CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMANDATIONS
# CHAPTER V

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

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CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Science is the base of every developed and developing society. So there is need to inculcate scientific knowledge in other words we say that there is need to improvement of scientific attitude in adolescents for the social change. Now there is need to develop scientific mentality of the society. This is possible through education and with the help of teachers. Scientific attitude is the proper way of thinking reasonably, logically, critically and clearly without any prejudice, prebias. It is necessary because unscientific thinking can create problem for the society.

It is necessary to provide opportunities to the students for independent working, extra-reading, laboratory works and important role in solving various kinds of problems through scientific methods. Give equal opportunity to students to take part in discussions conducted in class rooms, then they will try to put their views and opinions freely in front of large number of students. This will support them in developing a habit of taking decisions on the basis of logical thinking. With this, feature of critical thinking will get developed in them and their mind set will become wide in nature. In such kind of atmosphere, they will learn the fact that everything happens with a specific cause and they will try to find out reason of happening of various things around them.
5.1 REVIEW MATRIX

Table 5.1
Review Matrix

<table>
<thead>
<tr>
<th>Parts of Review of Related Literature &amp; Research</th>
<th>Sources of</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thesis &amp; Dissertations</td>
<td>Journal Papers</td>
</tr>
<tr>
<td>Attitude measurement</td>
<td>06</td>
<td>01</td>
</tr>
<tr>
<td>Development of programme and its effectiveness</td>
<td>08</td>
<td>01</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>02</td>
</tr>
</tbody>
</table>

5.2 STATEMENT OF THE PROBLEM

To assess scientific attitude of rural & urban IX standard Marathi medium students then to analyze data collected & to finalize components of scientific attitude to be improved.

Based on this data, to develop scientific attitude improvement programme and to study its effectiveness and to study retention of scientific attitude improvement programme after one month.

CONCEPTUAL AND OPERATIONAL DEFINITION OF KEY TERMS AND PHRASES USED IN THE STUDY

Scientific Attitude

Conceptual Definition:

Scientific attitude, thus is particular set of mind which is characterized to involve the personality traits like open mindedness, freedom from bias, prejudices and superstition; honesty, truthfulness, clarity and critical mindedness in one’s approach; clarity and precision in saying and doing; desire for reaching the truth on the basis of sufficient evidences following scientific method etc.(Good C.V.,1959)
Operational Definition:

For this research the term scientific attitude comprises of curiosity, open mindedness, faith in scientific method, cause and effect relationship, critical mindedness, seeks evidence, objectivity, suspended judgement, aversion to superstition given in scientific attitude scale constructed and standardized by Dr.Gakhar and Dr.Amandeep Kaur.

For this research scientific attitude score is a score obtained on Dr.S.C.Gakhar, Dr. Amandeep Kaur’s scientific attitude scale & is used as measurement of scientific attitude.

Adolescent Conceptual Definition

Adolescence is the crucial stage between the age of thirteen to nineteen (Dandekar, Makhija, 2002)

Operational Definition

In the present study Adolescents means students (Boys and girls) of IX standard students.

Scientific attitude improvement programmes

Operational Definition

In present study Scientific Attitude Improvement Programme means the group of activities developed to improve components of scientific attitude scale constructed and standardized by Dr.Gakhar and Dr.Kaur

Table 5.2
Activities selected for SAIP

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Identified Components of Scientific Attitude</th>
<th>Activities selected for particular component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Seeks evidence</td>
<td>1. Learning through experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Demonstration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Learning through project execution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Learning through Problem solving</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Guided reading</td>
</tr>
<tr>
<td>2</td>
<td>Objectivity</td>
<td>1. Visualisation of concepts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Sharing facts with students</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Expert guidance</td>
</tr>
</tbody>
</table>

Table continued...
Development
Operational Definition
In present study development means preparation, validation, finalization of the scientific attitude improvement programme incorporating suggestions given by experts based on the science activities for IX standard Marathi medium students affiliated to SSC board, Pune.

Effectiveness
Operational Definition
In the present study effectiveness of scientific attitude improvement programme means significant difference in the Mean scores of pre-test and post-test, post test and retention test, pre test and retention test on scientific attitude test constructed and standardized by Dr.Gakhar & Dr.Kaur.

