Chapter I
Introduction

1.0 Introduction:

The question why we teach mathematics is important from more than one point of view. The answer to this question depends upon what we should teach in the subject and how we should teach it. It is known that the ‘WHAT’ and ‘HOW’ have always been governed by 'WHY'. 'WHAT' concerns with the curriculum, 'HOW' concerns with the method, while ‘WHY’ concerns with the objectives and the process of thinking. Human brain is very important part of the body because it is used for thinking. The ability to think and reason is the most precious possession of the human brain. Therefore, one should develop the capacity to think, reason and understand. It is a fact that most of the new ideas have been discovered by reasoning. But to reason correctly, one needs information and ideas. Moreover, one must know how to use these ideas and information to discover the new truth.

The classroom activities involve four components. The teacher, the students, the instructional materials and the method of instruction. The final outcome is the resultant of the interaction of these four components. Therefore, for the qualitative improvement of education, these four components are to improved.

In the present study, investigator had adopted Williams’ Model. The Williams’ Model is three dimensional and structures learning as an interaction between subject area of curriculum (dimension one), strategies employed by the teacher (dimension two) and the eight thinking feeling behaviours as student responses, outcomes or objectives (dimension three).

Fifteen creative teaching programmes were designed in reference to the content area in the subject of mathematics of Std. Seventh of Gujarat state. To bring out students creativity, creative teaching programme provided to purposely develop four divergent thinking and four divergent feeling abilities of students. These are: Fluency, Flexibility, Originality and Elaboration, along with Curiosity, Risk taking, Imagination and complexity as spelled out the Williams’ Model.¹
Strategies or styles of teaching were used by the teacher in the classroom. Such strategies provide teachers with a wide repertoire of modes for teaching, extending great latitude and flexibility in the manner in which subject content is presented.

1.1 Goals of teaching of mathematics:

Proper practice of education and of teaching starts with an understanding of the purpose of the whole educational system, and what it aims at. These aims of course, are always subject to change. To quote Jerome S. Bruner:

“I shall take it as self-evident that each generation must define a fresh nature, direction and aims of education to assure such freedom and rationality as can be attained for further generation.”

The process of education can be kept on right lines only with the help of clear-cut aims. Aimlessness in teaching would result in the wastage of time, energy and other resources. According to Kulbir Singh Sidhu:

“Knowledge of educational values helps the teacher to avoid aimlessness in teaching. Value is the spring board of aim and vice-versa.”

The goals of education are Utilitarian, Social, Cultural and Personal. These goals of education are related to the objectives of teaching mathematics. Every student, on leaving school, should be able to use correctly, accurately and with understanding the four fundamental operations applied to both number and to measurement. Student should be able to apply his knowledge of mathematics to a wide range of problems that frequently occur in their everyday life. Mathematics is useful in specialized fields such as science, engineering, commerce, economics etc. and also in every walk of life. Then it is considered as background for basic algebra, calculus, trigonometry, statistics etc. Schools must provide provision for students to learn such aspects whilst ensuring that every student has a basic course in mathematics.

Aims of teaching mathematics are as follows-
Utilitarian aim:

Mathematics will be taught primarily for its practical values and aims. The students will be given mathematical knowledge and skills needed in his day-to-day life and enabled to make use of that knowledge and skill. This aim makes the study of mathematics functional and purposeful and establishes relation between the subject and practical life.

Disciplinary aim:

The subject has also to be taught for its disciplinary and intellectual values. It has to aim at providing training to the mind of the learner and developing intellectual habits in him.

Cultural aim:

This aim helps the learner to understand the contribution of mathematics in the development of civilization and cultural.

It has enabled him to understand the role of mathematics in fine arts and in beautifying human life.

Adjustment aim:

It is help the learner to develop a healthy, purposeful, productive, exploratory and controlling adjustment with environment.

Social aim:

It is to help the learner to imbibe essential social virtues.

Moral aim:

It enables the learners to imbibe the attribute of morality.

Aesthetic aim:

It is to develop their aesthetic sensibilities, meet their varying interest and help them in the proper utilization of their leisure time.
International aim:

To develop in them international outlook and understanding.

Vocational aim:

It is to prepare them for technical and other vocations where mathematics is applied.

Inter-disciplinary aim:

To give them insight into the application of mathematics in other subjects.

Self-education aim:

It is to help them to become independent in learning.

Educational preparation aim:

It is to prepare them for higher education in science, engineering, technology, etc.

