils respectively are the high scorers.
- Between sub samples based on sex \(t=4.554\) of High Study habits Group (HSh.G), where, girls are the better scorers.

**No significant difference:**
- Between the sub samples based on type of management of school of Low study habits Group (LSh.G)
- Between the sub samples based on sex of Medium Study habits Group (MSh.G)
Between sub samples based on location and type of management of school of High Study habits Group (HSh.G).

SIGNIFICANCE OF DIFFERENCE IN MEAN SCORES OF ACQUISITION OF BIOLOGICAL CONCEPTS - Based on Analysis Of Variance (ANOVA)

14) The acquisition of biological concepts of high medium and low groups in intelligence is significantly different. The mean scores of biological concepts of low group (17.83), medium group (24.83) and high group (32.49) show variation. Analysis of Variance (ANOVA) applied for studying the variation in the mean scores of acquisition of biological concepts of high, medium and low groups in intelligence. The F value (860.71) reveals that these variations are significant at 0.01 level. Thus with an increase in score of intelligence, there is a corresponding increase in score of biological concepts.

15) The acquisition of biological concepts of high, medium and low group in attitude towards science are significantly different. The mean score of acquisition of biological concepts of low group (18.02), medium group (24.13) and high group (31.72) show variation. Analysis of Variance (ANOVA) is applied to study the variation in the mean scores of acquisition of biological concepts of high, medium and low groups in attitude towards science. The F value (728.09) reveals that, these variations are significant at 0.01
level. That is, for an increase in mean score of attitude towards science, there is a corresponding increase in the mean score of biological concepts.

16) The acquisition of biological concepts of high, medium and low group in home environment are significantly different. The mean score of acquisition of biological concepts of low group (17.99), medium group (25.30) and high group (32.11) show variation. Analysis of Variance (ANOVA) is applied to study the variation in the mean scores of acquisition of biological concepts of high, medium and low groups in home environment. The F value (697.76) shows that these variations are significant at 0.01 level. Thus for an increase in mean score of home environment, there is a corresponding increase in the mean score of acquisition of biological concepts.

17) The acquisition of biological concepts of high, medium and low group in study habit are significantly different. The mean score of acquisition of biological concepts of low group (17.82), medium group (25.26) and high group (32.64) show variation. Analysis of Variance (ANOVA) is applied to study the variation in the mean scores of acquisition of biological concepts of high, medium and low groups in study habits. The F value (1101.90) shows that these variations are significant at 0.01 level. That means with an increase in mean score of study habits, there is a corresponding increase in the mean score of acquisition of biological concepts.
RELATIONSHIP BETWEEN ACQUISITION OF BIOLOGICAL CONCEPTS AND INTELLIGENCE

Relationship between acquisition of biological concepts and intelligence—based on Pearson's product-moment coefficient of correlation

18) There is positive and high relationship between acquisition of biological concepts and intelligence for the total sample, sub samples based on sex, locale of school and type of management of school and sub samples based on sex of urban private school pupils and urban government school pupils, rural private school pupils and rural government school pupils. These relationships are summarized as follows.

For total sample ($r=0.892$), ($t=55.74$), 0.99 confidence interval of $r'$-

between 0.873 and 0.911.

For boys ($r=0.86$), ($t=33.62$), 0.99 confidence interval of $r'$-

between 0.826 and 0.894.

For girls ($r=0.913$), ($t=44.65$), 0.99 confidence interval of $r'$-

between 0.891 and 0.934.

For urban school pupils ($r=0.898$), ($t=40.72$), 0.99 confidence interval of $r'$-

between 0.873 and 0.923.

For rural school pupils ($r=0.884$), ($t=37.72$), 0.99 confidence interval of $r'$-

between 0.885 and 0.912.

For government school pupils ($r=0.91$), ($t=41.25$), 0.99 confidence interval of $r'$-
between 0.886 and 0.933.
For private school pupils ($r=0.883$), ($t=39.60$), 0.99 confidence interval of ‘$r$’-
between 0.856 and 0.910.
For urban government school boys ($r=0.9$), ($t=18.95$), 0.99 confidence interval of ‘$r$’-
between 0.847 and 0.953.
For urban private school boys ($r=0.765$), ($t=12.59$), 0.99 confidence interval of ‘$r$’-
between 0.664 and 0.866.
For rural government school boys ($r=0.91$), ($t=20.37$), 0.99 confidence interval of ‘$r$’-
between 0.862 and 0.958.
For rural private school boys ($r=0.842$), ($t=16.39$), 0.99 confidence interval of ‘$r$’-
between 0.771 and 0.913.
For urban government school girls ($r=0.92$), ($t=22.09$), 0.99 confidence interval of ‘$r$’-
between 0.878 and 0.962.
For urban private school girls ($r=0.943$), ($t=29.40$), 0.99 confidence interval of ‘$r$’-
between 0.916 and 0.971.
For rural government school girls ($r=0.883$), ($t=17.67$), 0.99 confidence interval of ‘$r$’-
between 0.828 and 0.943.
For rural private school girls ($r=0.883$), ($t=19.57$), 0.99 confidence interval of ‘$r$’-
between 0.828 and 0.937.

19) There is positive and substantial relationship between acquisition of biological concepts and sub categories of intelligence such as low,
medium and high in intelligence. These relationships are summarized as follows.

For the low group in intelligence \((r=0.627), (t=12.90), 0.99\) Confidence interval of \(r\) –
between 0.529 and 0.724.

For the medium group in intelligence \((r=0.505), (t=10.39), 0.99\) Confidence interval of \(r\) –
between 0.397 and 0.613.

For the high group in intelligence \((r=0.674), (t=13.62), 0.99\) Confidence interval of \(r\) –
between 0.579 and 0.768.

The Relationship between Acquisition of Biological concepts and Intelligence—Based on Partial Correlation

(20) There is positive and significant relationship between acquisition of biological concepts and intelligence, when the effects of attitude towards science, home environment and study habits are partialled out using partial correlation technique for the total sample and sub samples based on sex, locale and management of school of secondary school pupils. The partial correlation coefficients thus obtained \((r_{12.345})\) are showing significance at 0.01 level, for the total sample and sub samples. The \(r_{12.345}\) values for boys (0.445), for girls (0.359), for urban school students (0.386), for rural school students (0.386), for government school students (0.468), for private school students (0.348) and for the total sample (0.414) are all positive also. In all these cases the values of partial correlation coefficient are lower than the respective values of Pearson's
product-moment coefficient of correlation ‘r’ between acquisition biological concepts and intelligence for the total sample and different sub samples of secondary school students based on sex, location of school and the type management of school.

RELATIONSHIP BETWEEN ACQUISITION OF BIOLOGICAL CONCEPTS AND ATTITUDE TOWARDS SCIENCE

Relationship between acquisition of biological concepts and attitude towards science—based on Pearson’s product–moment coefficient of correlation

21) There is positive and high relationship between acquisition of biological concepts and attitude towards science for the total sample, sub samples based on sex, locale of school and type of management of school and sub samples based on sex of urban private school pupils and urban government school pupils, rural private school pupils and rural government school pupils. These relationships are summarized as follows.

For total sample (r=0.873), (t=50.53), 0.99 confidence interval of ‘r’-

between 0.852 and 0.895.

For boys (r=0.841), (t=31.01), 0.99 confidence interval of ‘r’-

between 0.804 and 0.879.

For girls (r=0.922), (t=47.49), 0.99 confidence interval of ‘r’-

between 0.902 and 0.941.
For urban school pupils \((r=0.874)\), \((t=35.88)\), 0.99 confidence interval of 'r'-
between 0.844 and 0.905.

For rural school pupils \((r=0.905)\), \((t=42.44)\), 0.99 confidence interval of 'r'-
between 0.881 and 0.928.

For government school pupils \((r=0.853)\), \((t=30.71)\), 0.99 confidence interval of 'r'-
between 0.815 and 0.890.

For private school pupils \((r=0.888)\), \((t=40.64)\), 0.99 confidence interval of 'r'-
between 0.863 and 0.914.

For urban government school boys \((r=0.781)\), \((t=11.45)\), 0.99 confidence interval of 'r'-
between 0.672 and 0.890.

For urban private school boys \((r=0.795)\), \((t=13.87)\), 0.99 confidence interval of 'r'-
between 0.706 and 0.884.

For rural government school boys \((r=0.966)\), \((t=34.66)\), 0.99 confidence interval of 'r'-
between 0.781 and 1.151.

For rural private school boys \((r=0.909)\), \((t=22.86)\), 0.99 confidence interval of 'r'-
between 0.866 and 0.952.

For urban government school girls \((r=0.96)\), \((t=32.27)\), 0.99 confidence interval of 'r'-
between 0.939 and 0.981.

For urban private school girls \((r=0.955)\), \((t=33.40)\), 0.99 confidence interval of 'r'-
between 0.933 and 0.977.

