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CHAPTER - VI

SUMMARY, FINDINGS AND CONCLUSION

6.01 INTRODUCTION

In this chapter, we have tried to assimilate, what we had done so far in previous chapters by reinstating the statement of the problem the procedure used for investigation and finally presenting the major findings of the study. In the light of the major findings some recommendations for improvements and suggestions for research are proposed.

6.02 STATEMENT OF THE PROBLEM

“EFFECTIVENESS OF CONCENTRATION BASED ACTIVITY (CBA) IN SCIENCE TEACHING ON THE DEVELOPMENT OF PROCESS COMPETENCIES AMONG SECONDARY SCHOOL STUDENTS”.

6.03 OBJECTIVES OF STUDY

1. To compare the mean pre-test scores of Process Competencies of experimental and control groups

2. To compare mean pre-test scores and post test scores of Process Skills of experimental group

3. To compare the mean pre-test scores and post test scores of Scientific Attitude of experimental group

4. To compare mean pre-test scores and post test scores of Achievement in Biology Science of experimental group
5. To compare mean post-test scores of Process Skills of experimental and control groups
6. To compare mean post-test scores Scientific Attitude of experimental and control groups
7. To compare mean post-test scores of Achievement of Biology Science of experimental and control groups
8. To compare mean gain scores of Process Skills of experimental and control groups.
9. To compare mean gain scores of Scientific Attitude experimental and control groups
10. To compare mean gain scores of Achievement in Biology Science of experimental and control groups
11. To compare mean pre-post test scores of Process Skills of experimental and control groups
12. To compare mean pre-post test scores of Scientific Attitude of experimental and control groups
13. To compare mean pre-post test scores of achievement in Biology Science of experimental and control groups
14. To study the development of Process Competencies between the pupils taught through Concentration Based Activities (CBA)

6.04 HYPOTHESES

The following hypotheses are formulated for the present study.

1. There is significant differences in the mean pre-test scores of Process Competencies of experimental and control groups
2. There is significant differences in the mean pre-test scores and post test scores of Process Skills of experimental group

3. There is significant differences in the mean pre-test scores and post test scores of Scientific Attitude of experimental group

4. There is significant differences in the mean pre-test scores and post test scores of Achievement in Biology Science of experimental group

5. There is significant differences in the mean post-test scores of Process Skills of experimental and control groups

6. There is significant differences in the mean post-test scores Scientific Attitude of experimental and control groups

7. There is significant differences in the mean post-test scores of Achievement of Biology Science of experimental and control groups

8. There is significant difference in the mean gain scores of Process Skills of experimental and control groups.

9. There is significant difference in the mean gain scores of Scientific Attitude experimental and control groups

10. There is significant difference in the mean gain scores of Achievement in Biology Science of experimental and control groups

11. There is significant differences in the mean pre-post test scores of Process Skills of experimental and control groups

12. There is significant differences in the mean pre-post test scores of Scientific Attitude of experimental and control groups

13. There is significant differences in the mean pre-post test scores of Achievement in Biology Science of experimental and control groups
14. There is significant differences in the development of Process Competencies between the pupils taught through Concentration Based Activities (CBA)

6.05 METHODOLOGY

The methodology adopted for the study is briefly given in the following part.

EXPERIMENTAL DESIGN

(i) Quasi - Experimental design

In Quasi - Experimental designs, random assignment of members to the experimental and control group is not made but random selection of experimental and control groups among the groups available is made and as such the initial equivalence of groups is not assured.

The non - equivalent pre-test treatment post test design.

\[ \text{Gain} = T_2 - T_1 = DE \]

\[ \text{Gain} = T_2^1 - T_1^1 = DC \]

Two Groups as they exist (say section A and B) are selected and one group is taken to be the experimental group and the other control group. Pre-tests were administered to both the groups. Treatment was given only to the experimental group. The control group does not receive any treatment. After the treatment, Post-test is conducted. The difference in the post-test and pre-test measures is calculated separately for the two groups. The significance of difference between different measures of the two groups is completed. If difference is significant, conclude that the treatment is effective.
TOOLS USED

To verify the hypotheses, formulated in the study, the following tools have been used.

