CREATIVE THINKING ABILITY AND ATTITUDE TOWARDS SCIENCE AMONG STUDENTS OF SECONDARY SCHOOLS HAVING DIFFERENT ORGANISATIONAL CLIMATES

By

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I, Regina Thabor, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

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CHAPTER – I

INTRODUCTION

1.1.0 Study and Its Importance

The title of the present study is "Creative Thinking Ability And Attitude Towards Science Among Students of Secondary Schools Having Different Organisational Climates".

The oft quoted statement made in the Education Commission (1964-66) – "The destiny of India is now being shaped in her classrooms" – is relevant for times to come. Development of a nation depends much on the contribution of its citizens to it. If one has to realize the vision that our country should become a 'developed' one from the present status of 'developing' one, then it is to be hoped that the younger generation, particularly those who are on the verge of blossoming into youth and thus carry on the process of development, have to be equipped to undertake this gigantic task. This depends much on the abilities and attitudes of this group who are pre-adolescents and adolescents, a major part of them being students in high schools.

It may also be said that in the present era, it is the progress in the field of science and technology that contributes much to the development of a nation. This requires creative thinking and a favourable attitude towards science among high school students. Education has a great role to play in this direction.

Creative thinking is a process of being sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies and so on; identifying the difficulties, searching for solutions, making guesses or formulating hypotheses about the deficiencies, testing and retesting them and finally communicating the results. Thus, creative thinking becomes a driving force if properly cultivated. Subjects like Science and Mathematics have a greater role to play than the rest of the school study subjects in the curriculum in the promotion of creative thinking.

The word science has its origin from a Latin word 'Scienta' meaning 'to know'. The definition of science found in report on Policies for Science Education is –

"Science is a cumulative and endless series of empirical observations which result in the formation of concepts and theories, with both concepts and theories being subject to modification in light of

further empirical observations. Science is both a body of knowledge and the process of acquiring and refining knowledge". (Yadav, 1992).

Thus science is simultaneously a body of knowledge and continuous, self-evaluative process of enquiry.

Emphasising the importance of science education, the Education Commission (1964-66) suggested that science be made a compulsory subject of the school curriculum. The report of the Commission states the following: "We lay great emphasis on making science an important element in the school curriculum. We therefore, recommend that Science and Mathematics should be taught on compulsory basis to all pupils as a part of general education during the first ten years of schooling. In addition, there should be provision of a special course in these subjects at the secondary stage for students of more than average ability."

As a complement to this cognitive ability, suitable attitude becomes necessary. Attitude towards science refer to the feelings, opinion formed as a result of interacting directly or indirectly with various aspects of scientific enterprise and which exert directive influence on their behaviours towards science (Allport, 1967). Development of a positive attitude which impels an individual to look at each problematic situation in an analytical fashion, to demand proof

and adequate facts and results, is sought for in this constantly changing society. Curiosity to know things, understanding through logical method, belief in cause and effect, patience, truthfulness, love for justice etc., are the qualities which come under the phrase 'Scientific Attitude'. These can be achieved through the classroom teaching and various other activities that go on in the school as a whole. A person with such qualities will appreciate science and its study. It is then said that he has developed a favourable attitude towards science.

School or to say the climate of a school, plays a major role in the development of creative thinking ability and positive attitude towards science. The importance of conducive school climate can be had from Margaret's (1972) statement, "A gifted child may regress from original creative tendencies as he matures because of stultifying school atmosphere; from the once spirited child he is transformed overnight into a bored adult". Sharma (1971) found that students' academic performance has a significant relationship with school climate. Mishra (1982) found that home and school environment have a significant positive relationship with scientific activity. The climate of a school could be studied by identifying the type of organizational climate in which it works.

The present study works with the three variables, namely, creative thinking ability, attitude towards science and organizational climate of schools. These three variables are described below.

1.2.0 Variables Studied

The present study has dealt with three variables, namely, Creative Thinking Ability, Attitude Towards Science and Organizational Climate. Each of these variables are discussed below.

1.2.1.0 Creative Thinking Ability.

Man's way of life has changed a lot due to the innovations in the field of science and technology. These innovations are the results of the ability of persons who think creatively.

