CHAPTER III

METHODOLOGY

3.1.0 INTRODUCTION

In the previous chapter, researcher discussed the studies conducted in the area of thinking particularly on productive thinking, critical thinking and creative thinking. It helped to develop an understanding about methodology used by researchers to attain the specific objectives related to thinking abilities. Research methodology is the blue print of the whole research that guides the researcher to take specific action in order to attain the objectives of the research. The present study is experiment in nature where a model for development of productive thinking is developed and implemented among standard VIII students. This chapter presents the research methodology used by the researcher in the present study. This chapter discusses research design, population, sample, tools and techniques, data collection procedure and specific statistical techniques for analysis used in the present study.

3.2.0 RESEARCH DESIGN

Research design is the blue print for experimental research to achieve the objectives of the research. As the present study is an experimental study where randomization is not feasible to choose the sample, quasi-experimental research design was used in the present study. As stated by Gribbons & Herman (1996) quasi-experimental design is employed when random assignments is not possible. Pretest-posttest non-equivalent design was chosen for the present study. This design is used when experimental and control groups are assembled groups as intact classes (Best & Kahn, 2006). The research design used for the present study can be represented as follows.

O_1 X O_2

O_3 C O_4

Where, O_1 and O_3 are pretests,

O_2 and O_4 are posttests

X represents experiment group

C represents control group

The present study followed the said quasi-experimental pretest-posttest non-equivalent control group design where at the starting of the study both the intact groups were pretested and on the basis of these pretest score, groups were matched to avoid the threat to internal validity. Experimental group was taught science subject by the researcher with developed integrated strategy for one academic session (2019-20) while control group was taught through traditional classroom teaching method by their regular subject teacher. At the end of the study, posttest was administered on both the groups. Analysis and result of the data are used to see the effectiveness of developed strategy on productive thinking inculcation among elementary school students.

3.3.0 VARIABLES

Following variables were involved in the present study.

3.3.1 Independent variable

Independent variables are the conditions or characteristics that the experimenter manipulates (Best & Kahn, 2006) Developed integrated strategy in the form of a productive thinking model (FIESI) for the development of productive thinking was the independent variable in the present study whose effectiveness was measured to see the development of productive thinking among students after implementation of the strategy.

3.3.2 Dependent variable

Dependent variables are the conditions or characteristics those are changed by the manipulation of independent variable. In the present study, productive thinking, achievement in Science and reaction towards the integrated strategy were considered as the dependent variables.

3.4.0 POPULATION OF THE STUDY

Population of the present study consist of all the students of standard VIII studying in English medium schools affiliated to CBSE (Central Board of Secondary Education) in Gujarat state in the session 2019-2020. As per the CBSE annual report (2018-2019) there were total 471 schools (as on 31/03/2019) in the Gujarat state affiliated to CBSE. So all the students studying in standard VIII (2019-2020) in those schools comprise the population for the present study.

3.5.0 SAMPLE OF THE STUDY

As per the research design used in the present study, sample was selected using convenient sampling technique of non-probability sampling. Two Kendriya Vidyalayas were selected purposively from Vadodara city of Gujarat state for the present study as per the convenience to do the experiment. Permission was taken from Assistant Commissioner, Kendriya Vidyalaya, Regional Office, Gandhinagar (Permission letter is attached in the appendix VI) and principals of the schools for the experiment. As the permission granted, Kendriya Vidyalaya no. 4, ONGC, Makarpura, Vadodara was selected as the school for experimental group and Kendriya Vidyalaya no. 3, Airforce Station (AFS), Makarpura, Vadodara was selected as the school for control group. One intact section of standard VIII from each school was selected as the class for the sample for the experimental and control group. Before starting the experiment, students of both the sample classes were made equivalent on the basis of their pretest score of productive thinking for the purpose of experiment. Initially there were 45 students in experimental group and 59 students in control group. After matching, the equivalent groups consist of 26 students each for both experimental and control groups. Hence, those 52 students constituted as the sample for the present study. Sample design used in the present study is given in figure 3.1.

