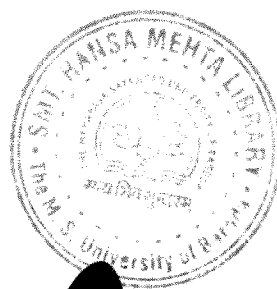


# Chapter 3



## **Chapter-III**

### **METHODOLOGY**

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- 3.3 Tools for the present study
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# **CHAPTER-III**

## **METHODOLOGY**

### **3.1 Introduction**

Methodology concerned with how the research work is being carried out in the actual field. The procedure adopted to realize the set objectives and to test the hypothesis formulated for the present study is described under the four main headings – population and sample of the study, tools used, design of the study and the implementation of strategy.

### **3.2 Population and Sample**

#### **Population**

All primary teachers of Visnagar taluka of Mehasana district following text books of Gujarat State Board of School Textbooks, Gandhinagar constituted the population for the present study.

#### **Sample**

All teachers of Visnagar taluka were selected on the basis of their willingness to participate throughout the study. In all 153 teachers have shown their interest and school authorities have permitted them. 153 seemed to be a large number for conducting the present study so finally twenty five teachers were randomly selected for present study.

### **3.3 The tools for the present study**

The present study was an intervention study aimed at enhancing creative and critical thinking in sampled teachers. In order to study the impact of the intervention on these teachers investigator developed a tool that measures development in creative and critical thinking. The investigator had reviewed the available tools developed by other researches in order to study creative and critical thinking for their respective study and developed two tools:

- (1) Creative and critical thinking tool: in order to study the impact of intervention on sampled teachers. The detail procedure followed for designing the tool is mentioned in this chapter under the section 3.3.1.

Final tool is enclosed in **Appendix II**.

Reaction scale: In order to examine the views of the teachers regarding the instructional strategy reaction scale was developed by the investigator. This scale is consisted of twelve items. Out of which eleven items were rated on five point scale i.e. strongly agree, agree, undecided, disagree strongly disagree and the last item was for open comment related to overall views regarding the strategy. The items were pertaining to the trainees liking, understanding, retention and the media, method, approach during the intervention. The components covered in the reaction scale were related to the time duration, clarity and understanding about the strategy, lesson plans, different methods of discussion etc.

The reaction scale was preceded by general instructions about the method of responding with regard to clarity and format of the items. The tool was

modified on the basis of the suggestions made by the experts. The final format is enclosed in the **Appendix-III**.

### **3.3.1 The development of tool for measuring creative and critical thinking**

The developed tool for measuring creative and critical thinking is given in the appendix I. This tool to measure creative and critical thinking was constructed thorough following these steps.

#### **Step-1 Identification of dimensions of creative and critical thinking**

The investigator reviewed available literature to identify various dimensions of creative and critical thinking. The literature search included various books on creative and critical thinking, articles published in various research journals, periodicals and project reports.

In the area of creativity, fluency, flexibility, originality, elaboration etc are the key dimensions. Out of which investigator had selected fluency, flexibility and originality in the present study.

Richard Paul had reported 35 different strategies for critical thinking a list of these strategies is as under:

#### **List of strategies:**

##### **Affective strategies:**

1. Thinking independently
2. Developing insight into egocentricity or sociocentricity
3. Exercising fair-mindedness

4. Exploring thoughts underlying feelings and feelings underlying thoughts
5. Developing intellectual humility and suspending judgment
6. Developing intellectual courage
7. Developing intellectual good faith or integrity
8. Developing intellectual perseverance
9. Developing confidence in reason

#### **Cognitive strategies**

10. Refining generalizations and avoiding oversimplifications
11. Comparing analogous situations: transferring insights to new contexts
12. Developing one's perspectives: creating or exploring beliefs, arguments, or theories
13. Clarifying issues, conclusions, or beliefs
14. Clarifying and analyzing the meaning of words or phrases
15. Developing criteria for evaluation: clarifying values and standards
16. Evaluating the credibility of sources of information
17. Questioning deeply: raising and pursuing root or significant questions
18. Analyzing or evaluating arguments, interpretations, beliefs, or theories
19. Generating or assessing solutions
20. Analyzing or evaluating actions or policies
21. Reading critically: clarifying or critiquing texts
22. Listening critically: the art of silent dialogue
23. Making interdisciplinary connections
24. Practicing Socratic discussion: clarifying and questioning beliefs, theories, or perspectives