The word Creativity as it is found in the Webster's Oxford Dictionary, has its roots in the Indo-European word base, 'Kere' which means 'to grow' or 'to cause to grow' with the accompanied adjective, referring meaning of creative to 'ability' or 'power'. Creativeness confers power and distinction (Lytton, 1971). Thus, the term 'creativity' is more or less defined as the 'quality of being creative' or 'ability to create something entirely new'.

As Torrance and Myers (1970b) states creativity as ".... a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results".

Wilson (1951) while offering an operational definition of 'creativity' synthesized the diverse meanings of creative process prevalent at that time and described creativity in terms of :

a) The outflow of individual or group, through which a product is structured;
b) An action of the mind that produces a new idea or insight;
c) The mental process of manipulating the environment which results in the production of new ideas, patterns or relationships;
d) The capacity to produce through thought or imagination; capacity for original work;
e) The emergence in action of a novel relational product growing out of the uniqueness of the individual on the one hand, and materials, events, people or circumstances of his life on the other;

f) The mental process that involves a rearrangement of past experiences with possibly some distortions into new patterns to better satisfy some expressed or implied need;

g) The process which results in novel work that is accepted as tenable or useful or satisfying by a group at some point in time; and

h) The process by which something new is produced – an idea or an object including a new form or arrangement of old elements.

Wallach and Kogan (1965) viewed creativity as an "individual's capacity or ability to generate cognitive associations in quality and with uniqueness". They emphasized that in a creative activity, there is present a playful permissible attitude towards the task which is independent of any temporal pressure.

Deo and Gupta (1975), define creativity as the "... capacity, whether innate or cultivated, of an organism, to express his own self, in ways which are unique, novel, appropriate, productive and satisfying". Deo and Gupta (1975), further state that the characteristics of creativity are :

i. Creativity is a mode of thinking.

ii. This type of thinking involves breaking away from the usual sequence of thought or getting away from the main track or breaking out of the mould.

iii. This type of thinking involves entering into an altogether different pattern of thought.

iv. This type of thinking permits one thing to lead to another.

v. The process of this type of thinking involves becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, etc.

vi. It is the tendency to experiment with novel ideas.

vii. The net result of this type of thinking is a novel work.

viii. A novel work implies a new association or combination of existing elements.

ix. The creative thinking ability aims at avoiding the common place and obvious solutions.

In order to clarify the concept of creative thinking, researchers have shown that there are two distinct modes of thinking, one referred to as 'convergent thinking' (intelligence) and the other as 'divergent thinking' (creative thinking). Divergent thinking calls into play the abilities of 'fluency' – the ability to think up as many solutions as possible, 'flexibility' – the ability to think up different or categories of

approaches or ideas, 'originality' – the ability to think up unusual solutions and 'elaboration' – the ability to think up complete details of an item. This is the type of thinking which makes the strange familiar and the familiar strange (Gordon, 1961) or beyond the information given (Bruner, 1951). Convergent thinking on the other hand, is where the information leads to one right answer or a recognized best or conventional answer. Guilford (1950) is of the view that creative thinking involves mainly the use of divergent production abilities which enable a person to think in different directions and find out new solutions to problems. According to Getzels and Jackson (1962), divergent thinking tends to be stimulus free, whereas, convergent thinking is stimulus bound.

Creative thinking comes within the range of our grasp only when we cause to strive for a time, when we let our desire cool, and retire the ordinary activity. A genuinely creative thinker is both critical of unsound views and yet adventurous in extending and developing new ideas. He is receptive towards what others have thought, although unwilling to accept it as final. He shifts out the sound parts from the unsound and attempts to develop and experiment with what satisfies the critic in him as worthy of attention. Still it is further described as intution, insight, imagination and the divine power in man (Thomson, 1959).

Mednick (1962) defines creative thinking as "... the forming of associative elements into new combinations which either meet specific requirements or are, in someway, useful. The more mutually remote the elements of the new combination, the more creative the process or solution".