Development of powers aim:

It pertains to the development of powers of thinking, reasoning, concentration, expression, discovery, etc.

Harmonious development aim:

Ultimately the overall aim of teaching all the subjects including mathematics is to ensure all-round and harmonious development of the personality of the child.

1.2 Justification of the present study:

Creative students consists one of the nation’s most valuable assets. The future of any nation depends upon the creative student. A birth of creative man-power is now felt in every branch of national life in developing countries is practicable one of the highest bottle neck to its progress. Hence, national education policy now demanded increased emphasize on creativity of all branches of science, technology, literature and art.

Students are creative by nature for that they have innate ability to see new relationship and produce new combination result in progress, but it is said to note that in
a long run they lose their ability due to lack of proper guidance and treatment of teachers as well as the parents. So home and school should need more clarity to distinguish between planting knowledge and training the mind. Knowledge is not the power it made up merely of ‘inert face’ instead of active fuel for the mind. They should provide such situation, ideas and imaginations flow and grow in mind.

Torrance E.P. and Myers R.E. stated,

“Each teacher’s way of teaching is a unique invention that takes place just like any other invention or creative production. All inventions however, are built upon failures, imperfection and little successes and the insights that come from them. It is our hope that from our own experiences those of our students and existing theory and research. We will be able to provide some guides and clues that can be used in your invention.”

Creativity cannot be taught as a process, but by developing situations that demand imagination, originality and problem solving. After due research works, some technique for developing creativity like Brainstorming, Attribute listing, Checklists and Synetics have been evolved and some special programmes like Purdue Creative Thinking Programmes, Productive Thinking Programme have been developed. But, yet there is a lack of programmes that based on the school subjects to develop creativity of children.

To nurture the creative thinking through school subjects, the investigator has ventured to undertake the study to develop cognitive and affective behavior through the teaching of one of the school subjects.

The present study is concerned with the development and implementation of the creative teaching programme which can produce cognitive and affective development of the student. The content of the programme is mathematics for Std. VII of Gujarat State. It was further proposed to study the effect of programmes on students’ achievements in mathematics. The teaching strategies were adopted from the second dimension of Williams’ Model.

The programme was designed to be used in an ordinary classroom under existing conditions. The regular class schedule or the class structure was not disturbed. The programme did not require any elaborate equipment or costly materials. The ordinary classroom materials are enough.
Present study is concerned with the development and implementation of creative teaching programme. Also in this study investigator checks the effect of this programme on student’s achievement in mathematics.

1.3 Title of the study:

The problem under study could be stated as:

“A study of the Effect of Creative Teaching Program on the achievement of the students of standard VII in Mathematics.”

This study was an experimental study. This attempt to develop and check the effect of Creative Teaching Programme in the teaching of Mathematics is supposed to be different from other researchers conducted in this university as per knowledge of the researcher.

1.4 Key word and their meaning:

(i) Effect

For the present study, Effect refers to bringing out of the result intended. Here effect means the effect of creative teaching programme on the achievement of the students of standard VII in mathematics.

(ii) Creative Teaching Programme :( CTP)

For the present study, creative teaching programme is a programme which is constructed on the basis of F.E.Williams’ Model.

Creative teaching programme are sequences of moves or strategies adopted by the teacher to bring the predetermined behavioural changes in the students. They are

(a) Organized Random Search:
- Using a familiar structure to go at random to build another structure.
- An example from which new approaches occur at random.
(b) Skill of Search:
- Search for ways something has been done before (historical search)
- Search for the current status of something (descriptive search)
- Set up an experimental situation and search for what happens (experimental search)

(c) Visualization Skill:
- Express ideas in visual forms.
- Illustrating thoughts and feelings.
- Describing experiences through illustrations.

(d) Evaluates Situations:
- Deciding upon possibilities by their consequences and implications.
- Check or verify ideas and guesses against the facts.

(e) Provocative Questions:
- Inquiry to bring forth meaning.
- Incite knowledge exploration.
- Summons to discovering new knowledge.

(f) Examples of Change:
- Demonstrate the dynamics of things; provide opportunities for making alterations, modifications or substitutions.

(g) Attributes:
- Inherent properties.
- Conventional symbols or ideas.
- Ascribing qualities.

(h) Discrepancies:
- Gaps or limitations in knowledge.
- Missing links in information.
- What is not known?
(i) Analogies:
- Situations of likeness.
- Similarities between things.
- Comparing one thing to another.