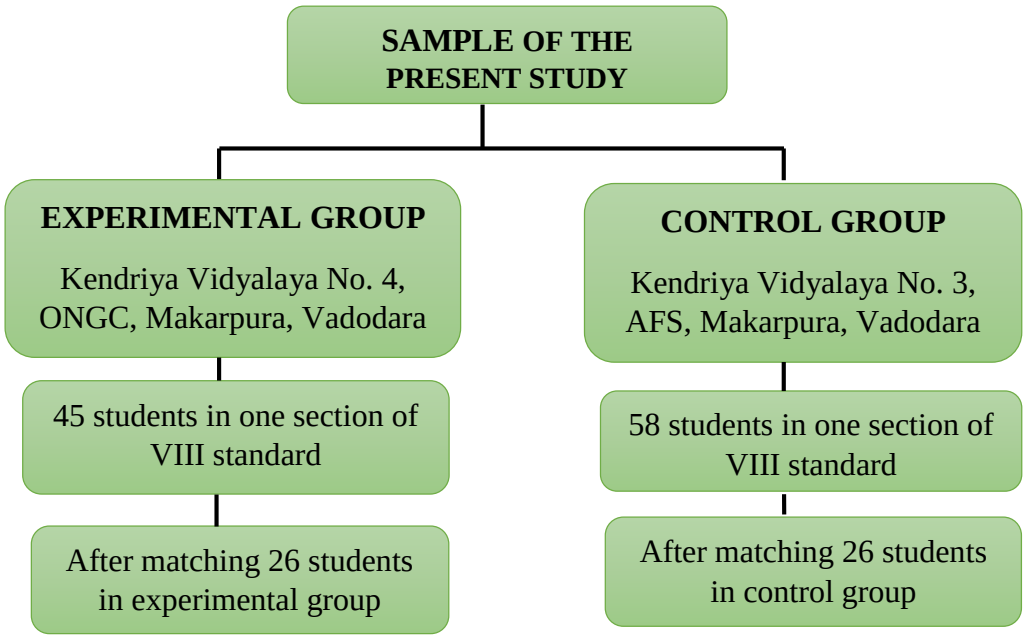

Figure 3.1: Sample of Present Study

3.6.0 PHASES OF THE STUDY

The present study was conducted with the following three phases:

3.6.1 Phase 1-Development

This is the preparatory phase that involved development of strategy for productive thinking and tools for data collection. At the initial phase an integrated strategy was developed. For the integrated strategy, a model of productive thinking (FIESI) was developed by keeping in mind the specific components of teaching model. Different child centered techniques and thinking techniques were selected to integrate with the different phases of model of productive thinking to teach productive thinking skills to the students. Integration of different techniques with model of productive thinking (FIESI) give rise to a strategy through which subject content can be taught in an integrated manner. The developed integrated strategy was sent to the experts in field of educational research to ensure the content validity of the strategy. By having the suggestions from the experts, the developed strategy was improved accordingly by keeping in mind the cognitive level of the sample students. The detailed description on developed strategy is given in caption 3.8.0. To collect the data, a scale for productive thinking was developed based on science content and validated by the experts to ensure the content validity and pilot study was done on VIII standard CBSE school students who were not from the selected sample of the present study to ensure the face validity. Along with this, a Likert type five point reaction scale was developed to get the students' reaction towards developed integrated strategy for productive thinking and validated by the experts in the field of educational research. A detailed description of tools involved is given in the caption 3.7.0.

3.6.2 Phase 2-Implementation

This is the implementation part of the research. Before starting the experiment, the researcher administered the developed productive thinking scale as pretest on experimental and control groups. The pretest scores were used to equate both the groups. The experimental group was taught science through developed strategy for one academic session (one year) (2019-2020) by the researcher, while the control group was taught by their regular subject teacher with the tradition classroom teaching method. In one academic session approximately 140 classes of science were taken by the researcher as science teacher. At the end of the session, posttest in the form of productive thinking scale and achievement test were administered on both the groups to study the effectiveness of developed integrated strategy in terms of productive

thinking and achievement respectively. A reaction scale was administered on experimental group to get the reaction of the students towards the teaching through the developed strategy. The achievement scores in science of both the groups were collected from both the sample schools at the end of the session. The achievement test was developed by Kendriya Vidyalaya authority and it was same for both the schools.

3.6.3 Phase 3-Analysis

This phase involves analysis of the collected data with suitable statistical techniques. Posttest scores were analyzed to study the effectiveness of the developed integrated strategy in terms of productive thinking scores, achievement and reaction of the students towards developed strategy. The detailed work on analysis and statistical techniques used is given in caption 3.11.0. Phases involved in the present study can be better understood by the figure 3.2.