As given in Parnes (1972), Dewey and Wallas suggested the following four stages of creative thinking process:

i. Preparation – Preparation is suggested as the first stage of creative thinking process. Preparation consists of the person's total acquaintance with the problem or object, his total previous experience.

ii. Incubation – It is mainly the work done unconsciously when preparation is completed and conscious thinking is over without fruitful results, there is an interval between this point and the time of arrival of the creative idea, that is, illumination. It is called Incubation. Incubation is a peculiar stage in creative thinking in which apparently, there is no activity on the part of the individual, but during which or at the end of which there often comes a flash of illumination, or solution to a problem or a strikingly new idea.

iii. Illumination – It is a state when an individual takes a sudden large leap in his thinking. Westcott (1961) calls it the 'intutive leap'. There is a unanimous agreement that during intution, there is an abundance of controlled thinking, a resort to free association in a kind of day-dreaming state and at the end, comes a 'flash of genius' (Beveridge, 1950).

iv. Verification – It involves both elaboration and evaluation. Evaluation in creative thinking is an unavoidable step if any of the creative product ultimately is to be of any use to a community. Creativity is considered to be a function of knowledge, manipulated, evaluated and effectively developed into usable ideas.

This type of thinking process may be considered to have the following components as given below:

i. Sensitivity to Problems – Many a time we are surrounded by problems though we are not quite aware of them. But a creative person senses the presence of a problem instantaneously and girds up his loin to find a satisfactory and acceptable solution to the problem. This component indicates the receptivity for problems when the creator

sees defects, needs, deficiencies, oddities, unusualities and sees what must be done.

ii. Fluency – It refers to a rapid flow of ideas and tendencies to change direction and modify information on a particular topic or problem; a creative person can express his ideas fluently. This component is the quantitative representation of the units of products.

iii. Flexibility – A creative person's thinking is characterized by flexibility rather than rigidity. It is the readiness to change the behaviour to meet the changing circumstances. Flexibility represents number of classes of objects or trains of ideas produced.

iv. Originality – It refers to the unusual ideas and suggestions or unusual appreciation of particular objects. While expressing his ideas on a certain topic or devising solution for everyday problems, a creative person will put forward such ideas as are original and not based on ideas previously read or heard.

v. Elaboration – It refers to the expanding and combining of activities of higher thought. It shows production of

detailed steps, variety of implications and consequences which can be qualitatively measured.

vi. Curiosity – Curiosity is another important component of creativity. The creative person is always anxious to understand each and everything of his universe. He remains restless until he is able to understand what he has heard or read.

vii. Imagination – Imagination occupies a very important place in the creativity component. A number of abilities included in creativity are based on imagination. Only a person with good imagination/imaginative mind can express a greater number of ideas fluently, flexibly and originally.

viii. Redefinition – It is closely related to flexibility that arise from transformation, specially of convergent productions. It is the ability to rearrange ideas, concepts, people and things to shift the function of objects and use them in new things.

Baqer Mehdi (1985), while developing his Creative Thinking Ability Test has taken fluency, flexibility and originality as components in the measurement of creative thinking ability. He feels that

measurement on these taken together would give a fairly valid information about the creative potential of the individual.

In the present study, creative thinking ability is taken as that ability in an individual by which she/he thinks creatively and is considered to have fluency, flexibility and originality as its components.

1.2.2.0 Attitude

The earliest model of man as homo-sapiens attached primacy to understanding and reason in accounting for human behaviour. But the increasing interest in scientific study of human behaviour led to the shift of emphasis to the concept of man as homo-volens, according to which irrational or arational than rational factors play more significant role in explaining why man behaves as he does. The earlier social psychologists pinned their faith in attitude as a highly potent determinant of human behaviour. Quoting Allport's (1935) statement about the attitude construct as the "most distinctive and indispensable concept in American social psychology", Sivacek and Crano (1982) observe that even after nearly fifty years, attitude still maintains a central position in social psychology today.

1.2.2.1 Concept of Attitude

The earliest concern with attitude in social psychology centered around the measurement of attitude for which highly sophisticated devices were developed (Thurstone and Chave 1929; Likert 1932, and Guttman 1944), without any concerted effort to arrive at an agreed definition of attitude. This lack of a common definition of attitude and failure to integrate it with the measurement of attitude led to a spate of criticisms of the researches on social attitudes. Despite the regrettable lack of consensus regarding certain major issues pertaining to the concept of attitude, it may be possible to point out some definitions of attitude that have come to be commonly accepted.