For rural government school girls \((r=0.988)\), \((t=59.24)\), 0.99 confidence interval of 'r'-
between 0.988 and 0.995.
For rural private school girls ($r=0.931$), ($t=26.53$), 0.99 confidence interval of $r$ - between 0.927 and 0.934.

22) There is positive and substantial relationship between acquisition of biological concepts and attitude towards science for sub categories of attitude towards science such as low, medium and high in attitude towards science. These relationships are summarized as follows.

For the low group in attitude towards science ($r=0.653$), ($t=13.66$),

0.99 Confidence interval of $r$ – between 0.560 and 0.746.

For the high group in attitude towards science ($r=0.676$), ($t=14.91$),

0.99 Confidence interval of $r$ – between 0.590 and 0.762.

23) There is positive and low relationship between acquisition of biological concepts and attitude towards science for the medium group in attitude towards science. That is,

For the medium group in attitude towards science ($r=0.38$), ($t=6.86$),

0.99 Confidence interval of $r$ – between 0.248 and 0.512.

**The Relationship between Acquisition of Biological concepts and attitude towards Science—Based on Partial Correlation**

24) There is positive and significant relationship between acquisition of biological concepts and attitude towards science, when the effect of intelligence, home environment and study habits are partialled out using partial correlation technique for the total sample and sub
samples based on sex, locale and type of management of school of secondary school pupils. The partial correlation coefficients thus obtained ($r_{13.245}$) are showing significance at 0.01 level, for the total sample and sub samples. The $r_{13.245}$ values for boys (0.401), for girls (0.446), for urban school students (0.354), for rural school students (0.436), for government school students (0.276), for private school students (0.43) and for the total sample (0.365) are all positive here also. In all these cases the values of partial correlation coefficients are lower than the respective values Pearson’s product-moment coefficient of correlation ‘r’ between acquisition of biological concepts and attitude towards science, for the total sample and different sub samples of secondary school students based on sex, location and the type of management of school.

RELATIONSHIP BETWEEN ACQUISITION OF BIOLOGICAL CONCEPTS AND HOME ENVIRONMENT

Relationship between acquisition of biological concepts and home environment—based on Pearson’s product–moment coefficient of correlation

25) There is positive and high relationship between acquisition of biological concepts and home environment for the total sample, sub samples based on sex, locale of school and type of management of school and sub samples based on sex of urban private school pupils and urban government school pupils, rural private school
pupils and rural government school pupils. These relationships are summarized as follows.

For total sample ($r=0.848$), ($t=45.2$), 0.99 confidence interval of $r$-

between 0.822 and 0.873.

For boys ($r=0.782$, ($t=25.03$), 0.99 confidence interval of $r$-

between 0.731 and 0.832.

For girls ($r=0.89$), ($t=38.94$), 0.99 confidence interval of $r$-

between 0.863 and 0.917.

For urban school pupils ($r=0.831$), ($t=29.80$), 0.99 confidence interval of $r$-

between 0.791 and 0.871.

For rural school pupils ($r=0.862$), ($t=33.92$), 0.99 confidence interval of $r$-

between 0.829 and 0.895.

For government school pupils ($r=0.874$, ($t=33.79$), 0.99 confidence interval of $r$-

between 0.841 and 0.906.

For private school pupils ($r=0.833$), ($t=31.69$), 0.99 confidence interval of $r$-

between 0.796 and 0.870.

For urban government school boys ($r=0.74$), ($t=10.10$), 0.99 confidence interval of $r$-

between 0.721 and 0.812.

For rural government school boys ($r=0.882$), ($t=17.36$), 0.99 confidence interval of $r$-

between 0.826 and 0.944.
For rural private school boys \((r=0.882),\ (t=19.67),\ 0.99\ confidence\ interval\ of\ \('r'-\)

between 0.827 and 0.937.

For urban government school girls \((r=0.856),\ (t=15.64),\ 0.99\ confidence\ interval\ of\ \('r'-\)

between 0.783 and 0.928.

For urban private school girls \((r=0.952),\ (t=32.21),\ 0.99\ confidence\ interval\ of\ \('r'-\)

between 0.928 and 0.975.

For rural government school girls \((r=0.931),\ (t=23.88),\ 0.99\ confidence\ interval\ of\ \('r'-\)

between 0.893 and 0.968.

For rural private school girls \((r=0.813),\ (t=14.51),\ 0.99\ confidence\ interval\ of\ \('r'-\)

between 0.729 and 0.896.

26) There is positive and substantial relationship between acquisition of biological concepts and home environment for urban private school boys sub categories of home environment such as medium and high group in home environment. These relationships are summarized as follows.

For urban private school boys \((r=0.442),\ (t=5.21),\ 0.99\ confidence\ interval\ of\ \('r'-\)

between 0.246 and 0.638.

For the medium group in home environment \((r=0.473),\ (t=9.50),\ 0.99\ Confidence\ interval\ of\ \('r'-\)

between 0.360 and 0.586.

For the high group in home environment \((r=0.665),\ (t=13.08),\ 0.99\ Confidence\ interval\ of\ \('r'-\)

between 0.575 and 0.756.
27) There is positive and low relationship between acquisition of biological concepts home environment for the low group in home environment.

For the low group in home environment \( r = 0.371 \), \( t = 6.50 \), 0.99 confidence interval of \( r \) between 0.235 and 0.508.

### The Relationship between Acquisition of Biological concepts and Home Environment – Based on Partial Correlation

28) There is positive and significant relationship between acquisition of biological concepts and home environment, when the effects of intelligence, attitude towards science and study habits are partialled out using partial correlation technique for the total sample, sub samples based on sex, locale of school and the government school pupils. The partial correlation coefficients \( r_{14.235} \) obtained are showing significance at least at 0.05 level for the total sample and sub samples except one (i.e. private school students). The \( r_{14.235} \) values for boys (0.293), for girls (0.099), for urban school students (0.232), for rural school students (0.194), for government school students (0.389) and for the total sample (0.234) are all positive also. In all these cases the values of partial correlation coefficients are lower than the respective values of Pearson's product-moment coefficient of correlation \( r \) between acquisition of biological concepts and home environment for the total sample and different
sub samples of secondary school students based on sex, locale and the type of management of school.

29) There is positive and insignificant relationship between acquisition of biological concepts and home environment, when the effects of intelligence, attitude towards science and study habits are partialled out using partial correlation technique, for the private school students. The $r_{14.235}$ value for the private school students is 0.073, which is positive, but not significant even at 0.05 level.

RELATIONSHIP BETWEEN ACQUISITION OF BIOLOGICAL CONCEPTS AND STUDY HABITS

The Relationship between Acquisition of Biological Concepts and Study Habits – Based on Pearson’s Product-moment correlation

30) There is positive and high relationship between acquisition of biological concepts and study habits for the total sample, sub samples based on sex, locale of school and type of management of school and sub samples based on sex of urban private school pupils and urban government school pupils, rural private school pupils and rural government school pupils. These relationships are summarized as follows.

For total sample ($r=0.908$), ($t=61.22$), 0.99 confidence interval of ‘$r$’-

between 0.892 and 0.924.

For boys ($r=0.833$), ($t=30.03$), 0.99 confidence interval of ‘$r$’-
between 0.794 and 0.873.

For girls \((r=0.955)\), \((t=64.23)\), 0.99 confidence interval of \(r\)-

between 0.944 and 0.966.

For urban school pupils \((r=0.89)\), \((t=38.93)\), 0.99 confidence interval of \(r\)-

between 0.863 and 0.916.

For rural school pupils \((r=0.929)\), \((t=50.08)\), 0.99 confidence interval of \(r\)-

between 0.911 and 0.947.

For government school pupils \((r=0.894)\), \((t=37.49)\), 0.99 confidence interval of \(r\)-

between 0.866 and 0.921.

For private school pupils \((r=0.924)\), \((t=50.86)\), 0.99 confidence interval of \(r\)-

between 0.906 and 0.942.

For urban private school boys \((r=0.809)\), \((t=14.57)\), 0.99 confidence interval of \(r\)-

between 0.725 and 0.893.

For rural government school boys \((r=0.966)\), \((t=34.56)\), 0.99 confidence interval of \(r\)-

between 0.947 and 0.984.

For rural private school boys \((r=0.864)\), \((t=17.97)\), 0.99 confidence interval of \(r\)-

between 0.802 and 0.926.

For urban government school girls \((r=0.932)\), \((t=24.32)\), 0.99 confidence interval of \(r\)-

between 0.896 and 0.968.

For urban private school girls \((r=0.974)\), \((t=44.69)\), 0.99 confidence interval of \(r\)-

between 0.961 and 0.981.
For rural government school girls \((r=0.986), (t=24.32), 0.99\) confidence interval of \(r\) - between 0.978 and 0.993.

For rural private school girls \((r=0.961), (t=44.69), 0.99\) confidence interval of \(r\) - between 0.942 and 0.980.