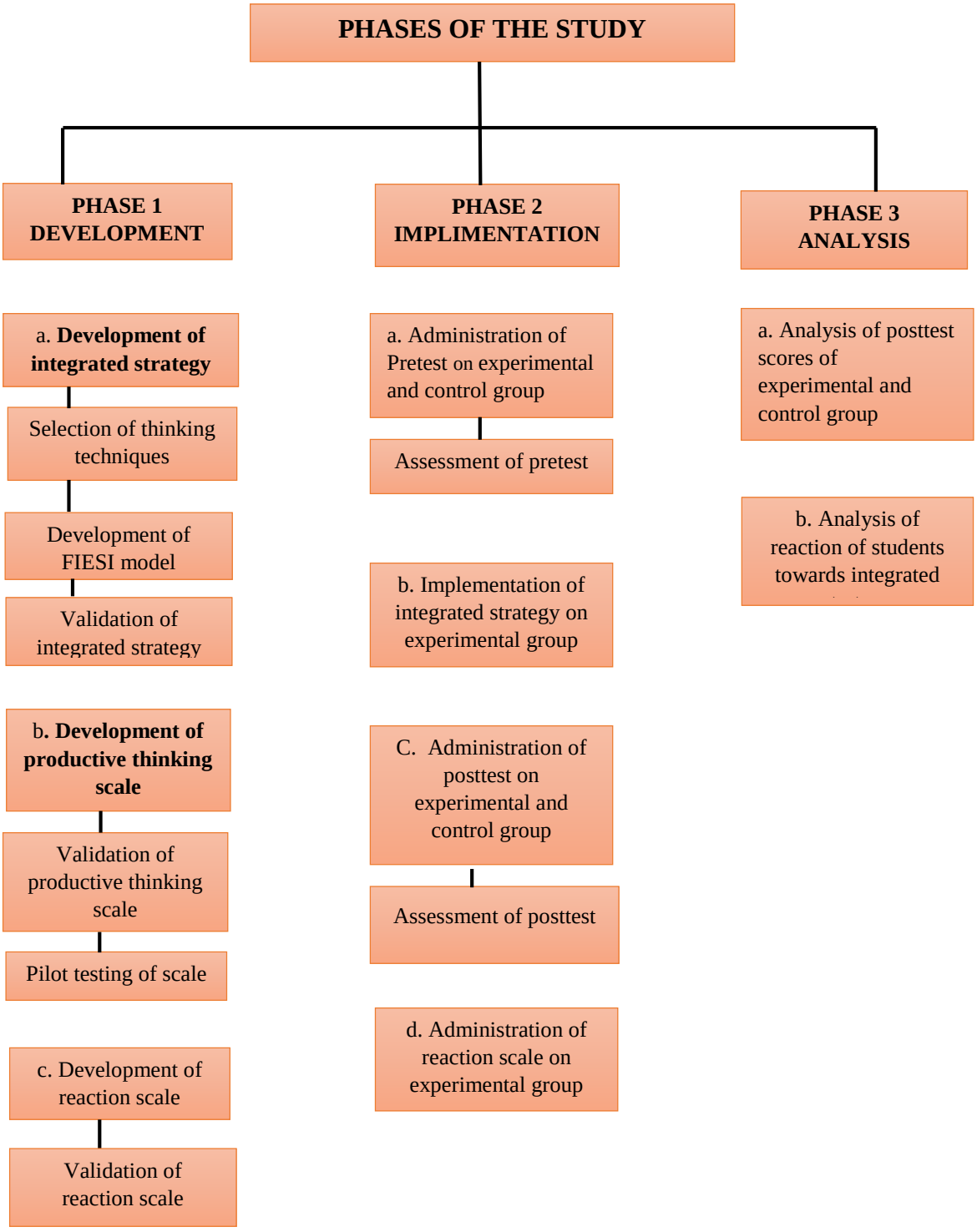

Figure 3.2: Phases of Present Study

3.7.0 TOOLS FOR THE DATA COLLECTION

Following tools were used by the researcher for the purpose of data collection.

3.7.1 Productive Thinking Scale

Present study was delimited to the science as the subject of teaching in class VIII of CBSE schools. Investigator developed a productive thinking scale based on science content by setting the assumption that productive thinking is the highest order thinking in the process starting from reproductive thinking through critical thinking and creative thinking. Each Item was designed like a thinking situation having four different options representing four different product of thinking process. The four options in each item represents product of reproductive thinking, critical thinking, creative thinking and productive thinking but not in the same order. Initially a draft scale was prepared with 30 items. To ensure the content validity of the scale, the scale was sent to the five experts who have experience in the field of educational research and also in higher order thinking skills. A pilot testing was done on standard VIII students of a CBSE school (Podar World School, Vadodara) to ensure the face validity of the scale. With due incorporation of suggestions from the experts and pilot testing, productive thinking scale was improved and in final version of the scale there were 20 items. Instructions to attempt the scale were given in the scale for respondents. Respondents were asked to choose one appropriate alternative out of four for specific items. The level of thinking ability for the specific item would be examined by the response given for the specific item. For example, if the respondent selects the option representing product of productive thinking process for an item, it means the respondent thought up to productive thinking level for the particular thinking task or if the respondent selects an option representing product of critical thinking process for an item, it means the respondent thought up to the level of critical thinking for the particular thinking task.

Since the process of productively generating idea is a sequential process where a person has to think in sequential manner to arrive at productive idea. This sequence can be understood through the following figure 3.3.

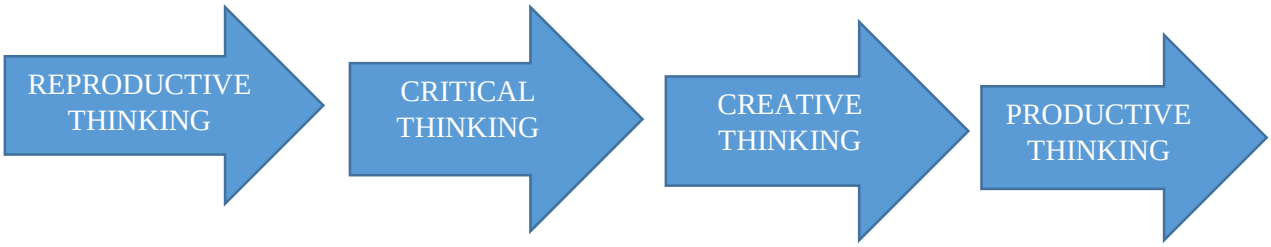

Figure 3.3: Sequence of Thinking Processes in Productive Thinking

By keeping in mind the above sequence of thinking processes involved, it can be said that reproductive thinking is the lowest order component and productive thinking is the highest order component (through critical thinking and creative thinking) in the productive thinking process. Therefore, in the productive thinking scale lowest i.e. mark 1 was allotted to the reproductive thinking, 2 mark was allotted to the critical thinking, 3 mark was allotted to the creative thinking and 4 mark was allotted to the highest order component i.e. productive thinking. Marks distribution can be understood by the following table 3.1.