25. Reasoning dialogically: comparing perspectives, interpretations, or theories
26. Reasoning dialectically: evaluating perspectives, interpretations, or theories
27. Comparing and contrasting ideals with actual practice
28. Thinking precisely about thinking: using critical vocabulary
29. Noting significant similarities and differences
30. Examining or evaluating assumptions
31. Distinguishing relevant from irrelevant facts
32. Making plausible inferences, predictions, or interpretations
33. Evaluating evidence and alleged facts
34. Recognizing contradictions
35. Exploring implications and consequences

On the basis of these thinking strategies investigator categorized some dimensions of critical thinking as under for the purpose of this investigation keeping in mind the availability of resources, nature of sample group of teachers, constraint of time, content, available material and researcher's own limitations of expertise in this complex area. Few dimensions of critical thinking that were selected for the purpose of present study included:

1. Intellectual empathy
2. Problem solving
3. Logical reasoning

## **Step-2 Designing the test items**

In order to frame the test items investigator had referred the school library for inquiring the kinds of books and activities the sampled teachers are exposed during their process of learning. Numbers of items were framed keeping in mind the Intellectual level, General awareness and Ability of reasoning of the teachers. Out of these representative items on creative and critical thinking were sampled out. Taking into consideration of opinion and feed back of guiding teacher investigator considered forty five items on various dimensions of creative and critical thinking and rests got discarded.

## **Step-3 Validation of the tool**

After identifying various dimensions of creative and critical thinking series of questions were formulated keeping in mind different levels of objectives of Bloom (2001) taxonomy that is remember, understand, apply, analyze, evaluate and create.

Investigator consulted experts (list of experts is appended in **Appendix-I**) keeping in mind their expertise in the language, experience in the field of research and primary education, teacher education, exposure to the population and sampled teachers.

The major points of discussion were appropriateness of the test items in order to estimate content validity.

- (1) Relevance of test item in the category of creative and critical thinking
- (2) Nature of the test items and
- (3) Clarity of instructions as per the expected answers of the test items.

After comprehensive study of comments of experts test items were modified accordingly and at the end finalized for the pilot study.

In the final tool total twenty five items were selected of which twelve items were on measuring awareness of creative and critical thinking, six items on creative thinking and seven items on critical thinking.

#### **Step-4 Pilot study**

The developed tool was administered to the primary school teachers of one school of Vijapur taluka of Mehasana district which is very much similar in nature to the sampled teachers of the study in order to estimate the comprehension level of the teachers on these test items. Some teachers finished in forty minutes and some took fifty five minutes. On average, forty five minutes is reasonably enough to attend all test items. After reviewing their comment on the time duration and language difficulty test items were refined and all twenty five test items were retained for the final run.

#### **Step-5 Scheme of scoring**

The test items in the tool were framed to measure the specific dimensions of creative and critical thinking. The tools comprised both essay and objective types of questions and is therefore a very subjective in nature. The test contain three different sections 1) items on awareness of creative and critical thinking 2) items on creative thinking and 3) items on critical thinking.

The scoring procedures for all of these sections are different.

### General instruction for scoring creative and critical thinking tool

1. The tool comprises of three main sections. One section measures the awareness of the subjects about the creative and critical thinking and the other two sections measure creative and critical thinking ability of the individual.
2. A dimension measuring creative thinking contains items on fluency, flexibility and originality.
3. Items on measuring critical thinking will be evaluated using certain standards. For example if reasoning is the dimension being measured, the standards for measuring would be clarity in reasoning, relevance in reasoning and completion in reasoning.

**Scoring procedure for awareness tool:** in order to score items on awareness tool the investigator has incorporated some of the international standards laid down by Dr. J. L. Williamson (1991) which are presented as under:

#### Standards for higher order thinking

Non clarity	vs	clarity
Irrelevant	vs	relevant
Biased	vs	unbiased
Non answerability	vs	answerability
Superficial	vs	deep
Incomplete	vs	complete

Following above standards respondents' answer is to be scored and maximum score for each item is 2 marks.

### **Scoring the items on creative thinking**

In order to score creative thinking test items teachers' responses are assessed in the following categories:

**Fluency:** total number of meaningful responses

**Flexibility:** is the ability to produce ideas which differ in approach i.e. number of variety of responses

**Originality:** number of unique answers in a group.

Scoring procedure one of the test items is illustrated as under:

Write the possible words with a, r, c and e.

The possible answers for this particular item may contain words such as: are, area, rare, rear, ear, era, career, care, car, race etc.