Rural area
Operational Definition
Rural area means the village which is governed by Grampanchayat of Ahmednagar district.

Urban area
Operational Definition
Urban area means the area which is governed by Tehsil of Ahmednagar district.

5.3 OBJECTIVES OF THE STUDY
1. To assess scientific attitude of adolescents and to compare scientific attitude between urban and rural students.
2. To analyze components of scientific attitude which need to be improved.
3. To develop programme for improvement of scientific attitude among adolescents through identified components.

4. To study the effectiveness of developed programme for improving scientific attitude.

5. To find out the retention of the developed programme.

6. To know the opinion of participant students about the developed programme.

5.4 DELIMITATIONS OF THE STUDY

1. Research was conducted in schools of Ahmednagar district.

2. In this study scientific attitude improvement programme was developed for improvement of only 3 components of scientific attitude of scientific attitude scale constructed and standardized by Dr. Gakhar and Dr. Amandeep Kaur. It was translated into Marathi and used.

3. Only one rural and one urban school of each tehsil of Ahmednagar district were selected for survey.

4. The sample for the study was drawn from Marathi medium schools.

5. The data was collected in academic year 2011-12.

6. Developed Scientific Attitude Improvement Programme has been tested on rural students only.

5.5 LIMITATIONS OF THE STUDY

1. Scientific attitude has been measured only with the help of available scientific attitude scale.

2. Effectiveness of the programme has been calculated on the basis of responses given by students on pre-test, post-test and retention test.

3. Scientific attitude formation through the subject other than science was beyond researcher’s control.

4. The Marathi translation was done by the researcher with the help of experts by forward-backward translation method.

5.6 SIGNIFICANCE OF THE STUDY

1) The developed programme is useful for the improvement of scientific attitude in adolescents.

2) With the help of this study one can know components of scientific attitude which need to be improved among adolescents.
3) Science teachers may use this scientific improvement programmes which will increase the students scientific attitude effectively.

4) The present research study may give the social contribution because today’s society is knowledge based society and it is essential to every person to have scientific attitude.

5) This research may enable the schools to use these scientific attitude improvement programmes in their school and improve student’s scientific attitude.

6) Programmes developed in present study may be useful for any teacher because proper guidelines/instructions are given in a developed programme.

7) Programmes developed in present study may useful for both teacher and students

5.7 ASSUMPTIONS OF THE STUDY

1. Scientific attitude may differ from student to student.(Patil, G.V., 2011)

2. Scientific attitude can be increased.(Shirode, S., 2004, Kolhatkar, M., 2007)

5.8 RESEARCH QUESTION

For objective 2

Which are the components of scientific attitude of Scientific Attitude Scale (2004) constructed and standardized by Dr.Gakhar and Dr.Kaur that need to be improved in the light of Objective 1 of the study ?

5.9 RESEARCH HYPOTHESIS

‘Scientific Attitude Improvement Programmes’ is useful in improving scientific attitude in adolescents.

5.10 NULL HYPOTHESES TESTED

For objective 1

There is no significant difference between mean scores of rural students and urban students of IX standard.

For objectives 4 and 5

A) Components which need to be improved are:

a) Seeks Evidence

b) Objectivity

c) Suspended Judgement
Null hypotheses for these components are as follow:

a) Seeks Evidence
1. There is no significant difference between mean scores of pre-test and post-test obtained by IX standard students in component of ‘Seeks Evidence’ in scientific attitude scale.
2. There is no significant difference between mean scores of post-test and retention-test obtained by IX standard students in component ‘Seeks Evidence’ in scientific attitude scale.
3. There is no significant difference between mean scores of pre-test and retention-test obtained by IX standard students in component ‘Seeks Evidence’ in scientific attitude scale.

b) Objectivity
4. There is no significant difference between mean scores of pre-test and post-test obtained by IX standard students in component of ‘Objectivity’ in scientific attitude scale.
5. There is no significant difference between mean scores of post-test and retention-test obtained by IX standard students in component ‘Objectivity’ in scientific attitude scale.
6. There is no significant difference between mean scores of pre-test and retention-test obtained by IX standard students in component ‘Objectivity’ in scientific attitude scale.