Table 3.1: Allotted marks to the Components in Productive Thinking

COMPONENTS OF PRODCUTIVE THINKING	MARKS ALLOTED IN THE SCALE
Reproductive thinking	1
Critical thinking	2
Creative thinking	3
Productive thinking	4

1 hour time is allotted to the students to solve the test and instructions to solve the test were also given in the scale. Scale of productive thinking is attached in the appendix I.

3.7.2 Achievement Test

To study the effectiveness of developed strategy in terms of achievement of the students in science, investigator used the achievement test in science conducted by school authority. Since both the schools were Kendriya Vidyalayas, there were same question papers for both the schools for their year-end examination. The test was developed by the Kendriya Vidyalaya authority followed by the norms of test construction and it is attached in appendix II. The test was for 80 marks. The investigator collected achievement test scores in science from experimental and control group schools after the final examination.

3.7.3 Reaction Scale

To get the reaction of the students towards the developed integrated strategy for productive thinking investigator developed a Likert type five point reaction scale. The scale covers all the

components of developed strategy for productive thinking. There were a total of 25 statements and all the statements were positive statements. Developed reaction scale had five ratings like strongly agree, agree, average, disagree and strongly disagree. Students were asked to put their reaction towards each statement honestly against these five point ratings. Developed reaction scale was given to five experts in the field to have the validity of the reaction scale and based on their suggestions it was improved. The developed and validated reaction scale was administered on experimental group at the last part of the experimentation to study the effectiveness of developed integrated strategy in terms of reaction of students who taught through the developed strategy for one academic year. The developed reaction scale is attached in appendix III.

3.8.0 INTEGRATED STRATEGY TO INCULCATE PRODUCTIVE THINKING

According to Oxford learner's dictionaries "strategy is a plan that is intended to achieve a particular purpose". Similarly Collins dictionaries defined strategy as "a general plan or set of plans intended to achieve something, especially over a long period." In the present study, to achieve the defined objectives, a strategy was developed. It was developed by keeping in mind the specified places of different thinking skills in productive thinking process. Like reproductive thinking, creative thinking and critical thinking have their own and separate places in productive thinking process. Therefore, a teaching model which can directs the teacher to separate the thinking process in a productive thinking process was needed. With this aim, a model of productive thinking (FIESI) was developed which provide opportunity to think specifically at different phases of this model. Then, suitable techniques directed towards specific thinking skill were selected and integrated with this FIESI model. The integrated strategy which was developed by using integration of thinking techniques with productive thinking model (FIESI) was used to teach science in an integrated manner where students learn productive thinking skills through science subject content.

Developed integrated strategy is an operational strategy which provides step by step direction to the teachers to use it while teaching a subject. It facilitates teachers to design learning situations to encourage students to think differently while solving a problem creatively. It also helps teachers to create a motivating environment in the classroom where students can share their experiences on the related content without hesitation. Teaching through developed integrated strategy facilitates students for free flow of ideas and imagination with no place for criticism by the teacher and by their peers also. In thinking productively, a threshold level of

knowledge and understanding is needed because productive thinking process never comes in vacuum. An adequate knowledge is necessary and therefore, integrated strategy provides opportunity to the students to learn the subject content through child centred techniques which enable students to think productively over a strong foundation of knowledge.

The development of productive thinking model (FIESI) and selected techniques is given in caption 3.8.1.0 and 3.8.2.0 respectively.

3.8.1.0 Development of Productive Thinking Model (FIESI)

Productive thinking is the ability to solve problems creatively by combining the analysis, synthesis and evaluation components. In the words of Newton (2017) it is the skill of reasoning, understanding, creative thinking, evaluative thinking, decision making and wise thinking. Rusbult (1997) described it as the combination of creative and critical thinking. By reviewing different definitions of productive thinking it can be defined as the ability to solve problem creatively by making use of creative and critical thinking skills. The process of productive thinking undergo through a cycle where each step is having its own importance.