31) There is positive and substantial relationship between acquisition of biological concepts and study habits for urban government school boys and sub category of home environment such as high group in study habits. These relationships are summarized as follows.

For urban government school boys \((r=0.669), (t=8.25), 0.99\) confidence interval of \(r\) - between 0.5146 and 0.824.

For the high group in study habits \((r=0.581),(t=10.70), 0.99\) confidence interval of \(r\) - between 0.467 and 0.695.

32) There is positive and substantial relationship between acquisition of biological concepts and study habits for sub categories of home environment such as low and medium group in study habits. These relationships are summarized as follows.

For the low group in study habits \((r=0.709),(t=16.85), 0.99\) confidence interval of \(r\) - between 0.632 and 0.785.

For the medium group in study habits \((r=0.738),(t=18.56), 0.99\) confidence interval of \(r\) - between 0.669 and 0.807.
The Relationship between Acquisition of Biological concepts and Study habits - Based on Partial Correlation

33) There is positive and significant relationship between acquisition of biological concepts and study habits, when the effects of attitude towards science, intelligence and home environment are partialled out using partial correlation technique for the total sample, sub samples based on sex, locale and type of management of school of secondary school pupils. The partial correlation coefficients ($r_{15.234}$) obtained are showing significance at 0.01 level for the total sample and sub samples. The $r_{15.234}$ for boys (0.173), for girls (0.553), for urban school students (0.29), for rural school students (0.452), for government school students (0.3), for private school students (0.469) and for the total sample (0.363) are all positive also. In all these cases the values partial correlation coefficient are lower than the respective values of Pearson's product-moment coefficient of correlation 'r' between acquisition of biological concepts and study habits for the total sample and different sub samples of secondary school students based on sex, location and the type of management of school.

THE RELATIONSHIP BETWEEN ACQUISITION OF BIOLOGICAL CONCEPTS AND COMBINED EFFECT OF THE SELECTED PSYCHO-SOCIAL CORRELATES - Based on Multiple Correlation

34) There is significant relationship between Acquisition of Biological concepts and combined effect of the selected psycho-social correlates such as intelligence, attitude towards science, home
environment and study habits for the secondary school pupils. The coefficient of multiple correlation 'R' is used to find out the relationship between acquisition of biological concepts and combined effect of the four selected psycho-social correlates. The R values obtained for boys (0.920), for girls (0.972), for urban school students, (0.939) for rural school students (0.939), for government school students (0.951), for private school students (0.951) and for the total sample (0.947) are all showing significance at 0.01 level.

SIGNIFICANCE OF DIFFERENCE IN THE RELATIONSHIP BETWEEN ACQUISITION OF BIOLOGICAL CONCEPTS AND THE SELECTED PSYCHO-SOCIAL CORRELATES BETWEEN DIFFERENT SUB SAMPLES AND SUB CATEGORIES

Significance of Difference in the Relationship between Acquisition of Biological concepts and Intelligence, between different Sub samples and Sub categories of intelligence -Based on Test of Significance of Difference in 'r's

35) There is significant difference in the relationship of acquisition of Biological concepts and intelligence between certain sub samples and sub categories of intelligence of secondary school pupils. That is between boys and girls (CR=3.532; p<0.01), between low and medium scores in intelligence (CR=2.132; p<0.01), between medium and high scores in intelligence (CR=2.976; p<0.01), between urban government school boys and urban private school boys (CR=3.202; p<0.01), and between rural government school
boys and rural private school boys (CR=2.068; p<0.05). All these critical ratios are significant at least at 0.05 level.

36) There is no significant difference in the relationship of acquisition of biological concepts and intelligence between certain other sub samples and sub categories of intelligence of secondary school pupils. That is, between urban and rural school pupils (CR=0.977; p>0.05), between government and private school pupils (CR=1.902; p>0.05), between low and high scorers in intelligence (CR= 0.889; p>0.05), between urban govt. school girls and urban private school girls (CR=1.253; p>0.05), and between rural govt. school girls and rural private school girl (CR=0.02; p>0.05). These critical ratios are not showing significance even at 0.05 level.

Significance of Difference in the Relationship between Acquisition of Biological concepts and attitude towards science, between different Sub samples and Sub categories of attitude towards science -Based on Test of Significance of Difference in 'r's

37) There is significant difference in the relationship of acquisition of biological concepts and attitude towards science between certain sub samples and sub categories of attitude towards science of secondary school pupils. That is, between boys and girls (CR= 5.269; p < 0.01), between urban and rural secondary school pupils (CR = 2.087; p < 0.05), between government and private school students (CR =2.087; p < 0.05), between low and medium scorers in attitude towards science (CR = 4.376; p < 0.01), between medium and high scorers in
attitude towards science (CR = 4.911; p < 0.01), and between rural
govt. schoolboys and rural private school boys (CR = 3.511; p <
0.01) All these critical ratios are showing significance at least at
0.05 level.

38) There is no significant difference in the relationship of acquisition of
biological concepts and attitude towards science between low and
high scorers in attitude towards science (CR = 0.464; p > 0.05),
between urban govt. schoolboys and urban private schoolboys
(CR = 0.264; p > 0.05), and between urban govt. school girls and
urban private school girls (CR = 0.383; p > 0.05). The critical ratio
obtained between these sub categories of attitude towards science
is not significant even at 0.05 level.

Significance of Difference in the Relationship between Acquisition of
Biological concepts and Home environment between different Sub
samples and Sub categories of Home environment-Based on Test of
Significance of Difference in ‘r’s

39) There is significant difference in the relationship of acquisition of
biological concepts and home environment between certain sub
samples and sub categories of home environment of secondary
school pupils. That is, between boys and girls (CR = 5.254; p <
0.01), between government school students and private school
students (CR = 2.103; p < 0.05); between low and high scorers in
home environment (CR = 4.477; p < 0.05); between medium and
high scorers in home environment (CR = 3.244; p < 0.01), between
urban govt. schoolboys and urban private schoolboys (CR = 3.986; p < 0.01), and between rural govt. schoolgirls and rural private schoolgirls (CR = 3.651; p < 0.01). All these critical ratios are showing significance at least at 0.05 level.

40) There is no significant difference in the relationship of acquisition of biological concepts and home environment between certain other sub samples and sub categories of home environment of secondary school pupils. That is, between urban school pupils and rural school pupils (CR = 1.581; p > 0.05), between low and medium scorers in home environment (CR = 1.479; p > 0.05) and between rural govt. school boys and rural private schoolboys. (CR = 0.013; p < 0.05), All these critical ratios are not showing significance at least at 0.05 level.

Significance of Difference in the Relationship between Acquisition of Biological concepts and Study habits between different Sub samples and Sub categories of Study habits-Based on Test of Significance of Difference in ‘r’s

41) There is significant difference in the relationship of acquisition of biological concepts and study habits between certain sub samples and sub categories of study habits of secondary school pupils. That is between boys and girls (CR = 9.679; p < 0.01), between urban school students and rural school students (CR = 3.243; p < 0.01), between government school student and private school students (CR = 2.425; p < 0.05), between low and high scorers in study habits (CR = 2.467, p < 0.05), between medium and high scorers in
study habits (CR = 3.169, p < 0.01), between urban govt. schoolboys and urban private schoolboys (CR = 2.171; p < 0.01), between rural govt. schoolboys and rural private schoolboys (CR = 4.965; p < 0.01), between urban govt. schoolgirls and urban private schoolgirls (CR = 3.425; p < 0.01), and between rural govt. schoolgirls and rural private school girls (CR = 3.651; p < 0.01). All these critical ratios are showing significance at least at 0.05 level.

42) There is no significant difference in the relationship of acquisition of biological concepts and study habits between low and medium scorers in study habits (CR = 0.731, p > 0.05). The critical ratio between these sub categories of study habits is not showing significance even at 0.05 level.

INFLUENCE OF BACKGROUND VARIABLES ON THE SELECTED PSYCHO-SOCIAL CORRELATES—Based on Multiple regression Analysis

43) Sex, location of school and type of management of school have significant influence on the intelligence score (significance levels less than 0.05). Girls, private school students and urban school students are better scorers in intelligence. The multiple regression analysis applied to find out the influence of background variables such as sex, location of school and type of management of school on the intelligence score of secondary school pupils. It is found that 4.5 percent (R² = 0.045) of the variation in intelligence scores is explained by these variables. The result also indicates that the
urban students have 2.151 units higher score in intelligence than their rural counterparts. Similarly government school students have 1.572 units less score in intelligence than private school students. Also boys have 1.268 units less score than girls.

44) The background variables like, sex, location of school, and type of management of school have no significant influence on the score of attitude towards science of secondary school pupils. Multiple regression analysis applied to find out the influence of background variables such as sex, location of school and type of management of school on the attitude towards science scores of pupil, shows that only 0.8% ($R^2 = 0.008$) of the variation in the score of attitude towards science is explained by these variables.