1. Lesson plan (Based on Concentration based Activity)
2. Lesson plan (Based on existing curriculum)
3. Test of Process Skills in biology
4. Scientific Attitude Inventory
5. Criterion Referenced Test

EXPERIMENT

Pre-test post - test non - equivalent groups design was adopted for the study. Two division of class IX, St. Antony’s Higher Secondary School, Thrissur were taught through two different teaching strategies. One division of class IX D was exposed to the concentration Based Activity (CBA), as experimental group, other division exposed to Existing method teaching acted as a control group.

Three common units were taught to the two groups Viz. Sixty periods of forty minutes duration each were taken for teaching the topics. The experimental group had 48 children while the control group had 48 children.

A pre-test (Test of Process Skills in Science, Scientific Attitude Inventory, Criterion Referenced Test) was administered to the pupils to test their Process Competencies before the experiment commenced in both sections. After teaching the content of science mentioned above, through the two different teaching strategies in the two sections, a post test (Test of Process Skills in Science, Scientific Attitude Inventory, and Criterion Referenced Test) was administered to the pupils.
SCORING

The investigator adopted specific method for scoring the responses from the students, finally 48 samples from experimental group and 48 samples from control group were obtained. The completed answer sheets of 96 pupils were consolidated for further analysis and all entries were coded by using digits facilitating computer feeding.

STATISTICAL TECHNIQUES USED

In the present study, the following statistical measures were used.

1. **Mean** \( \bar{X} = A + \frac{\sum f_d}{N} \times I \)

Where,

- \( A = \) Assured Mean
- \( F = \) Frequency
- \( D = \) Deviation from the assured Mean
- \( N = \) Number of observations
- \( I = \) Class interval

2. **Standard Deviation**

\[
SD = \sigma = I \sqrt{\frac{\sum f_d^2}{N} - \left( \frac{\sum f_d}{N} \right)^2}
\]

Where,

- \( F = \) Frequency
- \( D = \) Deviation from arithmetic Mean
- \( I = \) Class interval
- \( \sigma = \) Standard Deviation
3. Quartile Deviation

\[ Q_1 = L_1 + \frac{\left[ N/4 - C_1 \right]}{f_i} \times i \]

\[ Q.D = \frac{Q_1 - Q_3}{2} \]

\[ Q.D = \text{Quartile Deviation} \]

\[ Q_1 = \text{First Q.D} \]

\[ Q_3 = \text{Third Q.D} \]

\[ L_1, L_3 = \text{Lower Limit of medium class} \]

\[ N = \text{Total Frequency} \]

\[ C_1, C_3 = \text{Cumulative frequency} \]

\[ F_1, F_2 = \text{Frequency of the medium class} \]

4. Standard Error

\[ SE = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}} \]

\[ \sigma_1, \sigma_2 = \text{Standard Deviation} \]

\[ N_1, N_2 = \text{Total number of classes} \]

5. Critical Ratio (CR) \( CR = \frac{M_1 - M_2}{SE} \)

\[ M_1, M_2 = \text{Means of two groups} \]

6. Analysis of Variance (ANOVA)

\[ F \text{ ratio} = \frac{\text{Variance between group}}{\text{Variance within group}} \]
Correlation term \( = c = \frac{(\sum X_1 + \sum X_2 + 2 \times 3)^2}{N} \)

\[ TSS = X_2 - c \]

\[ BSS = \left[ \frac{\sum X_1}{W_1} \right]^2 + \left[ \frac{\sum X_3}{W_3} \right]^2 - C \]

\[ WSS = TSS - BSS \]

Where, \( X_1, X_2, X_3 \) are scores in different groups

\[
\begin{align*}
\text{C} & = \text{Correlation term} & \text{TSS} & = \text{Total Sum of squares} \\
\text{BSS} & = \text{Sum of SQRS between groups} & \text{WSS} & = \text{With in groups.}
\end{align*}
\]

7. Single Factor ANCOVA

By the use of the single factor ANCOVA the influence of the uncontrolled variable, some times called the co-variable or concomitant variable was removed.