c) Suspended Judgement
7. There is no significant difference between mean scores of pre-test and post-test obtained by IX standard students in component of ‘Suspended Judgement’ in scientific attitude scale.
8. There is no significant difference between mean scores of post-test and retention-test obtained by IX standard students in component ‘Suspended Judgement’ in scientific attitude scale.
9. There is no significant difference between mean scores of pre-test and retention-test obtained by IX standard students in component ‘Suspended Judgement’ in scientific attitude scale.
B) Null hypotheses tested (For all 9 components together)

Components included in the Scientific attitude scale are as follow:

a. Curiosity
b. Open mindedness
c. Faith in scientific method
d. Cause and effect relationship
e. Critical mindedness
f. Seeks evidence
g. Objectivity
h. Suspended judgement
i. Aversion to superstition

10. There is no significant difference between mean scores of pre-test and post-test obtained by IX standard students on scientific attitude scale.
11. There is no significant difference between mean scores of post-test and retention-test obtained by IX standard students on scientific attitude scale.
12. There is no significant difference between mean scores of pre-test and retention-test obtained by IX standard students on scientific attitude scale.

5.1 PLAN AND PROCEDURE OF THE STUDY

The present research study has adopted multimethod research involving both quantitative and qualitative methods at various stages of research.
Table 5.3
Objective-wise plan and procedure of the study

<table>
<thead>
<tr>
<th>Obj. No.</th>
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<th>Sample Selection Method</th>
<th>Sample</th>
<th>Data Collection Tool</th>
<th>Statistical Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>Survey method</td>
<td>1. All the tehsils</td>
<td>1377</td>
<td>Scientific Attitude Scale</td>
<td>Combined Mean, Mean, S.D, t-test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Random sampling for selection of school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 urban and 1 rural school from each tehsil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Product developme nt</td>
<td>.......................</td>
<td>.........</td>
<td>.........</td>
<td>...........</td>
</tr>
<tr>
<td>4 &amp; 5</td>
<td>Experimental</td>
<td>Purposive sampling for selection of school and students</td>
<td>51</td>
<td>Scientific Attitude Scale</td>
<td>Descriptive Inferential (t-test)</td>
</tr>
<tr>
<td>6</td>
<td>Survey</td>
<td>Purposive sampling</td>
<td>51</td>
<td>Questionnaire</td>
<td>Qualitative Percentage</td>
</tr>
</tbody>
</table>

TOOLS AND TECHNIQUES OF DATA COLLECTION

For this study following tools and techniques were used to collect the necessary data.

1. Selected scientific attitude scale was used scientific attitude scale constructed and standardized by Dr. Gakhar and Dr. Amandeep Kaur.
2. Scientific Attitude Improvement Programme.
PROGRAMME IMPLEMENTATION

1. First request letter was given to school principal of Shri.Nrusinh Madhyamic vidyalaya, Chas for conducting research.
2. Scientific attitude scale was administered to students of IX standard.
3. Discussion was done with teachers about program implementation.
4. Researcher implemented scientific attitude improvement programmes to students.
5. Again scientific attitude scale was administered to students as post-test and retention test.

5.12 STATISTICAL TOOLS USED IN THE STUDY

At different phases of research qualitative and quantitative methods were used for analysis and interpretation of data.

Qualitative method was used for identification of different components of scientific attitude which need to be improved.

The experimental design was used to check the effectiveness of scientific attitude programmes for improving scientific attitude in 9th standard students from Marathi medium school. The data was collected by administrating pre-test, post-test and retention test.

Following statistical techniques were used to analyze quantitative data,

1. Combined Mean
2. Mean
3. Standard Deviation
4. t-test

Quantitative method was used for analysis of opinion of the students on SAIP.

The analyzed data was tabulated and interpreted and results drawn.

5.13 RESULTS AND DISCUSSION

For rural and urban students

There is significant difference between mean scores of rural students and urban students obtained by IX standard students in scientific attitude scale.