For this, investigator developed a model of teaching which provide structural framework to the cognitive processes involved. This model is named as productive thinking model or FIESI model where FIESI can be expand as Foundation, Ideation, Evaluation, Stabilization, and Implication. The developed model is validated by the experts. Joyce & Weil (2003) discussed six components of a model of teaching that will define a structure of a model viz. focus, syntax, principle of reaction, social system, support system, and application. Productive thinking model (FIESI) also has focus, syntax, principle of reaction, social system, support system, and application. Its syntax has five phases viz. Foundation, Ideation, Evaluation, Stabilization and Implication through which productive thinking process is completed. It can be represented by figure 3.4:

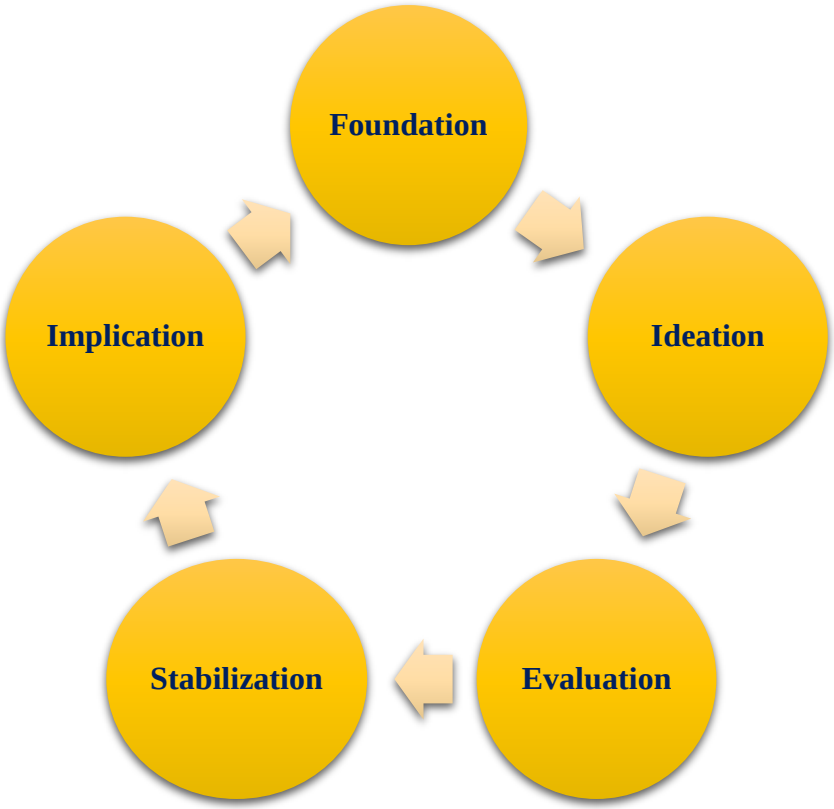

Figure 3.4: Syntax of Productive Thinking Model (FIESI)

Productive thinking model (FIESI) facilitates teachers to create a positive environment for the free flow of ideas where multiple dimensions of a situation can be considered. It requires an environment that support thinking beyond the knowledge level. This model helps the teachers to equip with skills of designing situations that break the equilibrium of the students' cognitive state and encourage them to think beyond the text material available. After the development of this model, it was sent to the experts in the field of educational research to have the content validity of the model. Then, it was improved by incorporating the suggestions given by the experts. Developed and validated Productive thinking model (FIESI) is attached in the appendix IV.

3.8.2.0 Techniques Used in FIESI Model

Following techniques were used in the FIESI model to make it more comprehensive and effective.

a. **Activity Based Learning**

Activity based learning is a technique to engage learners meaningfully in the cognitive tasks. This technique provides a platform for the students to explore the phenomenon by themselves.

It involves engagement of all the senses that ensure learning. It provides opportunity for learning by doing and thereby students engaged meaningfully and enjoy learning process. This technique is particularly useful in the present study at phase one of productive thinking model i.e. foundation phase. Here, students are engaged in learning and meaning making. This technique helps students to retain concepts for longer time and make them away from rote memorization.

b. Open Ended Questioning

Open ended questions open the door for thinking in multiple directions. It is a way to avoid adherence to single correct answer for a question. Open ended questions are helpful to provoke the students to think beyond the text given in the textbook. It creates space for discussion where students learn to accept ambiguity. This technique is particularly useful to set a stage for productive thinking. In the present study, open ended questioning were used at phase 1 to engage students in the learning process and at phase 2 to draw the creative potential of the students on the given thinking situation.

c. ICT

Information and Communication Technology (ICT) is known for addressing the diverse needs of the learners. It is also useful to connect classroom with the real life world. In the present study, ICT was used at first phase of FIESI model to create interest in the learners towards the teaching concepts. It was used to motivate the students towards thinking differently and to ignite the spark of creativity in the students. Some interesting videos, documentaries, newspaper articles and photographs were used to show them recent discoveries or as a warm up exercise so that students get motivated towards thinking something new.

d. Brainstorming

Alex Osborn is the 'father of Brainstorming'. He used "Brain storm session" word for his technique (Wilson, 2013). It is a good technique to create a promising and creative idea for the problem. The structure of brainstorming process can be explained as follow.

- Composition of Groups

  Brainstorming sessions are conducted individually or in the groups. When it is conducted in the group, there is a leader normally the investigator or the teacher in the classroom takes the responsibility of a leader. A leader is a person who form the groups by keeping in mind

the group dynamics. It is necessary to make heterogeneous group so that brainstorming session will result in the diverse ideas. The ideal group size varies from 3 to 10. In each group there is a secretary and a presenter. Secretary makes list of ideas generated during the brainstorming and presenter puts the ideas in front of the other groups or in the class in an academic situation.