In the present study, initial status of the student in terms of Process Competencies is the covariate. By the use of ANCOVA, the effect of this co-variable can be removed (Ferguson, 1971).

An application of sample of co-variance requires paired observations on ‘k’ groups of experimental subjects. The number of pairs of observation in the ‘k’ groups of experimental subjects. The number of pairs of observation in the ‘k’ groups is denoted by \( N_1, N_2, \ldots, N_k \). The paired observations are assumed to the paired samples.

6.06 TENABILITY OF HYPOTHESES

(i) Hypothesis - 1

There is significant differences in the mean pre-test scores of Process Competencies of experimental and control groups

The t-values were 1.073, 1.23, , and .898 of, Process Skill, Scientific Attitude and Achievement in Biology Science respectively, which is not significant at any
level. It shows that mean scores of pre test of Scientific attitude, Process Skill, and Achievement in Biology Science have no significant difference. Thus hypothesis that There is significant differences in the mean pre-test scores of Process Competencies(, process skill, scientific attitude, achievement) of experimental and control groups is rejected.

(ii) **Hypothesis - 2**

There is significant differences in the mean pre-test scores and post test scores of Process Skills of experimental group

The t-value 6.718 which is significant at 0.01 level, It shows that mean scores of mean post-test scores of Process Skills of experimental and control groups differs significantly. Thus hypothesis that there are significant differences in the mean post-test scores of Process Skills of experimental and control groups is accepted.

(iii) **Hypothesis - 3**

There is significant differences in the mean pre-test scores and post test scores of Scientific Attitude of experimental group

The t-value 4.080 which is significant at 0.01 level, It shows that mean scores of mean post-test scores of Scientific Attitude of experimental and control groups differs significantly. Thus hypothesis that there are significant differences in the mean post-test scores of Scientific Attitude of experimental and control groups is accepted.

(iv) **Hypothesis - 4**

There is significant differences in the mean pre-test scores and post test scores of Achievement in Biology Science of experimental group

The t-value 7.829 which is significant at 0.01 level. It shows that mean scores of mean post-test scores of Achievement of Biology Science of experimental and control groups differs significantly. Thus hypothesis that there are significant
differences in the mean post-test scores of Achievement of Biology Science of experimental and control groups is accepted.

**Hypothesis - 5**

There is significant differences in the mean pre-test scores and post test scores of Process Skills of experimental group

The t-value 11.026 which is significant at 0.01 level, it shows that mean scores of pre-test scores and post test scores of Process Skills in Science of experimental group differs significantly. Thus hypothesis that there is significant differences in the mean pre-test scores and post test scores of Process Skills of experimental group is accepted.

**Hypothesis - 6**

There is significant differences in the mean pre-test scores and post test scores of Scientific Attitude of experimental group

The t-value 13.451 which is significant at 0.01 level, It shows that mean scores of pre-test scores and post test scores of Scientific Attitude of experimental group differs significantly. Thus hypothesis that there is significant differences in the mean pre-test scores and post test scores of Scientific Attitude of experimental group is accepted.

**Hypothesis - 7**

There is significant differences in the mean pre-test scores and post test scores of Achievement in Biology Science of experimental group

The t-value 11.909 which is significant at 0.01 level, it shows that mean scores of pre-test scores and post test scores of Achievement in Biology Science of experimental group differs significantly. Thus hypothesis that there is significant
differences in the mean pre-test scores and post test scores of Achievement in Biology Science of experimental group is accepted.

**Hypothesis - 8**

There is significant difference in the mean gain scores of Process Skills of experimental and control groups.

The t-value 10.113 which is significant at 0.01 level, it shows that mean gain scores of Process Skills in biology of experimental and control groups differ significantly. Thus hypothesis that there is significant difference in the mean gain scores of Process Skills of experimental and control groups are accepted.