(j) Examples of Habit:
- Effects of habit bound thinking.
- Building sensitivity against rigidity in ideas and well-tried.

(k) Tolerance for Ambiguity:
- Challenge thinking.
- Pose open-ended situations which do not force closure.

(l) Adjustment to development:
- Learn from mistakes or failures.
- Developing many options or possibilities.

(iii) Achievement:

According to Encyclopedia of Education

“Achievement is generally used in the sense of acquired abilities to do, capacity to do or tendency to do.”  

According to International Dictionary of Education

“Performance in school or college in a standardized series of educational tests. The term is used more generally to describe performance in the subject of the curriculum.”

(iv) Standard-VII:

For the present study, the word standard-IX means:

Standard-VII is the last standard of primary school of Gujarat state.

(iv) Mathematics:

According to International Dictionary of Education

“Science of magnitude and number.”
“Mathematics is the process of defining ideas, words, which we have to use to describe the world, understanding, the simple universal rules which have been discovered by those before us, connecting facts and events and learning logical methods of combining the simple rules to understand and predict complex phenomena.”

For the present study, the word Mathematics means: One of the compulsory subjects which are taught to the students of std.VII, prescribed by Gujarat State Board of School Textbooks, Gandhinagar.

Mathematics is such a school subject through which the mental faculty of human being is developed to think logically. Therefore, it is a must subject in education system.

1.5 Variables:

There are several Special programme available for developing various abilities like creativity, self-concept, divergent thinking and attitude. There were also programme like SMSG, SMP and PSSC for developing improved instructional materials. But all of them are special programmes that cannot be used in an ordinary classroom without disturbing its activities. A programme that could be used without causing any inconveniences to the students has to be developed. Creative Teaching Programme (CTP) provides such type of facility.

CTP produces cognitive and affective behavior in students through mathematics using certain modes of teaching or strategies. Since one of the objectives of the study is to study its effect on student’s achievement toward mathematics. Thus, treatment was chosen as an independent variable.

Several studies have shown that sex is an important biological factor that influences other variable like achievement. Hence, sex was taken as independent variable.

Intelligence quotient is an effective variable in nurturing the achievement of the students. So I.Q. was taken as independent variable.

Socio- Economic factors like standard of living, parental income, caste and parental education have much influence on student’s achievement and his school performance. Hence, parental education was also chosen as an independent variable.
Thus, there are four independent variables each of two levels. Achievement is the dependent variable. The details of these variables are shown in table 1.1

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the variable</th>
<th>Nature of the variable</th>
<th>Number of level</th>
<th>Name of the level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Treatment(CTP)*</td>
<td>Independent</td>
<td>2</td>
<td>1. Experimental(A_1) 2. Control (A_2)</td>
</tr>
<tr>
<td>2</td>
<td>Sex</td>
<td>Independent</td>
<td>2</td>
<td>1.Boys(B_1) 2. Girls (B_2)</td>
</tr>
<tr>
<td>3</td>
<td>I.Q.*</td>
<td>Independent</td>
<td>2</td>
<td>1.High IQ(C_1) 2.Low IQ(C_2)</td>
</tr>
<tr>
<td>4</td>
<td>P.E.*</td>
<td>Independent</td>
<td>2</td>
<td>1.High SES(D_1) 2.Low SES (D_2)</td>
</tr>
</tbody>
</table>

Achievement is considered as dependent variable.

* CTP:- creative teaching programme, I.Q.-: Intelligence Quotient, P.E.-: Parental Education

1.6 Objectives of the study:

Every work is base on certain objectives because without objective one cannot get idea to plan his work. The purpose of this study was to investigate the effects of CTP on the achievement of students in mathematics. This study was undertaken with the following objectives:

1. To construct the creative teaching programme in mathematics of standard VII.

2. To implement the creative teaching programme and to study its effects on student’s achievement in mathematics.

3. To study the main effect of factors like sex, intelligence and parental education on the achievement.

4. To study the interaction effect of treatment, sex, intelligence and parental education on achievement of students in mathematics.
1.7 Hypotheses:

In present study, the hypotheses are formulated on the bases of objectives and variables. They are as mentioned below.

$H_{01}$: There is no significant difference between the achievement of control group and experimental group.

$H_{02}$: There is no significant difference between the achievement of boys and girls.

$H_{03}$: There is no significant difference between the achievement of students of low I.Q group and high I.Q group.

$H_{04}$: There is no significant difference between the achievement of students of low P.E. group and high P.E. group.