**Fluency:** one mark is given for each meaningful correct word so in this case score comes 10.

**Flexibility:** one for each different category so here score comes 7.

- |              |                    |
|--------------|--------------------|
| 1. are       | 2. car, race, rear |
| 3. area, era | 4. career          |
| 5. care      | 6. rare            |
| 7. ear       |                    |

**Originality:** the number of unique responses of individual in a group is accounted for his/her originality.

It is the uncommonness of a given response. The more uncommon the response the higher is the originality weightage.

In the present study, considering the size of the sample the scoring of originality components was done on the basis of the Statistical uncommonness of responses. Scoring procedure is shown in the next table.

Scoring criteria for originality

No. of teachers who have given the uncommon response	Originality score to be given to each of these response
4 or more	0
3	1
2	2
1	3

### Scoring the test items on critical thinking

Scoring of items on critical thinking is little tricky. Item wise expected answers are as follows :

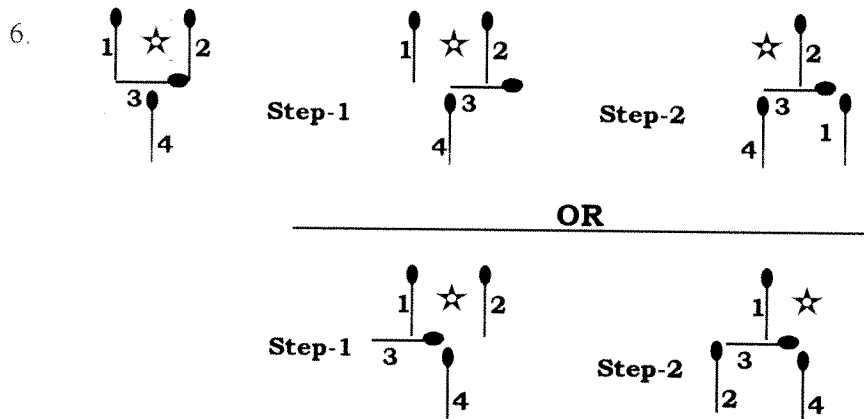
#### Answers :

1. Addition = 45; multiplication = 0 (One mark for each correct answer)
2. E is the correct one because except E rest are consonants (one mark for right answer and one mark for reason.)
3. Total number of squares are  $16+9+4+1=30$  (two marks for correct answer)
4. Step-1 First both child will cross the river with boat.  
Step-2 One child will come back with boat.  
Step-3 Mehta will cross the river with boat.  
Step-4 Another child will come back with boat.  
Step-5 Again both child will cross the river with boat.  
Step-6 One child will come back with boat.  
Step-7 Mehti will cross the river with boat.  
Step-8 Another child will come back with boat.  
Step-9 Both child will cross the river.  
(two marks for right solution)

બે બાળ —————> બે બાળ  
એક બાળ <—————  
—————> મહેતો  
એક બાળ <—————  
—————> બે બાળ  
એક બાળ <—————  
—————> મહેતી  
એક બાળ <—————  
—————> બે બાળ

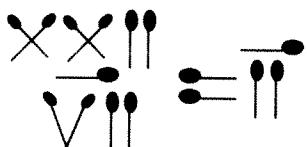
5. B is correct, because given all beggars are poor.

**Reason :** If Magan is beggar then it is implied by the premise that he will be poor. (one mark for correct choice and one for proper reason).

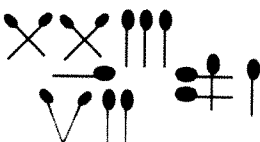


(two marks for right solution)



Ans. 1   $\left( \frac{22}{7} = \pi \right)$

OR

Ans. 2   $\left( \frac{23}{7} \neq 1 \right)$

(one mark for each right answer)

### 3.4 The design of the study

The present investigation was an intervention study carried out for twelve weeks and was of developmental in nature. The study aimed at evaluating the changes in the teachers as a result of intervention strategies employed to enhance creative and critical thinking skills using suitable content matter. To conduct this experiment investigator had selected pre experimental design, though they provide little control of extraneous variables. The research design selected for the present investigation was **one-group pretest posttest design**. Considering the administrative difficulties on the part of the schools and teachers, feasibility of commuting, expenditure involved in the process of experiment and many such constraints led to the said design. Keeping in mind the threats of this poor experimental design, however, investigator ensured the following measure to establish the internal validity of this study.

Two extraneous variables that can have major impact on the internal validity are history and maturation. History, as a source of extraneous variable refers to the specific events that can occur between the pretest and the posttest, other than the experimental treatment. In this case, selected group of teachers have not undergone for and other treatment through out the study and this precautions were taken by the investigator through out the study.