- Role of the Leader

  Leader plays following role in brainstorming session like,

  1) Leader forms the group by selecting the group members.
  2) Leader presents the problem or thinking situation before the groups to brainstorm.
  3) Leader directs and maintain the flow of discussion.
  4) Leader always try to be away from restrictive criticism.
  5) Leader encourages others to stop criticizing others idea.

- Rules of Brainstorming:

  Brainstorming session is governed by following rules.

  1) Focus is on to generate as many ideas as possible without considering the quality of ideas at the initial phase of brainstorming.
  2) Ideas which are new, never thought before, looks impossible at first sight, different and wild are welcomed.
  3) Improvement in the ideas are welcomed at the later phase of brainstorming.
  4) Combinations of ideas are encouraged to give rise new ideas.
  5) Restrictive criticism and judgments are not allowed especially at phases that involve imagination.

- Brainstorming Session:

  At the start of brainstorming session, leader explain the rules with the groups and presents the problem to work upon in front of the groups. A specific time is given to brainstorm within the group. When a long list of ideas is ready, leader invites the secretary to present the ideas before the class and then suggestions and critical evaluation are welcomed to improve the solution.

- Evaluation:

  Evaluation is needed to process the generated ideas. In this phase leader classifies the ideas in different categories. With the help of others' suggestions and critical thinking or critical evaluation best promising ideas are selected. The idea are selected on the basis of workability or feasibility criteria and established criteria for the task concerned.

- Implication:

  Leader conduct the discussion to imply the best promising ideas to solve the problem at hand.

e. SCAMPER

It is the technique of generating divergent ideas and widely used as a creative thinking technique. SCAMPER is an acronym in which each letter represent a different mode of generating idea. Ozyaprak (2016) described SCAMPER as represented in the table 3.2.

Table 3.2: Description of SCAMPER Technique

S	**Substitute**	It refers to substitute something already in use with some unusual idea/object
C	**Combine**	It refers to combine various disconnected ideas to get new
A	**Adapt/Adjust**	It refers to the change in present situation/idea/object/process to get adapt to the new one
M	**Modify/Minify/Magnify**	It refers to the modification of present situation/idea/object/process
P	**Put to another use**	It refers to the unusual and unexpected uses
E	**Eliminate**	It refers to elimination of one/more component from already existing situation/idea/object/process
R	**Rearrange/Reverse**	It refers to the rearrangement or reverse in already existing situation/idea/object/process.

This technique is used in the second phase (ideation) of the productive thinking model (FIESI). In this study this technique is used to generate a long list of ideas by thinking unusually.

f. Evaluation

This is the convergent thinking or critical thinking component. Evaluation could be done by presenting the long list of ideas in front of panel to get critical judgment and suggestion to improve the ideas. The purpose of this technique is to select best promising ideas out of a long list of ideas to solve the problem at hand. In the present study this technique was particularly use at the third phase (evaluation) of FIESI model.

g. Concept Map

It is a good technique to summarize the concept as well as to retain the concept in mind for long time. It is because information in the concept maps are presented in some patterns and represent the relationship between the components in an effective way. In the present study, this technique was used at the first phase to categories the ideas generated and to select the best promising idea.

By the integration of above discussed techniques at different phases of the productive thinking model, our integrated strategy was developed. Then it was discussed with experts in the field and improved accordingly to maintain the content validity of the developed integrated strategy.

3.9.0 IMPLEMENTATION OF THE STRATEGY

The present study started with the objectives to prepare integrated strategy to teach VIII standard students and to prepare tools to measure the effectiveness of the strategy in inculcating the productive thinking among elementary school students. To achieve the said objectives of the study, investigator selected two CBSE schools from Vadodara city viz. Kendriya Vidyalaya No. 4, ONGC, Makarpura and Kendriya Vidyalaya No. 3, Air force station, Makarpura after getting permission from the competent authorities. Kendriya Vidyalaya No. 4, ONGC was selected as experimental school for teaching science through developed integrated strategy to VIII standard students for the full academic session 2019-2020 and Kendriya Vidyalaya No. 3, Air force Station, Makarpura was selected as control group where students were taught by their regular subject teacher. Investigator administered pre-test on both the schools in the month of June, 2019. After that investigator started teaching through developed integrated strategy in standard VIII of experimental group. To teach the experimental group, lesson plans were prepared based on developed integrated strategy by following the syntax of productive thinking model (FIESI model) for each lesson. Sample lesson plan is attached in appendix V. As the investigator taught VIII standard students of experimental group for full one academic session (2019-2020) as a subject teacher, she had taken care of other things like, notebook correction, completion of course for their regular school examination and progress in their academic achievements while teaching science along with the inculcation of productive thinking. Approximately 140 classes were taken that were focused around the teaching trough developed stratey.

Teaching through the developed integrated strategy also needed some facilities from the school side like audio-visual room to teach through technology whenever it was needed, use of laboratory instrument to teach through activity based learning and a slight change in seating arrangement for the ease of effective discussion in the group and for other group activities. Students were asked to maintain their regular classroom notebook along with the activity note book. In the activity notebook they record all the activities which are part of teaching through integrated strategy and which were not given in their text book. After the completion of syllabus, investigator administered productive thinking scale as posttest on both the group of students to study the effectiveness of integrated strategy for inculcating productive thinking. Reaction scale was also administered on experimental group who were taught through the developed strategy to get students' reaction towards the developed strategy. Few images related to the implementation of the strategy is presented in the figures 3.5 to 3.10.