Looking into the etymology, it is found that the word attitude stems from the Latin word 'aptus' which in the language of Allport "has on the one hand the significance of 'fitness' and 'adaptedness' and like its bye-form 'aptitude' connotes a subjective or mental state of preparation for action".

The concept of attitude does not refer to one's single act or response, but is based on a number of related acts/responses. The acts or responses, which refer to one's attitude are acquired and learnt. Attitude is a latent or dominant variable. It cannot be observed, but can be deduced from statements, actions, responses of an individual. In the

language of Green (1954) "attitude is a hypothetical or latent variable, rather than an immediately observed variable."

According to Chave (1928), an attitude is a set of complex feelings, desires, fears, convictions, prejudices or other tendencies that give an individual readiness to act because of his varied experiences.

Bogardus (1931) defines an attitude 'as a tendency to act toward or against something in the environment which becomes thereby a positive and negative value.'

Morgan (1934) states, "Attitudes are literally mental postures, guides for conduct to which each new experience is referred before a response is made."

Thurstone (1946) defines an attitude "as the degree of positive or negative affect associated with some psychological object." By a psychological object, Thurstone means any symbol, phrase, slogan, person, institution, ideal or idea toward which people can differ with respect to positive or negative effect.

According to Allport (1950), "An attitude is a mental and neural state of readiness organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related."

Garrett (1975) states that attitude is primarily an inner state rather than an outer expression. It is an implicit response toward or away from an individual value or social value. An attitude is always a stand or position which an individual takes toward a person or an issue.

Anastasi (1976) says, "An attitude is a tendency to repeat favourably or unfavourably towards a designated class of stimuli, such as a national/social group, a custom or an institution."

Attitude has been defined in a number of ways, indeed in so many ways as to give a feeling that the term is 'elusive'. This is owing to the difference in approach and emphasis. Determination of attitude as well as its survey in modem times is not only important for scientific study, but is also useful for practical purposes. In attitude, psychologists and sociologists find a meeting point for discussion and research. A person's attitude toward any person or object is likely to influence his reaction towards that person or object. In any situation, an individual tends to learn and retain the material or object much quicker if he possesses a positive attitude towards it. Any subject for which one has a negative or unfavourable attitude will not be learnt at all. Hence, it may be said that a person's achievement in a particular subject is greatly influenced by his attitude towards it.

Mohsin, (1990) gives the following characteristics of attitudes:

i. Attitudes are not inborn; they are learned through experience.

ii. Like most psychological concepts, they can be inferred from the observed antecedent stimuli and the consequent behaviour pattern. They are, thus, of the nature of an intervening variable and a hypothetical construct.

iii. Attitudes have objective reference; one holds an attitude regarding some object, person or issue. In this respect, they differ from motives or personality traits that have subjective reference.

iv. Attitudes differ in valence; having an attitude regarding an object signifies that the person concerned is either favourably or unfavourably disposed towards it. Stated otherwise, attitudes are positive or negative, pro or anti.

v. They orient the organism to the attitude object and channel the energy at the disposal of the organism.

vi. Once formed, attitudes persist in times; they are enduring dispositions and are unlikely to change under ordinary conditions.

vii. From operational point of view, attitudes are manifested in the consistency of responses made to a specific object or situation.

1.2.2.2 Components of Attitude

Attitudes are generally agreed to encompass three different components. These are :

i. A Cognitive Component - pertaining to the ideas or propositions that express the relation between situations and attitudinal objects.

ii. An Affective Component - pertaining to the emotion or feeling that accompanies the idea.

iii. A Behavioural Component – pertaining to the predisposition or readiness for action.

A description of these components are presented further –

Cognitive Component: Most theoretical accounts of the origin of the cognitive component of attitudes adopt the basic premise of the "need for consistency". It is postulated that human individuals strive for consistency in their own thoughts, beliefs, attitudes and behaviour. Various forms of this theory, including those emphasizing 'balance', 'symmetry' and 'dissonance' have been given critical reviews by Kiesler, Collins and Miller (1969). The basic idea is that when an inconsistency or dissonance among beliefs is encountered, the

individual strives to achieve consistency and in this process may undergo a change in attitude.