**Hypothesis - 9**

There is significant difference in the mean gain scores of Scientific Attitude experimental and control groups

The t-value 12.372 which is significant at 0.01 level, it shows that mean gain scores of Scientific Attitude of experimental and control groups differ significantly. Thus hypothesis that there is significant difference in the mean gain scores of Scientific Attitude of experimental and control groups are accepted.

**Hypothesis - 10**

There is significant difference in the mean gain scores of Achievement in Biology Science of experimental and control groups

The t-value 9.597 which is significant at 0.01 level, it shows that mean gain scores of Achievement in Biology Science of experimental and control groups differ significantly. Thus hypothesis that there is significant difference in the mean gain scores of Achievement in Biology Science of experimental and control groups are accepted.
**Hypothesis - 11**

There is significant differences in the mean pre-post test scores of Process Skills of experimental and control groups.

The F-value 40.447 which is significant at 0.01 level with df = 3/188. It indicates that mean scores of process skills in biology of students belonging to CBA and traditional group differ significantly, that is type of strategies have significant influence on process skills in biology of the students. Thus the hypothesis there is significant differences in the development of process skills between the pupils taught through concentration based Activities (CBA) is accepted.

**Hypothesis - 12**

There is significant differences in the mean pre-post test scores of Scientific Attitude of experimental and control groups.

The F-value 6.667 which is significant at 0.01 level with df = 3/188. It indicates that mean scores of scientific attitude of students belonging to CBA and traditional group differ significantly, that is type of strategies have significant influence on scientific attitude of the students. Thus the hypothesis there is significant differences in the development of scientific attitude between the pupils taught through Concentration based Activities (CBA) is accepted.

**Hypothesis – 13**

There is significant differences in the mean pre-post test scores of Achievement in Biology Science of experimental and control groups.

The F-value 48.791 which is significant at 0.01 level with df = 3/188. It indicates that mean scores of achievement in biology of students belonging to CBA and traditional group differ significantly, that is type of strategies have significant influence on achievement in biology of the students. Thus the hypothesis there is
significant differences in the development of achievement in biology between the pupils taught through Concentration based Activities (CBA) was accepted

**Hypothesis - 14**

There is significant differences in the development of Process Competencies between the pupils taught through Concentration based Activities (CBA) and existing method

The F-value 40.447, 6.747, 48.791 respectively which is significant at 0.01 level with df =3/188. It indicates that mean scores of Process Skill, Scientific Attitude, Achievement in Biology (Process Competencies) of Students belonging to CBA and traditional group differ significantly, that is type of strategies have significant influence on Process Competencies of the students. Thus the hypothesis there is significant differences in the development of Process Competencies between the pupils taught through Concentration Based Activities (CBA) is accepted.

**Analysis of Co vrience (ANCOVA)**

From the F - value 7.838, 4.1449, 13.8129 of Process skill, scientific attitude and achievement in biology science respectively after adjusting the co-variate effect, which is significant at 0.01 level with df=3/188. It indicates that pupil taught through Concentration Based Activity (CBA) is superior to the pupil taught through existing method in the development of Process Competencies. Thus the hypothesis there is significant differences in the development of Process Competencies between the pupils taught through Concentration Based Activities (CBA) is accepted on considering the ANCOVA results.
6.07 MAJOR FINDINGS

The major findings of the present investigation are given briefly in this section.

1. The t-value obtained from the pre-test control and experiment group are compared, and it has no significant difference between these two. So we can conclude that the both group have homogeneous.

2. The t-value obtained from the post test control and experiment group are compared. It shows there is domination of post test experiment over pre-test control group.

3. The t-value obtained from the comparison of experiment and control group of Process Skill, Scientific Attitude and Achievement in Biology Science the gain scores are found significant. Thus the results show Process skill, Scientific Attitude and Achievement in Biology Science differentiate the experimental group and control group. High mean scores associated with experimental group suggest the advantage of this group over the control group.

4. ANCOVA for the total sample for the Process Competencies showed that there exist significant difference in the criterion means between experimental and control group even after statistical adjustments are made to remove the effect of co-variate of Socio Economic Status and Intelligence.