Figure 3.5: Students Involved in Activities at Foundation Phase of FIESI Model

Figure 3.6: Students Involved in Activities at Foundation Phase of FIESI Model

Figure 3.7: Brainstorming and SCAMPER in the Group at Ideation Phase of FIESI Model

Figure 3.8: Brainstorming and SCAMPER in the Group at Ideation Phase of FIESI Model

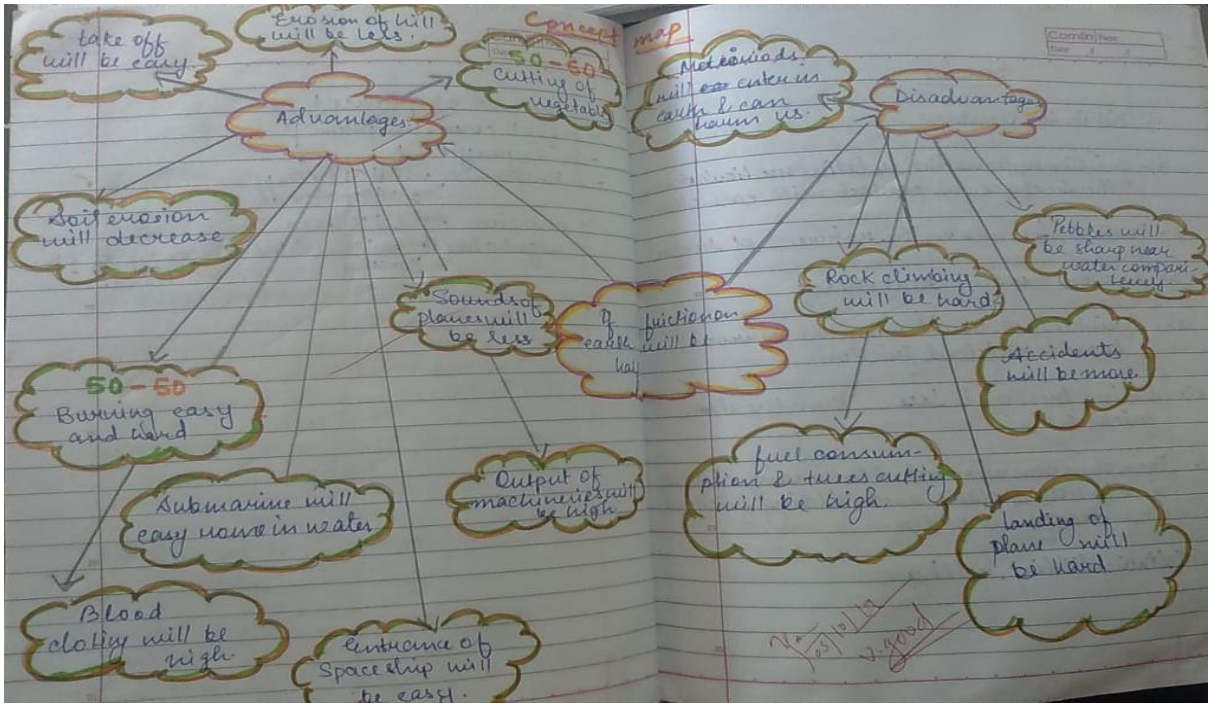

Figure 3.9: Concept Map on Ideas at Stabilisation Phase of FIESI Model

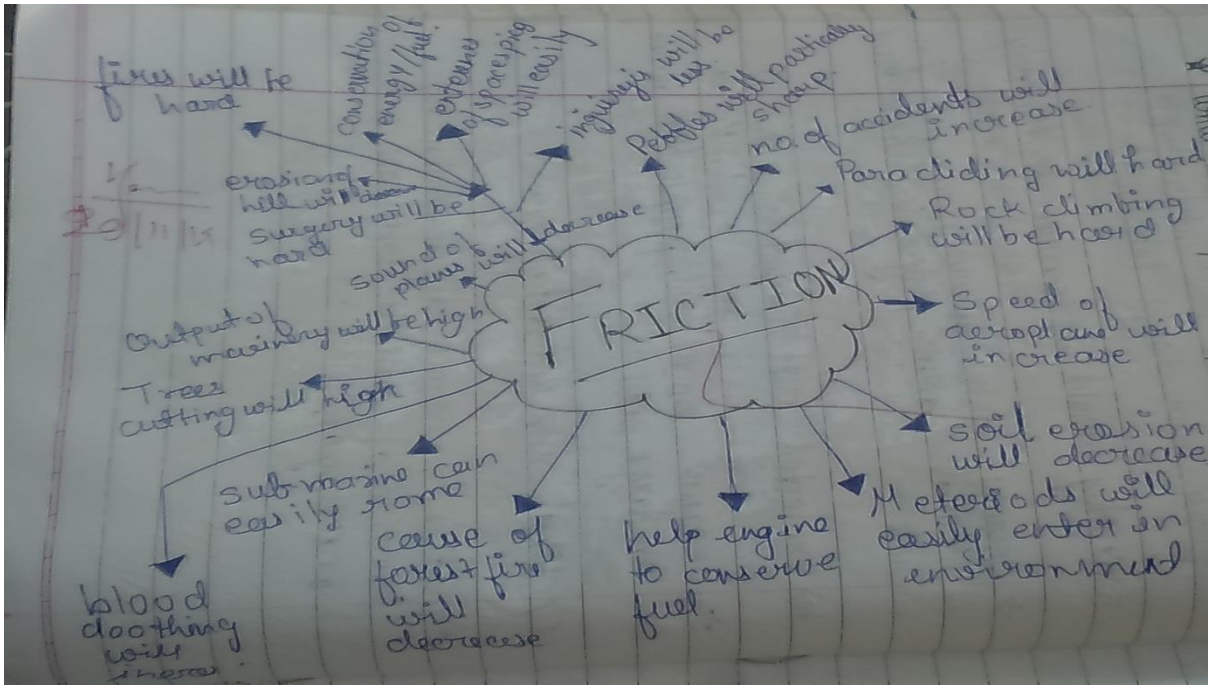

Figure 3.10: Concept Map on Ideas at Stabilization Phase of FIESI Model

Table 3.3 represents the techniques used in different concepts while teaching science to the VIII standard through developed integrated strategy following the syntax of productive thinking model (FIESI).

Table 3.3: Techniques Used in Chapters while Teaching through Productive Thinking Model (FIESI)

Chapter	Technique	Creative situation
Microorganism: friends and foe	Brainstorming	Imagine the role of microorganism as a positive element of ecosystem.
Synthetic fibers and plastic	Brainstorming SCAMPER	What would happen if we ban plastic production in our country for next five years? Imagine the unusual uses of nylon?
Materials: Metals and Non-metal	Brainstorming	We know that reaction of sodium with water is very vigorous and produce a lot of heat. How would you use it to make human life better?

Coal and petroleum	Brainstorming	Imagine the ways to save our earth from consequences of use of fossil fuel.
Combustion and flame	Brainstorming	Imagine, you are at the 5th floor of a shopping mall and fire from behind the building started spreading. What would you do to save yourself and the people present there?
Conservation of plants and animals	Brainstorming SCAMPER	Imagine the ways to conserve wildlife using technology? What changes could be done to make animals comfortable and happy in the zoo?
Reaching the age of adolescence	Brainstorming	At the age of adolescence, what changes would you expect in your school, home, and society?
Force and pressure	SCAMPER	What would happen if gravitation force of the earth become half?
Friction	SCAMPER	What would happen when friction become half?
Sound	Brainstorming SCAMPER SCAMPER	Imagine the life with only four sense; sight, touch, smell, and taste. Imagine the unusual uses of ultrasound. How would you use noise as a source of renewable energy?
Some natural phenomena	Brainstorming	How would an earthquake-proof city look like?
Light	SCAMPER	Imagine the changes if we have to live in a dark setting for a very long time?