Hypotheses for interaction effects:

First order interaction effects:

$H_{05}$: There is no significant effect of the interaction of treatment and sex on the achievement of students in Mathematics.

$H_{06}$: There is no significant effect of the interaction of treatment and I.Q on the achievement of students in Mathematics.

$H_{07}$: There is no significant effect of the interaction of treatment and Parental Education on the achievement of students in Mathematics.

$H_{08}$: There is no significant effect of the interaction of sex and I.Q on the achievement of students in Mathematics.

$H_{09}$: There is no significant effect of the interaction of sex and Parental Education on the achievement of students in Mathematics.

$H_{010}$: There is no significant effect of the interaction of I.Q and Parental Education on the achievement of students in Mathematics.
Second order interaction effects:

H_{011}: There is no significant effect of the interaction of treatment, sex and I.Q. on the achievement of students in Mathematics.

H_{012}: There is no significant effect of the interaction of treatment, sex and Parental Education on the achievement of students in Mathematics.

H_{013}: There is no significant effect of the interaction of treatment, I.Q. and Parental Education on the achievement of students in Mathematics.

H_{014}: There is no significant effect of the interaction of sex, I.Q. and Parental Education on the achievement of students in Mathematics.

Third order interaction effects:

H_{015}: There is no significant effect of the interaction of treatment, sex, I.Q. and Parental Education on the achievement of students in Mathematics.

Following hypotheses were formed to check effects of treatment on achievement of student of different groups.

H_{016}: There is no significant difference in achievement of boys of treatment group and control group.

H_{017}: There is no significant difference in achievement of girls of treatment group and control group.

H_{018}: There is no significant difference in achievement of high I.Q students of treatment group and control group.

H_{019}: There is no significant difference in achievement of low I.Q. students of treatment group and control group.

H_{020}: There is no significant difference in achievement of high P.E. students of treatment group and control group.

H_{021}: There is no significant difference in achievement of low P.E. students of treatment group and control group.
\textbf{H}_022: \text{ There is no significant difference in achievement of high I.Q. boys of treatment group and control group.}

\textbf{H}_023: \text{ There is no significant difference in achievement of high I.Q. girls of treatment group and control group.}

\textbf{H}_024: \text{ There is no significant difference in achievement of low I.Q. boys of treatment group and control group.}

\textbf{H}_025: \text{ There is no significant difference in achievement of low I.Q. girls of treatment group and control group.}

\textbf{H}_026: \text{ There is no significant difference in achievement of high P.E. boys of treatment group and control group.}

\textbf{H}_027: \text{ There is no significant difference in achievement of high P.E. girls of treatment group and control group.}

\textbf{H}_028: \text{ There is no significant difference in achievement of low P.E. boys of treatment group and control group.}

\textbf{H}_029: \text{ There is no significant difference in achievement of low P.E. girls of treatment group and control group.}

\textbf{1.8 Limitation of the study:}

The present study is delimited as follows:

1. The study is limited to Gujarati speaking students only.

2. The study is limited to the students of two primary schools of Ahmedabad.

3. The study is conducted on the small sample which consists of 174 students of standard VII.
4. The creative teaching programme were prepared on the basis of the content of Mathematics of std. VII.

5. The study of the effect of creative teaching programme is only restricted to some closely related variables like Sex, I.Q. and Parental education.

1.9 The plan of report:

The following matter is the brief outline of the thesis. All the details of study are included so that any investigator who wants to replicate the experiment can do it with the help of the thesis. It has six chapters followed by references and appendices.

The first chapter includes the need, importance and significance of the study. It provides a outline for the whole thesis. The key words used in the statement of the problem are defined. The objectives of the study are explained and the limitations are stated. Also variables are mentioned.

The second chapter describes the reviews of some research works in the area of mathematics education.

The third chapter deals with planning and programme construction.

The fourth chapter deals with research design and execution of the programme. How the design and samples are chosen is explained. The tools used to measure the dependent and independent variables were described. It includes the observations of the investigator during the experiment.

The fifth chapter contains the data and its analysis using ANOVA. The hypotheses for main effects and interaction effects were tested.

The sixth chapter contains the summary of research work, observations, conclusions, educational implications and suggestions for further study.

At the end of the report, book and references consulted with the present study have been listed. The appendices include the programme and tools used for measuring the dependent and independent variables.
Footnote


5. Williams, Loc.Cit.


8. Ibid. Page No.216

9. K. Ramnathan, (1963), Suganitam. ganit mandal,Ahmedabad:March, Page No.02