6.08 SCOPE AND LIMITATION OF THE STUDY

This study is intended to explore Concentration Based Activities as correlates of Process Skills in Science. The sample consists of 96 pupils of Standard IX., attending schools in Thrissur.
The scope of the study has been limited to certain well-defined boundaries indicated below:

Concentration based activities (CBA) in science teaching will develop process competencies that make a positive change in the pupil learning style. The study has been conceived in teens of a single level of education, viz. students of Standard IX. If the study addressed itself to just one area of the Secondary Curriculum, viz. Science and the Process Skill expected to be achieved for the Science curricula at this level.

Process Skills in Science have been measured in terms of thirteen sub-dimensions, solely with the help of paper-pencil type tests. For process-skill evaluation, use of the paper and pencil test is limitation. For the evaluation of process skill, we can think of psycho-motor processes connected with laboratory instrumentation, experimentation and fieldwork. But the inclusion of such tests would have otherwise increased several fold the scope of the study. The availability of students for such an elaborate testing schedule would be highly doubtful. Also the involved administrative and technical formalities would be forbidding. Hence the test of Process Skills had to be confined to paper-pencil tests only.

Concentration can be developed through other activities the investigator can not used in his package

The sample for the study was confined to pupils attending to Malayalam medium schools only. Also the sample was confined to pupils of Standard IX, obtained from representative schools of Thrissur Districts. But this has not decreased the generalisability of the results, since all levels of school efficiency. The findings of the study can be generalized to samples similar to what have been covered by the study.
Statistical techniques used in the study are t test, ANOVA, ANCOVA etc. Alienate statistical techniques like percentage variance, multiple regression etc., which could also provide valid results for the study. have not been attempted because of procedural difficulties.

6.09 EDUCATIONAL IMPLICATIONS

The concentration based learning activity is a significant method help to develop process competencies in secondary school students. This new method helps to improve normal classroom atmosphere.

The finding of the study and the conclusion drawn from the findings helped the investigator to frame some measures, to improve Process Skills & Scientific Attitude and Achievement in Biology Science (process competencies) among Secondary School Pupil.

Based on the findings following practical methods are suggested for improving Process skill & scientific attitude (process competencies) and achievement in biology science of students.

1. Teacher must plan that concentration Based Activities (CBA) in order to develop Process Skill & Scientific Attitude (Process Competencies) and Achievement in Biology Science.

2. Teacher must encourage student participation in the classroom.

3. Teacher should monitor the development of students.

4. Teacher should plan the activities which have to develop Process skill & Scientific Attitude and Achievement in Biology Science (Process Competencies) and participation pupils.

5. Teacher should motivate develop pupil’s their own learning style

The following are the some activities for creating concentration
a. Concept ladder  b. Concept mapping
c. Concentration games  d. Picture monitoring
e. Round robin  f. Brain Storming sessions
g. Use of ICT  h. Changing Teaching styles
i. Role play  j. Cross word puzzles
k. Mazes puzzle  l. Jigsaw
m. Simulated Interview  n. Cartoons
o. posters pictures  p. Work Experience

Concentration Based Activities (CBA) will help the students to develop the process skill, Meta- cognitive skill, lateral thinking, problem solving abilities and creative thinking etc. Curriculum reformation should focus on the development of pupil’s Concentration power.

6.10 SUGGESTIONS FOR FURTHER RESEARCH

Some suggestions with regard to possibilities of the record in the field of education are offered with a view to stimulate prospective research workers to this area as follows –

1. Concentration Based Activity (CBA) in the development of Process Competencies can be studied among Senior Secondary School Students.
2. Concentration Based Games on the development of doing Multiple Task can be studied among Secondary School Students.
3. Concentration Based Games and Process Skills may be done in Primary School Students.
4. Concentration Based Activity (CBA) and Lateral Thinking can be conducted among Primary School Students.
5. Concentration Based Activity (CBA) and Life Skills can be conducted among Primary School Students.

6. Concentration Based Activity (CBA) and Schoolphobia can be conducted among Primary School Students.