45) Sex and type of management of school have significant influence on study habits score of secondary school pupils and the variable location of school does not have any significant influence on the study habits scores (significance greater than 0.05). Girls, urban school students and private school students are better scorers in study habits. Also study habits are independent of the location of school of secondary school students. The multiple regression analysis, applied to find out the influence of background variables such as, it is found that, 3 percent ($R^2 = 0.030$) of the variation in the study habits scores is explained by these variables. The result also shows that the boys have 2.837 units less score than girls and urban school students have 1.573 units more score than
their rural counterparts. Also government school students have 2.710 units less score in study habits than their private school counterparts.

46) Sex and location of school have significant influence on the home environment score of the secondary school pupils and the variable, type of management of the school does not have any significant influence on the home environment scores of the secondary school pupils (significance level greater than 0.05). Girls, urban school pupils, and private school pupils are better scorers in home environment questionnaire and the score for home environment questionnaire is independent of the variable, type of management of school. The multiple regression analysis applied to find out the influence of background variables such as sex, location of school and type of management of school on the home environment scores of secondary school pupils, shows that 1.9 percent ($R^2 = 0.019$) of the variation in the home environment score is explained by these variables. The result shows that, boys have 1.067 units less score than girls, urban secondary school students have 1.245 units higher score than rural secondary school students and the government school students have 0.127 units lesser score than their private school counterparts.
INFLUENCE OF THE BACKGROUND VARIABLES ON THE ACQUISITION OF BIOLOGICAL CONCEPTS—Based on Multiple regression Analysis

47) Sex and location of school have significant impact on the acquisition of biological concepts scores of the pupils. But the background variable, management of school does not have any significant influence in the acquisition of biological concepts score of the pupils (significance level greater than 0.05). Girls, urban school pupils and private school students are higher scorers in the test of biological concepts. The multiple regression analysis is applied to find out the impact of background variables such as sex, location of school and the type of management of school in the acquisition of biological concepts scores of secondary school pupil, it is found that 3 percent ($R^2 = 0.030$) of the variation in the acquisition of biological concepts score is explained by these variables. The result shows that, boys have 1.729 units less score than girls in acquisition of biological concepts. Also urban school pupils have 1.574 units more score than their rural counterparts in the test biological concepts. The government school students have a 0.536 units lesser score than the private school students.

The multiple regression equation obtained can be written as follows:

\[
\text{Biological concepts score (BC)} = 25.036 - 1.729x_1 + 1.574x_2 - 0.536x_3
\]

Where, $x_1 = \text{dummy for boys}$;
INFLUENCE OF THE SELECTED PSYCHO-SOCIAL CORRELATES ON
THE ACQUISITION OF BIOLOGICAL CONCEPTS – Based on Multiple
regression Analysis

48) The selected psycho-social correlates such as intelligence, attitude
towards science, home environment and study habits have
significant influence on the score of acquisition of biological
concepts of secondary school pupils (significance at 0.000 level).
The multiple regression analysis is applied to find out the influence
of the four selected psychological correlates such as intelligence,
attitude towards science, home environment and study habits in the
acquisition of biological concepts of the secondary school pupils. It
is found that 89.8% ($R^2 = 0.898$) variation in the score of acquisition
of biological concepts is explained by these selected psycho-social
correlates. Of this 27.78% variation in the score biological concepts is explained by the selected psycho-social correlate, study
habits. Thus the study habits is the highest influencing of the
psycho-social correlates, selected. Similarly another psycho-social
correlate selected, intelligence explains 27.38% variation in the
score biological concepts and hence forms second highest
influencing psycho-social correlate. While attitude towards science
(21.91%) and home environment (12.63%) are the third and fourth
highest influencing psycho-social correlates, in the acquisition of
biological concepts by secondary school pupils. The result shows
that beta coefficient (β) of all the psycho-social correlates are positive and also for every unit change in the score of test of intelligence, there will be 0.307 units increase in the score of test of biological concepts. Also for every unit change in the score attitude towards science there will be 0.201 units increase in the score of test of biological concepts. Also for every unit change in the score attitude towards science there will be 0.201 units increase in the score of test of biological concept. There will be 0.172 units increase in the score of biological concepts for every unit increase in the score of home environment for every unit increase in home environment score. For every unit increase in score of study habits there will be 0.173 units increase in score of test biological concepts. The multiple regression equation obtained is as follows.

\[
\text{Biological concepts score (BC) = } -24.684 + 0.307x_1 + 0.201x_2 + 0.172x_3 + 0.173x_4
\]

Where, 
\(x_1\) = score for intelligence test,
\(x_2\) = score for attitude towards science scale.
\(x_3\) = score for home environment questionnaire
\(x_4\) = score for study habits inventory

**INFLUENCE OF THE SELECTED PSYCHO-SOCIAL CORRELATES AND BACKGROUND VARIABLES ON THE ACQUISITION OF BIOLOGICAL CONCEPTS – Based on Multiple regression Analysis**

49) The four selected psycho-social correlates such as intelligence, attitude towards science, home environment and study habits, together with the background variables such as sex, locale and type
of management of school have significant influence (significance at 0.01 level) on the acquisition of biological concepts of secondary school pupils. Multiple regression analysis applied to find out the influence of the four selected psycho-social correlates, together with the background variables such as sex, locale and type of management of school shows that 90.7 percent ($R = 0.907$) of the variation in the acquisition of biological concepts scores is explained by these variables. For every unit change in the score of test of intelligence, there will be $0.280$ units increase in the score of test of biological concepts. For every unit change in the score of attitude towards science there will be $0.257$ units increase in the score of test of biological concepts. There will be $0.140$ units increase in the score of biological concepts for every unit change in the score of home environment. An increase of $0.161$ units can be there in the score of test biological concepts for every unit change in the score of study habits. It can also be inferred from the result that the boys have $0.989$ units lesser score in biological concepts than girls, urban school students have $0.822$ units more score in biological concepts than the rural school pupils. It is also clear from the result that, the government school pupils have $0.549$ units more score than the their private school counterparts. The multiple regression equation can be written as follows;

\[
\text{Biological concepts score (BC)} = -27.749 + 0.280x_1 + 0.257x_2 + 0.140x_3 \\
+ 0.161x_4 - 0.989x_5 + 0.822x_6 + 0.549x_7
\]
Where,

\[ x_1 = \text{score for intelligence test}; \]
\[ x_2 = \text{score for scale of attitude towards science}; \]
\[ x_3 = \text{score for home environment questionnaire}; \]
\[ x_4 = \text{score for study habits inventory}; \]
\[ x_5 = \text{dummy for boys}; \]
\[ x_6 = \text{dummy for urban school students}; \]
\[ x_7 = \text{dummy for government school students}. \]

**INFLUENCE OF THE SUB CATEGORIES OF SELECTED PSYCHO-SOCIAL CORRELATES AND BACKGROUND VARIABLES ON THE ACQUISITION OF BIOLOGICAL CONCEPTS—Based on Multiple regression Analysis**

50) The sub categories of the four selected psycho-social correlates (high, medium, low) together with background variables (except the management of school) have significant influence on the acquisition of biological concepts of secondary school pupils (significance at 0.00 level). The background variable, management of school does not have any significant influence on the acquisition of biological concepts (significance level greater than 0.05). The multiple regression analysis is applied to find out the influence of background variables such as sex, locale and type of management of school, together with the sub categories of the four selected psycho-social correlates (high, medium, low). It is found that 85.9 percent \((R^2 = 0.859)\) of the variation in the acquisition of biological concepts scores is explained by these variables. From the result it can also be inferred that, the boys have
1.342 units lesser score than the girls in biological concepts. The urban school students have 1.605 units more score than the rural school students in the test of biological concepts. The government school students are scoring 0.089 units lesser score than the private school students in the test of biological concepts. The low scorers in intelligence have 3.411 units lesser score in acquisition biological concepts than the high scorers in intelligence. The medium intelligence group have 1.791 units lesser score in acquisition biological concepts than high scorers in intelligence. The low attitude towards science group has 5.545 units less score in test of biological concepts than the high attitude towards science group. The medium scorers in attitude towards science have 2.930 units lesser score than high attitude towards science group, in the test of acquisition of biological concepts. The low home environment group has 3.938 units lesser score in the test biological concepts than the high scorers in home environment. The medium home environment group has 1.886 units lesser score than the high home environment group. The low study habits group has 4.732 units lesser score than the high study habits group in the test of biological concepts. The medium group in study habits has 2.089 units lesser score in acquisition of biological concepts than the high study habit group. The multiple regression equation can be written as follows,

\[
\text{Biological concepts score (BC)} = 33.703 - 1.342x_1 + 1.605x_2 - 0.089x_3 \\
- 3.411x_4 - 1.791x_5 - 5.545x_6 - 2.930x_7
\]
Where,

\[ y = -3.938x_8 - 1.866x_9 - 4.732x_{10} - 2.089x_{11} \]

\( x_1 \) = dummy for boys;
\( x_2 \) = dummy for urban school students;
\( x_3 \) = dummy for government school students;
\( x_4 \) = score of low intelligence group in intelligence test;
\( x_5 \) = score of medium intelligence group in intelligence test;
\( x_6 \) = score of low attitude towards science group in scale of attitude towards science;
\( x_7 \) = score of medium attitude towards science group in scale of attitude towards science.
\( x_8 \) = score of low home environment group in home environment questionnaire;
\( x_9 \) = score of medium home environment group in home environment questionnaire;
\( x_{10} \) = score of low study habits group in study habits inventory;
\( x_{11} \) = score of medium study habits group in study habits inventory.