Maturation refers to changes in the subjects themselves that occur with the passage of time, between pretest and posttest. Here, time plays a vital role. In this case time period selected is not very long and all teachers are already matured physically so will leave to marginal impact.

Pretesting, expose to the pretest may affect the teacher's performance on a second test, regardless of the experimental treatment. Before conducting pretest no such

instruction or hints were given to the teacher's that they are going to be tested second time. Knowingly, teachers were not allowed to bring and take any material at the time of pretest. They were asked to write in the question paper only and any rough work they have done was collected along with their answer sheets.

Measuring instrument refers to the change in the measuring instrument itself, the scorer, or the observer used in the procedure of measurement. Here, investigator have utilized the same test as the posttest, scored and observed the testing procedure both the time of testing to take care of this variable.

Experimental mortality, here 25 teachers have constituted the sample of the study, all teachers remained present during pretest and posttest and not a single teacher dropped through out the study.

### **3.4.1 Variables of the study**

There were two types of variables involved in the present study (i) independent and (ii) dependent variable

#### **(i) independent variable**

Treatment based on the developed instructional strategy by the investigator is considered as independent variable.

#### **(ii) dependent variable**

The measures of the creative and critical thinking tool that is the scores obtained by the sampled teachers on three dimensions of creative thinking (Fluency, Flexibility, and Originality) and scores on various items of critical thinking were the dependent variables in the present study.

### **3.5 The implementation of the strategy**

The present study was implemented in three phases (1) the pre-intervention phase (2) the intervention phase and (3) the post-intervention phase.

#### **Phase – I Pre-intervention phase**

This phase was utilized for (a) the development of tool for measuring creative and critical thinking and reaction scale for sampled group of teachers. (b) selection of techniques and methods for developing creative and critical thinking and (c) developing a sample lessons plans of standard I to VII in order to facilitate creative and critical thinking by integrating thinking tools and strategies with content.

#### **Phase –II The intervention phase**

The present study is an intervention carried out in order to study the effectiveness of developed instructional strategy to enhance creative and critical thinking in the teachers. For this purpose investigator has identified thinking tools and thinking strategies and integrated these tools and transacted the content using these tools and strategies. Bereiter, C. (1985) had identified following three basic approaches in order to implement the teaching of thinking.

1. Thinking is taught as enrichment: in this approach either special classes on thinking are organized or special thinking exercises are developed and added on the curriculum. In either case thinking is seen as something that is 'added on' as if it were a curriculum area, being separated from the academic substance.

2. Teaching thinking as content: in following this approach, one proceeds to identify the elements of good thinking and then teaches students what those elements are. Essentially it is a course in logic and problem solving.
3. Pervasive approach: in this approach teaching of the basic school subjects are in such a way that thinking is enhanced. It facilitates teaching thinking skills as well as increases the learning of subject matter. More over, to teach the basic subjects without teaching thinking simultaneously not only neglects thinking but is ineffective.

In this intervention investigator has followed pervasive approach where in various school subjects were taught by integrating thinking skills as it facilitates teaching of thinking skills as well as increases the learning outcome of the content matter. The intervention was carried out for 12 weeks through following schedule.

<i>Week</i>	<i>Task during that week</i>
1	Pre test
2	Demonstration of lesson by sampled teachers
3	Concept and nature of thinking, creative thinking, critical thinking
4	Concept, nature, importance, dimensions of creative thinking
5	Concept, nature, importance, aspects of critical thinking
6	Characteristics of students and teachers with creative thinking
7	Characteristics of students and teachers with critical thinking
8	Introduction and practice of thinking tools: P.M.I., C.A.F., A.P.C., C&S

9	Explanation about thinking strategies S1, S2, S3, S4
10	Demonstration and discussion of lesson plan developed by investigator using thinking tools and thinking strategies using content
11	Development of lesson plans by sampled teachers using thinking tools and strategies, presentation and discussion
12	Administration of Post test and Reaction Scale

### Phase –III      The post Intervention phase

In the post intervention phase the investigator once again administered the tool measuring critical thinking to the sample group of subjects. Their scores on the developed tool before the intervention and after the intervention programme were analyzed.

Reaction scale was also administered to study the reactions of teachers regarding the intervention programme, the appropriateness of thinking tools and thinking strategies in order to develop creative and critical thinking, timing of the programme, time duration of group discussion and any other suggestions they would like to make for the improvement of instructional strategy.