For component ‘Seek evidence’

There is significant difference between mean scores of pre-test and post-test obtained by IX standard students in component of ‘Seek Evidence’ in scientific attitude scale.(Rejection of null hypothesis 1)
The performance of students in post-test and retention-test for scientific for component ‘Seeks Evidence’ was better than in pre-test in scientific attitude scale. (Null hypothesis 2 accepted)

There is significant difference between mean scores of pre-test and Retention-test obtained by IX standard students in component of ‘Seek Evidence’ in scientific attitude scale. (Rejection of null hypothesis 3)

**For component ‘Objectivity’**

There is significant difference between mean scores of pre-test and post-test obtained by IX standard students in component of ‘Objectivity’ in scientific attitude scale. (Rejection of null hypothesis 4)

The performance of students in post-test and retention-test for scientific for component ‘Objectivity’ was better than in pre-test in scientific attitude scale. (Null hypothesis 5 accepted)

There is significant difference between mean scores of pre-test and Retention-test obtained by IX standard students in component of ‘Objectivity’ in scientific attitude scale. (Rejection of null hypothesis 6)

**For component ‘Suspended Judgment’**

There is significant difference between mean scores of pre-test and post-test obtained by IX standard students in component of ‘Suspended Judgment’ in scientific attitude scale. (Rejection of null hypothesis 7)

The performance of students in post-test and retention-test for scientific for component ‘Suspended Judgment’ was better than in pre-test in scientific attitude scale. (Null hypothesis 8 accepted)

There is significant difference between mean scores of pre-test and Retention-test obtained by IX standard students in component of ‘Suspended Judgment’ in scientific attitude scale. (Rejection of null hypothesis 9)

**For all 9 component together**

There is significant difference in the mean scores of scientific attitude obtained in pre-test and post-test obtained by IX standard students. (Rejection of null hypothesis 10)

The performance of students in post-test and retention-test for scientific attitude was better than in pre-test. (Null hypothesis 11 accepted)
There is significant difference in the mean scores of scientific attitude obtained in pre-test and Retention-test obtained by IX standard students. (Rejection of null hypothesis 12)

These results of this study are supported by following researchers. They found that:

Scientific attitude in rural and urban students differ significantly.
Scientific attitude is measurable. (Patil C, 2005; Kadlaskar S, 1994)

5.14 MAIN CONCLUSIONS
1. On the identified components of scientific attitude, the scientific attitude improvement programme was prepared in this study. The developed programmes are found to be effective.
2. There is significant difference in scientific attitude of rural and urban students. Urban students are having more scientific attitude compared to rural students.
3. From the results of this present study it is proved that developed scientific attitude improvement programmes can be effectively used for improvement of scientific attitude of adolescents.
4. Scientific Attitude Improvement Programme helps to retain the scientific attitude.
5. Scientific Attitude improvement Programme is useful in daily life and enhances their critical and logical thinking.

5.15 SUGGESTIONS BASED ON THE RESULTS OF THE STUDY
Following are suggestions given to schools, teachers, parents and students based on the results of the study
1. School should arrange special training programme for teachers for implementation of scientific attitude improvement program.(Main conclusion 2)
2. Teachers should be encouraged to adopt these programme so that student’s scientific attitude could be improved.(Main conclusion 2)

5.16 SUGGESTION FOR FURTHER RESEARCH
1. Study of scientific attitude of higher secondary students.
2. Development of scientific attitude improvement programme for primary students and its effectiveness.

3. Comparative study of scientific attitude with respect to family background of rural and urban students.

4. Scientific Attitude Improvement Programme developed in the present research work may be tested for urban students of IX class.

5. The developed SAIP for urban school students can be studied.

**5.17 CONTRIBUTION TO KNOWLEDGE**

1. This study has brought out the need of improvement of scientific attitude in adolescents with the help of Scientific Attitude Improvement Programme in Ahmednagar district.

2. The study had uniquely contributed to the literature in the following areas:
   - Effectiveness of research based Scientific Attitude Improvement Programme in improvement of scientific attitude in IX standard Marathi medium school students.

3. The developed Scientific Attitude Improvement Programme is useful for teachers for inculcating scientific attitude in students.

4. The study can be implemented in any school (Rural and urban) since Scientific Attitude Improvement programme is tested for effectiveness.