**INTERACTION WITH OTHER INDEPENDENT VARIABLES** - Based on Multiple Classification Analysis

51) The background variable - sex of the sample does not have any significant interaction with other independent variables in the study. The multiple classification analysis (MCA) gives the adjusted and unadjusted mean of biological concepts score corresponding to
different categories of independent variable with corresponding $R^2$.
The adjusted mean of biological concepts score of boys (25.39) and unadjusted mean of biological concepts score of boys (25.58) are almost same. Similarly adjusted mean score of biological concepts score of girls (24.05) and unadjusted mean of biological concepts score of girls (23.86) are also almost the same.

52) The background variable - location of schools does not have any significant interaction with other independent variables in the study. The multiple classification analysis table gives adjusted mean of biological concepts score of rural school pupil as 23.92 and unadjusted mean of the same sub sample is 23.93. Both these values are nearly the same. Also adjusted mean of biological concepts score of urban school pupils in the MCA table is given as 25.52 and the unadjusted mean biological concepts score of same sub sample is given as 25.51, both values being almost the same.

53) The background variable - the type of management of the school does not have any significant interaction with other independent variable in the study. From the multiple classification analysis tables it can be seen that adjusted mean of biological concepts scores of private school pupils is 24.76 and the unadjusted mean of the same sub sample is 24.95. Both these values are nearly the same. Also adjusted and unadjusted mean of biological concepts scores of government school pupils are 24.67 and 24.44 respectively. These values are almost the same.
54) The low and high group in the selected psycho-social correlate - intelligence has significant interaction with other independent variables in this study. From the multiple classification analysis table it can be seen that the respective adjusted and unadjusted mean biological concepts scores of both high (26.53, 32.49) and low (23.12, 17.83) scorers in intelligence test are showing much difference.

55) The medium group in the selected psycho-social correlate - intelligence has no significant interaction with other independent variables in this study. From the multiple classification analysis table it can be seen that the respective adjusted and unadjusted mean biological concepts scores of medium (24.74, 24.83) scorers in intelligence test does not show much difference.

56) The low and high group in the selected psycho-social correlate - attitude towards science has significant interaction with other independent variables in this study. From the multiple classification analysis table it can be seen that the respective adjusted and unadjusted mean biological concepts scores of both high (27.5, 31.72) and low (21.96, 18.02) scorers in scale of attitude towards science vary very much.

57) The medium group in the selected psycho-social correlate – attitude towards science has no significant interaction with other independent variables in this study. From the multiple classification
analysis table it can be seen that the respective adjusted and unadjusted mean biological concepts scores of medium (24.57, 24.13) scorers in the scale of attitude towards science does not show much difference.

58) The low and high group in the selected psycho-social correlate - home environment has significant interaction with other independent variables in this study. From the multiple classification analysis table it can be seen that the respective adjusted and unadjusted mean biological concepts scores of both high (26.77, 32.11) and low (22.83, 17.99) scorers in the home environment questionnaire show much difference.

59) The medium group in the selected psycho-social correlate - home environment has no significant interaction with other independent variables in this study. From the multiple classification analysis table it can be seen that the respective adjusted and unadjusted mean biological concepts scores of medium (24.9, 25.3) scorers in the home environment questionnaire does not show much difference.

60) The low and high group in the selected psycho-social correlate - study habits has significant interaction with other independent variables in this study. From the multiple classification analysis table it can be seen that the respective adjusted and unadjusted mean biological concepts scores of both high (27.15, 32.64) and
low (22.42, 17.82) scorers in the study habits inventory show much difference.

61) The medium group in the selected psycho-social correlate -study habits has no significant interaction with other independent variables in this study. From the multiple classification analysis table it can be seen that the respective adjusted and unadjusted mean biological concepts scores of medium (25.06, 25.26) scorers in the study habits inventory does not show much difference.

5.3 TENABILITY OF HYPOTHESES

The tenability of hypotheses in this study is given below.

**Hypothesis I**

There is significant difference between the sub samples of secondary school students with respect to the selected psycho-social correlates such as intelligence, attitude towards science, home environment and study habits.

Major finding No.1 shows that significant difference in mean scores of intelligence between the sub samples based on sex, location and the type of management of school. Major findings No.2 shows no significant difference in mean scores of attitude towards science between the different sub samples, based on sex, location and type of management of school. Major finding No.3 shows significant difference in mean scores of home environment between sub samples based on sex and location of
school and no significant difference in means scores of home environment between sub samples based on the type of management of school. Similarly Major finding No.4 shows significant difference in mean scores of study habits between sub samples based on sex and management of school and no significant difference in means scores of study habits between sub samples based on location of school. Hence hypothesis I is partially substantiated.

Hypothesis II

There is significant difference between the sub samples of secondary school students with regard to their acquisition of biological concepts.

Major finding No.5 shows that there is significant difference in the mean scores of acquisition of biological concepts between sub samples based on sex and location of school and no significant difference in score of biological concept is noted between sub samples based on type of management of school. Similar results with significant difference in mean scores between certain sub samples and no significant difference in mean scores between certain other sub samples are seen in Major findings No.6 to 13. From the Major finding No.10 it can be noted that no significant difference in mean scores of biological concepts is there between different sub samples of low intelligence group. Major findings No. 6 to 9 show that, between all the subs samples based on low, medium and high scoring in a particular psycho-social correlate, are showing significant difference in the mean scores of biological concepts. The Major findings No.14 to 17 based
on the results of ANOVA substantiate these results. Hence hypothesis II is only partially substantiated.

**Hypothesis III**

There exists significant and positive relationship between the acquisition of biological concepts and intelligence, for the total sample and sub samples of secondary school students.

Major finding No.18 shows that, there is positive and significant relationship between acquisition of biological concepts and intelligence for the total sample and sub samples based on sex, location of school and type of management of school of secondary school students. This Major finding also shows positive and significant relationship between acquisition of biological concepts and intelligence for the urban government school pupils based on sex, urban private school pupils based on sex, rural government school pupils based on sex and rural private school pupils based on sex. Major finding No.19 shows that there is positive and substantial relationship between acquisition of biological concepts and intelligence for the low, medium and high group in intelligence. Major finding No.20 shows that there is positive and significant relationship between acquisition of biological concepts and intelligence, when the effect of attitude towards science, home environment and study habits are partialled out, using partial correlation technique, for the total sample and sub samples based on sex, location of school and the type of management of school of secondary school students. Hence hypothesis III is fully substantiated.
Hypothesis IV

There exists significant and positive relationship between the acquisition of biological concepts and the attitude towards science, for the total sample and sub samples of secondary school students.

Major finding No.21 shows that there is positive and high relationship between acquisition of biological concepts and attitude towards science for the total sample and sub samples based on sex, location of school and the type of management of school secondary school students. This Major finding also shows positive and significant relationship between acquisition of biological concepts and attitude towards science for the urban government school pupils based on sex, urban private school pupils based on sex, rural government school pupils based on sex and rural private school pupils based on sex. Major finding No.22 shows that there is positive and substantial relationship between acquisition of biological concept and attitude towards science for the low and high attitude towards science group. Major finding No.23 shows that there is positive and low relationship between acquisition of biological concepts and attitude science for the medium group in attitude towards science. Major finding No.24 shows that there is positive and significant relationship between acquisition of biological concepts and attitude towards science, when the effect of intelligence, home environment, and study habits are partialled out using partial correlation technique. Hence hypothesis IV is fully substantiated.
Hypothesis V

There exists significant and positive relationship between the acquisition of biological concepts and the home environment, for the total sample and sub samples of secondary school students.

The major finding No.25 shows that there is positive and high relationship between acquisition of biological concepts and home environment for the total sample and sub samples based on sex, location of school and the type of management of school of secondary school students. This Major finding also shows positive and significant relationship between acquisition of biological concepts and home environment for the urban government school pupils based on sex, urban private school pupils based on sex, rural government school pupils based on sex and rural private school pupils based on sex except the urban private school boys. Major finding No.26 shows that there is positive and substantial relationship between acquisition of biological concepts and home environment for the urban private school boys, medium and high group in home environment. Major finding No.27 shows that there is positive and low relationship between acquisition of biological concepts and home environment for the low group in home environment. Major finding No.28 shows that there is positive and significant relationship between acquisition of biological concepts and home environment, when the effect of intelligence, attitude towards science and study habits are partialled out using partial correlation technique, for the total sample and sub samples such as boys, girls, urban school students, rural school
students and government school students. The main finding No.29 shows that the relationship between acquisition of biological concepts and home environment is positive but not significant, when the effect of intelligence, attitude towards science and study habits are partialled out using partial correlation technique, for the private school students. Thus the hypothesis V is only partially substantiated.