Affective Component: Attitudes are accompanied by positive and negative 'feeling' derived largely from introspective accounts. Attitudes vary from 'positive' to 'negative'. According to Triandis (1971) these positive and negative tendencies represent two dimensions rather than only one. The most obvious quality is the behavioural tendency of seeking versus avoiding content. The second dimension pertains to 'affect', to liking and disliking. For example, when an individual is willing to learn Mathematics, such an attitude is positive and when he is unwilling, such an attitude is negative.

Behavioural Component : An attitude is defined as a disposition or readiness for some kind of action. Attitude and behaviour are related to each other. Attitudes play a certain role in regulating the behavioural outcomes. Very often, attitude scales indicate dimensions of like-dislike or favourable – unfavourable.

Differences among theories of attitudes pertain to questions about which of these components is primary or which is a cause of the others. Many theorists hold that discrepancies in "beliefs" (cognitive component) result in attitude change (Festinger, 1957).Still others, stress on the affective and behavioural components.

1.2.2.3 Attitude Formation and Change

The socialization of the child pertains not just to his learning of the cultural patterns of behaviour. It relates also to the acquisition by the child of the ideas, feelings, attitudes and values characteristic of the social group to which the child belongs. This learning is described as social learning, a type of learning not resulting from personal experience, but involving the mediation of other persons in the child's environment, more particularly his parents. The child observes his parents to be favourabloy disposed towards the ingroup, and to be hostile and antipathic to the outgroup. He learns to think, feel and act in the same way with respect to members of the ingroup and the outgroup.

Attitudes are by no means fixed and unchanging predispositions. They can and do change. The task of attitude change is very much related to their formation. Attitudes are formed through experiences – direct and indirect. Consequently, they may be changed through acquisition of new experiences as Bonner (1969) remarks, "such factors as social experiences, propaganda, education and personal experience with different attitudes do make for modifications and shifts in people's predispositions towards objects, persons, ideas and situations in their environment".

The theories of attitude change have been classified in different ways by different writers. McGennies (1970) divides all theories into two groups, namely,

i. Cognitive or Consistency theories

ii. Reinforcement or behaviour theories.

Cognitive or consistency theories are so labelled, because they all imply the individual's awareness of consistent or inconsistent relations among his opinions, beliefs, attitudes, values and behaviour. They also make the common assumption about the individual's need to believe himself to be rational and sensible which impels him to introduce coherence or connectedness among his beliefs, attitudes and behaviours whenever he becomes or is made aware of a state of incongruity, inconsistency or dissonance prevailing among them.

Reinforcement or behaviour theories have adopted the learning theoretical framework for studying the effect of reward contingencies in their researches concerning attitude formation and also in researches on attitude change. Several studies, for example, have used classical conditioning for explaining attitude formation which likewise explains attitude change also. Similarly, experiments on verbal reinforcement of attitude responses illustrate the application of operant conditioning for producing new attitudes as well changing the existing ones.

1.2.2.4 Development of Attitudes

Attitudes are not inborn, they are acquired. Hence, many factors influence the development of attitudes. These factors include:

i. Perceptual factor: The manner in which we perceive an object, incident, group or individual influences the formation of an attitude concerning that object, incident, group or individual.

ii. Motivational factor: There is an intimate relationship between motivation and attitude. Our attitude is positive in relation to those things which help us in satisfying our needs or prove useful in the fulfillment of our motivations. But we develop negative attitude towards such things which do not help the fulfillment of our needs and motivations.

iii. Verbal factor: We not only develop attitudes towards those things or individuals who are personally known to us, but we also develop attitudes towards those about whom we read or hear.

iv. Cultural factor: Culture or cultural background has a great say in the development of attitudes. It is because of the cultural influence that individuals brought up in different cultures have different attitude towards a certain thing or ideal.

v. Social or Group-Membership factor: Influence of social factor in the development of attitudes is only natural in view of the fact that man is a social animal and he learns about things, other individuals, institutions, principles and different ideals by living in a society. He forms attitudes about things according to knowledge he gains from the society. Social attitudes are of three kinds – reciprocal, common and private. When the attitude is for one another it is reciprocal. Common attitude is commonly found in each member of the group. The private attitude is an individual's attitude for the other, while the other person concerned is not aware of it.

vi. Functional factor: The mental set, needs, experiences and values come in the category of functional factor because each one of them has a strong role in the development of attitudes.