Stars and the solar system	SCAMPER	Imagine the life on the earth in the absence of moon?
Pollution of air and water	Brainstorming	Imagine creative ways to stop water/air pollution.

3.10.0 DATA COLLECTION

As the present study was delimited to the CBSE schools of Vadodara city, investigator approached CBSE schools of Vadodara city to take permission for experimentation. Schools

were approached for experimentation for one academic year (2019-2020) with permission letter from department. The school that was ready for experimentation took as experimental group and another school was selected as control group. Data collection was done at the start and at the last of experimentation.

3.10.1 Administration of Pretest

At the starting of the session 2019-2020, investigator established a rapport with the students. When students get comfortable in the new class, productive thinking scale was administered as pretest over the experimental and control group students. Investigator first discussed the objective of the research study and also discussed the purpose of giving the test. Investigator explained the instruction to the students to take the test whose duration was one hour.

3.10.2 Administration of Posttest

After the completion of syllabus, posttest was administered on both the groups in the month of February, 2020. The same productive thinking scale was used for posttest that was used for pretesting to study the effectiveness of developed strategy.

3.10.3 Administration of Reaction Scale

To study the effectiveness of developed strategy in terms of reaction of the students taught with the developed integrated strategy, a Likert type five point reaction scale was administered on experimental group at the last part of the experimentation. Students have to tick the preferred rating against five ratings viz. strongly agree, agree, average, disagree and strongly disagree for each statement. Investigator administered the reaction scale and gave instruction to feel free while rating the statements.

3.11.0 DATA ANALYSIS

After data collection, data analysis was done in order to study the effectiveness of developed strategy on inculcation of productive thinking among students. Posttest data of productive thinking scale were analyzed using mean, standard deviation, Mann-Whitney U test, and chi-square test. Achievement test data were analyzed by mean, standard deviation, and Mann-Whitney U test and the data of reaction scale were analyzed using percentage, frequency and intensity index. Detailed analysis of data is given in the chapter 4.