**Hypothesis VI**

There exists significant and positive relationship between the acquisition of biological concepts and the study habits, for the total sample and sub samples of secondary students.

The major finding No.30 shows that there is positive and high relationship between the acquisition of biological concepts and study habits for the total sample and sub samples based on sex, locale and type of management of school. This major finding also shows positive and significant relationship between acquisition of biological concepts and study habits for the urban government school pupils based on sex, urban private school pupils based on sex, rural government school pupils based on sex and rural private school pupils based on sex except urban government school boys. Major finding No.31 shows that there is positive and substantial relationship between acquisition of biological concepts and study habits for the urban government school boys and the high group in study habits. The major finding No.32 show that there is positive and substantial relationship between acquisition of biological concepts and study habits for the low and medium group in study habits. Major finding
No.33 shows that there is positive and significant relationship between acquisition of biological concepts and study habits, when the effects of attitude towards science, intelligence and home environment are partialled out, using partial correlation technique, for the total sample and sub samples based on sex, locale and type of management of school of secondary school students. Thus the hypothesis VI is fully substantiated.

**Hypothesis VII**

There exists significant relationship between acquisition of biological concepts and combined effect of the four selected psycho-social correlates, for the total sample and sub samples of secondary school students.

The major finding No.34 shows that, the relationship between acquisition of biological concepts and combined effect of the four selected psycho-social correlates such as intelligence, attitude towards science, home environment and study habits, for the total sample and sub samples of secondary school students are significant at 0.01 level. Thus the hypothesis VII is fully substantiated.

**Hypothesis VIII**

There is significant difference between the relationships of acquisition of biological concepts and each of the selected psycho-social correlates of pupils at secondary level.
The major finding No.35, 37, 39 and 41 show that there is significant difference in the relationship of acquisition of biological concepts and each of the selected psycho-social correlates such as intelligence, attitude towards science, home environment and study habits respectively between different sub samples of secondary school students. Major finding No.36, 38, 40 and 42 show that there is no significant difference in the relationship of acquisition of biological concepts and each of the selected psycho-social correlates such as intelligence, attitude towards science, home environment and study habits respectively between different sub samples of secondary school students. Hence hypothesis VIII is only partially substantiated.

Hypothesis IX

The background variables like sex, location of school, and type of management of school have significant influence on the acquisition of biological concepts as well as on the selected psycho-social correlates of secondary school pupils.

The Major finding No.43 shows that all the three background variables are having significant influence on the intelligence scores of secondary school pupils. Major finding No.44 shows that all the three background variables have no significant influence on the attitude towards science scores of secondary school pupils. Major findings No.45 to 47 show that some of the background variables have significant influence while certain others have not, on the score of study habits home environment, study habits and acquisition of biological concepts respectively of secondary school students. The result of multiple classification analysis (MCA) appearing in Major findings No. 51 to
53 show that the three background variables do not have any significant interaction with the independent variables in the acquisition of biological concepts. Hence hypothesis IX is only partially substantiated.

**Hypothesis X**

The selected psycho-social correlates have significant influence on the acquisition of biological concepts of secondary school pupils.

The Major findings No.48 to 50 show the significant influence of the selected psycho-social correlates in the acquisition of biological concepts of secondary school students. Major finding No.48 shows that study habits is the highest influencing psycho-social correlate in the acquisition of biological concepts of secondary school pupils, followed by intelligence, attitude towards science and home environment respectively. Major findings No.54 to 61 also shows the significant interaction of each of the selected psycho-social correlates with others in the acquisition of biological concepts of secondary school pupils. Hence hypothesis X is fully substantiated.

### 5.4 CONCLUSIONS OF THE STUDY

The main conclusions arrived at, from this study are the following;

**Conclusion I**

a) In the aspect of each of the selected psycho-social correlates, certain pairs of sub samples compared are at the same level, while certain other pairs compared are not at the same level. There is difference in the mean scores of selected psycho-social correlates
between different sub samples in the study. But these differences are statistically significant between certain pairs of sub samples only.

b) The selected psycho-social correlates such as intelligence, home environment and study habits in certain sub samples changes with sex, location and the type of management of school. But one of the selected psycho-social correlate - attitude towards science does not change with these background variables, in any of the sub samples considered. With respect to the psycho-social correlate - intelligence girls, rural school pupils and private school pupils are the high scorers. Girls and rural secondary school pupils are the high scorers in the psycho-social correlate - home environment. In the psycho-social correlate - study habits, girls and private school pupils are the high scorers. For the psycho-social correlate - attitude towards science, no significant difference in the mean scores can be seen between the different sub samples, based on sex, location of school and type of management of school of secondary school students.

Conclusion II

a) The acquisition of biological concepts by certain pairs of sub samples compared are of the same level, while in certain other pairs of sub sample compared, the acquisition of biological concepts are not at the same level. The mean scores of acquisition
Summary of the study. Conclusions and Suggestions

of biological concepts of secondary school students are showing difference between different sub samples, selected on the basis of sex, location of school, type of management of school and difference in the level of the selected psycho-social correlates. The difference in mean scores between certain sub samples are statistically significant. While between certain other sub samples, the difference in the mean scores of acquisition of biological concepts are not statistically significant.

b) High scorers in intelligence test, attitude towards science scale, home environment questionnaire and study habits inventory are the highest mean scorers in the test of biological concepts.

c) High scores in intelligence favour girls to have more scores in the test of biological concepts. High scores in attitude towards science favour girls and urban school students to have more scores in the test of biological concepts. High scores in home environment favour girls and private school students to have more score in the test of biological concepts. High scores in study habits favour girls to have high scores in the test of biological concepts.

d) The sub samples in the study such as girls and rural secondary school pupils are the high scorers in the acquisition of biological concepts, in comparison with boys and urban secondary school pupils respectively. Also government school students in the medium intelligence group, girls in the high intelligence group, girls and
urban school pupils in the low attitude towards science group, urban school pupils and girls in the medium attitude towards science group, urban school pupils and private school pupils of the low home environment group, girls of the medium home environment group, girls and private school pupils of high home environment group, boys and urban school pupils of low study habits group, urban school pupils and government school pupils of medium study habits group and girls of high study habits group are the high scorers among the respective sub samples compared, in the test of biological concepts.

**Conclusion III**

a) There is a significant and positive relationship between the acquisition of biological concepts and intelligence for the total sample and sub samples of secondary school pupils. For every unit increase or decrease in intelligence score there will be a corresponding increase or decrease is in the score of biological concepts for the secondary school students.

b) The relationship between acquisition of biological concepts and intelligence is positive and significant, when the effects of attitude towards science, home environment and study habits are partialled out using partial correlation technique for the total sample and sub samples of secondary school pupils.
Conclusion IV

a) There is positive and significant relationship between acquisition of biological concepts and attitude towards science for the total sample and sub samples except medium group in attitude towards science. For medium group in attitude towards science, a positive and low relationship between acquisition of biological concepts and attitude towards science is seen. Thus for every unit increase or decrease in the score attitude towards science there is a corresponding increase or decrease in the score of biological concepts for the secondary school pupils.

b) There is a positive and significant relationship between acquisition of biological concepts and attitude towards science for the total sample and sub samples, when effect of intelligence, home environment and study habits are partialled out using partial correlation technique.

Conclusion V

a) There is a positive and significant relationship between acquisition of biological concepts and home environment for the total sample and sub samples except the low group in home environment. For the low group in home environment, a positive and low relationship between acquisition of biological concepts and home environment can be noted. Thus for every unit increase or decrease in the score of home environment, there is a corresponding increase or
decrease in the score of biological concepts for the total sample and sub samples except the low group in home environment.

b) There is a positive and significant relationship between acquisition of biological concepts and home environment, for the total sample and sub samples such as boys, girls, urban school pupils, rural school pupils government school pupils, when the effect of intelligence, attitude towards science and study habits are partialled out using partial correlation technique. For the private school pupils, the partial correlation coefficient denoting the relationship between acquisition of biological concepts and home environment is positive but not significant.

Conclusion VI

a) There is a positive and significant relationship between acquisition of biological concepts and study habits for the total sample and sub samples of secondary school pupils. Thus for every unit increase or decrease in the score of study habits there is a corresponding increase or decrease in the score of biological concepts for the secondary school students.

b) There is a positive and significant relationship between acquisition of biological concepts and study habits, for the total sample and sub samples, when the effect of intelligence, attitude towards science and home environment are partialled out using partial correlation technique.
Conclusion VII

There is significant relationship between acquisition of biological concepts and combined effect of the four selected psycho-social correlates such as intelligence, attitude towards science, home environment and study habits, for the total sample and sub samples. The coefficient of multiple correlation obtained are all above 0.9.