1.2.3.0 Organizational Climate

Before discussing the meaning of organizational climate, it would be imperative to state first the meaning of an organization.

What is an organization?

Organization as a concept has been discussed by different authorities in different ways.

Herbert Spencer (1904) points out "A social organism is like an individual organism in these essential traits; that it grows; that while growing it becomes more complex; its parts acquire increasing mutual interdependence; that its life is immense in length compared with the lives of its component units . . . . . that in both cases there is increasing integration accompanied by increasing heterogeneity".

Roethlisberger and Dickson (1939) observes that an organization may be seen as performing two major functions; that of production; and that of creating and distributing satisfaction among the individual members of the organization.

According to Griffiths (1959), "Formal organization is construed to mean an assemble of individuals who perform distinct but inter-related and coordinated functions in order that one or more tasks can be completed".

In fine, an organization can be defined as a highly complex social system composed of the most complex organisms – the human beings, interacting with each other and who are interdependent ingredients of the interaction phenomenon, where the interaction takes place between two dimensions, namely, the social dimension and the psychological dimension of the social system.

Halpin (1966) says that an organization may be defined as a special kind of group – a social group whose members are differentiated as to their responsibility for accomplishing the group's tasks.

In the human organization like school, we find a number of individuals working together towards a common goal. Each of these individuals is bringing to the work situations different background of personal and social experiences, and they differ in their demands of their jobs. These demands depend upon the socio-physical needs and sentiments of the individuals (Sharma, 1979).

1.2.3.1 Meaning of Organizational Climate

Each and every individual observes that a unique climate, atmosphere or personality is felt whenever they spend even a small amount of time with the personnel of a particular organization. However, they find it extremely difficult to identify the source of this feeling or to describe it in words. The distinct climate, atmosphere or personality perceived by persons in a particular building is a result of the manner in which actors at each hierarchical level of the organization interact with each other; and this results in what is referred to as the Organizational Climate (Sharma, 1979).

Gipp (1960) says, "when the new observer comes into a group for the first time, he is able to sense a feeling about the group which he might call an atmosphere or a climate". Further, he discusses this climate in terms of supportive climate and a defensive climate. The behaviours that produce what has been called a 'supportive climate' are shared problem – solving attitude, feelings of acceptance, empathy towards other group members. The behaviours that produce what has been called a 'defensive climate' are advice giving, censoring, defense, persuasion, controlling, punishing etc. towards other group members.

In any organization including school, there exists a particular type of inter-personal relationship which generally affects the development and behaviour of an individual. The type of inter-personal relationship which exists in a particular school is quite different and distinct from other schools. Such different types of interpersonal relationships that exist among the group members of a school as an organization has been referred to as the Organizational Climate of a school.

Halpin and Croft (1963) explains the point as, "the organizational climate can be construed as the organizational personality of a school. Analogously personality is to the individual what organizational climate is to the organization."

After analyzing the definitions given by different authors, referred to in his studies on schools, Sharma (1979) says, organizational climate may be explained in terms of interaction that takes place between organizational ingredients as they fulfill their prescribed roles while satisfying their individual needs. Interaction is a process where, upon contact, men influence each other's behaviour.

Thus, the organizational climate of a school may be defined as the feelings and attitudes of the group members which result from the interactions and inter-relationships at the various hierarchical level of a particular school.

1.2.3.2 Types of School Organizational Climates

Depending upon the type of interactions between members in a school, different types of school organizational climates have been identified.

Halpin and Croft (1963), in their study to identify and construct a measure of the organizational climate in schools have identified six types of organizational climates. Sharma (1973) also has identified the same six types of climates in his study. But however, in his study he has reported familiar climate as belonging to open type and controlled climate as belonging to closed type of climate, just the opposite of the

report by Halpin and Croft. The present study has taken Sharma's classification into account as his study has been conducted in Indian schools.