Conclusion VIII

There is difference in coefficient of correlation between acquisition of biological concepts and each of the four selected psycho-social correlates. But this difference is statistically significant between certain pairs of sub samples only. Thus for those pairs of sub samples, which show significant difference in correlation coefficient (denoting the relationship between acquisition of biological concepts and a particular psycho-social correlate), the score for biological concepts for unit increase or decrease in that psycho-social correlate, will be much different. While in those pairs of sub samples in which there is no significant difference in correlation coefficients (denoting relationship between acquisition of biological concepts and a particular psycho-social correlate), the scores for acquisition of biological concepts, for unit increase or decrease in the score of that psycho-social correlate, will be almost the same.

Conclusion IX

a) Background variables such as sex, location of school and type of management of school have significant influence on the score of
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Psycho-social correlate - intelligence. With respect to home environment and study habits some of the background variables have significant influence. That means, the mean scores for these two psycho-social correlates show significant difference between certain sub samples.

The influence of the background variables such as sex, location of school and type of management of school on the psycho-social correlate attitude towards science of secondary school pupils, is not significant. Thus the score of attitude towards science do not show much difference between sub samples based on sex, location and type of management of school.

b) All the background variables except the type of management of school have significant influence on the acquisition of biological concepts of secondary school pupils. That means, the score of biological concept do not show any significant difference between government and private secondary school pupils. While there is significant difference in the mean scores of biological concepts among the sub samples based on sex and location of school.

Conclusion X

a) The influence of the independent variables (selected psycho-social correlates) such as intelligence, attitude towards science, home environment and study habits are having significant influence on the dependent variable (acquisition of biological concepts). Multiple
regression analysis carried out to find out the influence of the selected psycho-social correlates on the acquisition of biological concepts showed a very high percentage (89.8%) of variation in the score of acquisition of biological concepts is explained by these selected psycho-social correlates.

b) It is also found that study habits is the highest influencing psycho-social correlate on the variance in the score of acquisition of biological concepts of secondary school pupils, followed by intelligence. While home environment is the lowest influencing out of the four psycho-social correlates selected in the study.

c) The four multiple regression equations developed in this study can be used to predict, the score of acquisition of biological concepts of a secondary school student when his score of psycho-social correlates and nature of the background variables taken in this study are known.

5.5 SUGGESTIONS OF THE STUDY

The study could reveal the nature of acquisition of concepts in biology by the secondary school pupils. The nature of the selected psycho-social correlates such as intelligence, attitude towards science, study habits and home environment and their influence on the acquisition of biological concepts of the secondary school pupils also was revealed. The nature and influence of background variables such as sex, location of school and management of school in relation to acquisition of biological
concepts and selected psycho-social correlates are also identified in this study. In the light of the findings of the study some suggestions are made.

1) **The science curriculum must be rearranged in a systematic manner as per preplanned conceptual schemes to facilitate conceptual understanding.**

It is found in the study that a major proportion of students in the secondary school are average or below average scorers in the test of biological concepts. Hence curriculum in Biology and science curriculum at large should be rearranged in a systematic manner with preplanned conceptual schemes. Each conceptual scheme thus developed must be containing a well-connected group of selected concepts, to be attained by every learner in a particular standard.

2) **Instructional strategy should be developed and modified to effect maximum acquisition of concepts in science by every learner.**

In this study it is found that boys and rural secondary school students are the low scorers in the acquisition of biological concepts, as compared to girls and urban school pupils respectively. Similarly private school students among the medium intelligence group, boys belonging to high intelligence group, boys of high, medium and low group in attitude towards science, rural secondary school students in the low, medium and high group in attitude towards science, boys of high study habits group, girls of low study habit group, rural school students of low and medium group in study habits, private school
students of medium study habits group, rural secondary school
students of low home environment group, boys of high and medium
group in home environment and government school students of low
and high group in home environment are also low scorers, in the
acquisition of biological concepts, in comparison with their respective
counterparts. Hence effective steps must be taken to diagnose the
causes of the backwardness among these pupils and develop effective
instructional strategies for the benefit of these groups.

3) **The abilities and drawbacks of each and every individual
student may be identified and instruction must be provided
to all for mastery learning in essential concepts proposed
for a standard.**

The study shows that the different subgroups among the major
sub samples show differences in the acquisition of concept in Biology.
This result show that, following a uniform pattern of instruction to the
whole class, who belong to different grades in their cognitive and
affective outcomes and drawn from varied social environment, is not of
much use to the students of secondary schools. Hence the need of the
hour is to detect the abilities and drawbacks of each and every student
in the class. Then effective individualized instruction must be provided
to the students, to develop mastery of essential concepts proposed for
each standard.
4) **The teacher-student ratio may be lowered to facilitate individualized instructions.**

An over crowded class room is not an ideal atmosphere for individualized instruction. Hence for providing individualized instruction and to reach at mastery of essential concept in each standard, the teacher-student ratio may be lowered. Though this can cause much financial burden on the government, the potential benefit of this approach to future generations can justify such a decision.

5) **There must be provision for teachers specially trained in the field of educational psychology and educational sociology in every school.**

It is found in the study that students of secondary schools are differing very much in their psychological and sociological factors. It is also found that the influences of these factors on the acquisition of biological concepts are at varying degrees. So the government must arrange special training, at least for one teacher, each from every school in the state in educational psychology, psychometric techniques and educational sociology. Such specially trained teachers should be able to administer different psychological tests and questionnaires to students, score them and categorize them accordingly. Interviews and other appropriate techniques may be used to get a complete picture of the psychological and sociological background of the learners. Once the abilities, shortcomings and learning disabilities of the learners are thus identified, specialized and individualized instruction can be given to the learners, so that they can
reach at mastery of essential concepts. For the poor performers, effective counseling and remedial instruction should be provided in a scientific manner.

6) **The pre-service and in-service training of teachers should be restructured.**

   In the present system of teacher education, the formation of concepts and diagnosis of conceptual errors are not much stressed. Hence the teachers are not well equipped with the strategies to be adopted to impart maximum acquisition of concepts in their learners. Hence the teachers become more examination oriented and promote rote memorization by the students. Thus the students will be engulfing the whole of content area without the formation of concepts. So it is time to restructure the pre-service and in-service teacher training to provide in depth knowledge about the importance of acquiring concepts and the methods to be adopted for imparting maximum acquisition of concepts in their students.

7) **The evaluation in science subjects should be centered around the acquisition of scientific concepts and there must be provision to diagnose conceptual errors to take up remedial instruction.**

   In the present system of examination of the secondary school level, more importance in being given to the knowledge of facts, which the student will attain by rote memorization. But the factual knowledge thus developed is less permanent and have very less transfer value.
So it is important to assess the acquisition of essential concepts in the learner in a continuous manner, giving more representation to application, analysis, synthesis and evaluation type questions. Diagnostic test may be given to find out conceptual errors in the learner, from time to time, throughout the instruction. There must be provision also for remedial instruction for the poor performers on the basis of concept-based tests.

8) The science textbooks should be restructured to promote conceptual understanding of science.

The science textbooks should be presenting well-connected concepts in a systematic manner. Concepts to be learned in particular standard must be associated with the related concepts, which the student has previously learned either in the same standard or an earlier standard. There must be activities given in the textbook, related to the concepts, which the learner can do inside or outside the school campus that will promote him in the further acquisition of related concepts. These activities can be conducted by utilizing the free time. The activities may include performing scientific experiment, observing nature and natural phenomena, improvising scientific devices, referring science literature etc. Science textbooks also should be giving information about the other sources from which students can widen his already formed concepts. This is possible by giving related source of information at the end of every chapter.
concept maps, regarding the concept contained in a particular chapter and can be given at its end.

9) **The use of different audio-visual aids should be promoted for effective science education.**

Giving direct, experiences to the students are the best way to develop concepts in students. Since that is not possible in all instances of teaching, audio-visual aids can be used to represent actual objects in the class to provide a vicarious experience. The different audio-visual aids, which are actually the gifts of science itself, can be used for effective science education. The use of audio visual devices and services such as radio, tape recorder, television, computer, Internet, OHP, DVDs, VCDs, LCD projectors, printed matter like, newspapers, magazines, journals, pamphlets and other educational publications can be made use effectively, to develop mastery of essential concepts and also to widen the already formed concepts in science of secondary school students.

10) **The infrastructure facilities in the secondary schools for science learning should be improved to promote learning of concepts by doing.**

The facilities available for science learning such as science laboratory, science library, and different audio-visual aids are very poor or totally absent in many secondary schools. Even the available facilities are not well kept or utilized properly in many schools. It is very important that, there must be separate laboratories for the three science subjects such as biology, chemistry and physics taught in the secondary schools.
All the learners should be getting enough opportunities in the school to do by themselves the different scientific experiments. These activities are actually intended for learning of concepts by doing and will be having more permanent effect in the learners.

11) **The secondary school students must be given training to develop better study habits.**

The present study revealed that, study habits are the most highly influencing of the psycho-social correlates in the acquisition of biological concepts of secondary school pupils. This points to the importance of giving training in study habits for the students of secondary schools. The teachers have an important role to play in the development of proper study habits in the learners. They should not only teach different content area to the students, but also train the students on how to study, the different content area. Schools can also seek the services of specialists in this field. When proper study habits are developed in the students, the need of compulsion from the external environment for studies such as home, teachers etc, get much reduced. Proper study habits developed in the learners will be useful to the learner through out his academic life. Since learning is a life long activity, it influences an individual throughout his life. In the study it is found that, boys and government school students are the low scorers in study habit inventory. So there must be special thrust for these groups, while giving training in study habits.

Training in study habits development strategies for the secondary school teachers may be provided with the help of resource persons from
S.C.E.R.T and D.I.E.Ts. The curriculum of B.Ed course must be reorganized to give the teacher trainees enough exposure to the methods of imparting better study habits to the learners.

12) **Effective categorization of students using intelligence test and individualized instruction, to develop maximum capabilities of students in different levels of intelligence.**

In the study it is found that intelligence is second highest influencing psycho-social correlate in the acquisition of biological concepts. Since intelligence is more a congenital factor, its level can be improved, but not altered much by the activities in the school. What is possible by the school may be to administer intelligence test to the students under an experts' guidance. It will facilitate the teachers to provide individualized attention to each student to enhance his maximum academic development within the limits of his intelligence level. This can be practically done in the schools by grouping pupil of same intelligence level, and providing instruction to reach at mastery of essential concepts. Thus high scorers in intelligence can move faster in the educational ladder, by acquiring mastery of concepts earlier than others. Highly intelligent students can be given higher tasks in learning and thus every student can move at his own pace in learning. In the study it is found that boys, urban secondary school pupils and government secondary school pupils are the low scorers in comparison with girls, rural and private secondary school pupils respectively. So there must be some special plans, which will help the low scorers in the attainment of mastery of essential concepts.
13) **Importance must be given to co-curricular activities in science in the secondary schools.**

It is found in the study that attitude towards science is the third highest influencing factor, in the acquisition of biological concepts. That means formation of a positive attitude towards science will be facilitating in the better acquisition of biological concepts. It is also found in the study that attitude towards science does not show significant variation with sex, location and management of school. That means all the students, irrespective of their sex, location and type of management of school can attain a positive attitude towards science, if the schools provide them proper opportunities for it. The method of teaching of science as well as chances for co-curricular activities related to science in the school will be greatly promoting better scientific attitudes. **Co-curricular activities like science club, nature club, study tours to places of scientific importance, nature visits, seminars, group discussions, debates, science quiz competitions, science exhibitions, science drama etc. may be arranged in the schools to promote proper scientific attitudes and in turn for better acquisition of concepts in science.**

14) **Better parental support and proper home learning environment should be given to secondary school students.**

It is found in the study that, a high and positive relationship exists between home environment and acquisition of concepts in biology for the total sample and most of the sub samples of the study.
Hence parents must give special attention to the educational needs of children. The children must be getting proper home learning environment. They must allow their children to participate in the co-curricular activities related to science. Above all, parents must have a close relationship with the school and participate and co-operate with the activities conducted in the school for the academic improvement of their children.

15) **Schools must try to adopt remedial measures to reduce the negative influence of student's home environment as far as possible.**

In the present study it is found that, home environment is an influencing factor in the acquisition of concepts in biology. Some home environments will be having a positive influence on learning, while certain others will be of negative influence on learning. The teachers are needed to identify the nature and influence of home environment on each student in their class. The positive influence of home environment may be nurtured. While negative influence of home environment may be reduced as far as possible. The negative influence of home environment may be mainly due to poor financial background of home, social and educational backwardness of parents or as a result of family problems in the home. Though some of these reasons are beyond the reach of school, but a majority of the reasons can be minimized or reduced by the school. In order to achieve this goal, the schools can arrange scholarships to the poor and needy, arrange special tuitions, provide noon meals and provide counseling services as and when required by the students with the help of
different community service agencies and individuals. The schools with the assistance of PTA, can arrange awareness classes for parents about developing proper study habits in their children, the need for providing feasible atmosphere for learning at home, the ill effects of family problems in the academic achievement of their children etc. Thus schools must develop a strong relationship with home of every student and vice-versa.

16) More research and development should be conducted in the field of effective concept acquisition strategies to suit the needs of pupils of differing psycho-social backgrounds.

The present study could reveal that, level of concept acquisition is very poor in a large proportion of secondary school students. The effect of different psycho-social correlates on the acquisition of biological concepts is found to be varying. It is also found that the relationship between selected psycho-social correlates and acquisition of biological concepts are differing with pupil, who belong to different categories in the selected psycho-social correlates. Hence there is an urgent need to take up research and development of new techniques to effect concept acquisition at its best among pupil, who belong to different psycho-social environment. More standardized concepts based tests giving stress to higher objectives of learning in different subjects are to be developed. Diagnostic tests to find out conceptual errors are to be developed and utilized. Newer models of teaching for effective concept acquisition are to be developed and experimented for their effectiveness.
17) Special emphasis must be provided to pupils with learning disabilities such as dyslexia and dysgraphia for acquisition of maximum concepts in different subjects and developing better study habits suited to their disability.

A number of students in secondary schools are learning disabled. Many of these students are able to acquire concepts, but many of them are not able to reproduce them, especially in the written form. So there must be special instructional programmes to better their condition. Objective type questions, oral questioning, on line tests etc. can be employed to evaluate the learning disabled for the acquisition of concepts.

18) Preparation of Student's profile must be made mandatory in the secondary schools

This can prove useful for the teachers to give individualized attention to their students at its best and it will also be a useful database for the educational administrators, policy makers and researchers. In the preparation of psycho-social profile, the different psychological and sociological tests and inventories should be administered and scored under the guidance of experts in the field.

19) Research establishments in the field of education must give more thrust to development of better models of concept acquisition in biology giving more stress to local resources.

In the teaching of biology for concept acquisition, the local resources are found more useful. So the research establishments must try to develop better models of concept acquisition with emphasis on the usage of local resources.
20) **Innovative teachers who are able to develop and practice better concept acquisition strategies using the locally available resources must be given due recognition.**

Since concept acquisition has a key role in teaching-learning situation, those teachers who are able to develop better strategies for concept acquisition within the limitations of school, making use of the local resources must be given due recognition. They may be given financial assistance to pursue their work. A particular percentage of promotion quota in the general education department of the government must be set apart for teachers who have a proven track record in the field of developing innovative teaching strategies, in the aspect of concept acquisition in different school subjects.

21) **There must an attitudinal change in the secondary school teachers to accept, develop and practice modern strategies adopted for concept acquisition, and it must be a leading principle in the training of teachers.**

Unless the teachers are not able to imbibe the modern methodologies adopted for concept acquisition throughout the world and conform themselves with a view on the local necessities and resources, all the efforts done by the governmental agencies and others concerned will be futile. So training of teachers must be centered on the attitudinal change needed to be developed for accepting, developing and practicing modern instructional strategies for better concept acquisition in their concerned subjects.
5.6 SUGGESTIONS FOR FURTHER RESEARCH

The present study is conducted to identify the influence of different selected psycho-social correlates in the acquisition of biological concepts in secondary school pupils. Some of the desirable areas for further research indicated by this study are the following;

1) This study can be extended to other science subjects like physics and chemistry etc. and can be replicated on a wider sample.

2) Studies can be conducted on the effect of other psychological and sociological variables in the acquisition of concepts in biology.

3) A study of this kind can be conducted on the acquisition of concepts in biology of students of primary level, higher secondary level and university level to reach at more valid generalizations.

4) A study can be done for the development of innovative instructional strategies for the enhancing the acquisition of biological concepts of secondary school pupils.

5) Similar studies can be conducted on secondary school pupils who belong to Kerala syllabus English medium schools, CBSE syllabus schools and ICSE syllabus schools in the state.

6) A comparative study of concept acquisition in Biology of secondary school pupils of Kerala syllabus - Malayalam medium
and English medium schools following Kerala state syllabus can be conducted.

7) An experimental study can be done on the effectiveness of instruction using modern audio-visual aids in the acquisition of biological concepts of secondary school pupils.

8) An experimental study can be conducted to compare the effectiveness of modern methods such as learning cycle and concept mapping on the acquisition of concepts in biology of secondary school pupils against the conventional teaching strategies.

9) Factorial studies can be conducted on the relationship between acquisition of biological concepts and the different dimensions of study habits, attitude towards science, home environment and intelligence to reach at more conclusive results.

10) A study on development and testing of concept maps related to the important concepts to be learned by the student in different science subjects.
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