The characteristic features of the different climates are explained in terms of eight dimensions of the organizational behaviour by Sharma (1978). These eight dimensions are Disengagement, Alienation, Esprit, Intimacy, Psychophysical Hindrance, Controls, Production Emphasis and Humanized Thrust. (A detailed description of these eight dimensions are given in Caption 3.3.3). These dimensions in different proportional combinations are categorised to form six different school climates.

The description of these six climates as given by Sharma (1978) are as follows:

1. **Open Climate**

   This climate is characterized by high 'morale' in general and high 'esprit' in particular among the teachers. 'Disengagement' is low in open climate, as there is unity among the teachers and they work together co-operatively for the accomplishment of their task. Emotionally the teachers feel that they are associated with each other. They perceive their principal as highly considerate and democratic in behaviour and hence the group

members as well as the principal feel 'all of a piece'. 'Alienation' in open climate is low.

As there is high esprit among the teachers, they obtain social needs satisfaction as well as job satisfaction and enjoy a sense of accomplishment in their job. In such a situation the teachers feel very proud 'to be associated with their work'. They do not feel much need for high degree of intimacy among them. As such 'Intimacy' is average.

As the behaviour of the principal is perceived as democratic, there is proper adjustment between his own personality and the role he plays. His behaviour may be regarded as genuine, which means he has a good sense of his own self and awareness of other's positions. He personally sets an example in the group to motivate the teachers. The principal does not exert any extra pressure upon the teachers but they themselves come forward to carry out the work. In such a situation 'production emphasis' is average. With the intention of facilitating the teachers towards the accomplishment of their task, the principal frames policies and rules. Such is the situation that 'Psychophysical Hindrance' is low. He believes in democratic procedures of control of organizational behaviour of

the teachers, whereby 'Controls' is low. The behaviour of the principal though task-oriented but at the same time is characterized by an inclination to treat the teachers humanely. Such is the situation that 'Humanized Thrust' is high.

2. **Autonomous Climate**

Autonomous climate depicts a situation in which the principal gives complete freedom to the teachers. There is a good chance for the teachers to structure their work activities the way they like. In such an environment the principal does not set any example for the motivation of teachers nor makes emphasis on production. As such 'Humanized Thrust' as well as 'Production Emphasis' is low. Though the principal allows the teachers to work at their own speed yet he exercises average control over their activities and organizational behaviour. This sort of principal's behaviour is regarded as hindrance by the teachers. As such 'Psychophysical Hindrance' is high.

The 'Morale' of the teachers is high but not as high as it is in open climate. They obtain social needs satisfaction on account of high 'Intimacy' among the members of the group, but this social needs satisfaction does not stem out of the task and team spirit. The teachers enjoy high 'Esprit' as well as high job

satisfaction. There is unity among the teachers with regards to task accomplishment. They work together towards the common goal. Such is the situation that 'Disengagement' is low. The principal keeps himself aloof from the members of the group, so 'Alienation' is average, and this aloofness on the principal's part leads to average 'Controls'.

3. **Familiar Climate**

This climate is characterized by friendly relationship between the principal and the teachers as well as among the teachers themselves. Every teacher feels that he is a member of 'a big happy family'. They obtain high social needs satisfaction which stems from 'Intimacy'. The principal attempts to make the work of the teachers as easy as possible and does not burden them with heavy routine work. In such a situation 'Psychophysical Hindrance' is low. 'Esprit' is average in this climate and it emanates from social needs satisfaction. 'Production Emphasis' is high whereas 'Humanized Thrust' is low. As there are extremely high friendly relations among the teachers, 'Disengagement' is low. But due to the 'Production Emphasis'

being high or average 'Controls' which the principal exercises, 'Alienation' is high.

4. Controlled Climate

This climate is marked by a press for achievement at the expense of social needs satisfaction. It weighs towards task accomplishment under established controls and directives. Therefore, the teachers perceive the behaviour of their principal high on 'Production Emphasis' and 'Controls'.

The teachers' morale which stems from task accomplishment is average. There is an excessive amount of busy routine work and general 'Hindrance'. Teachers get rare chance for socialization among themselves and as such 'Intimacy' is low.

All the teachers are engaged in busy work to get the work done and they have no time to pull in different directions. As such a situation 'Disengagement' is low. The principal is not sensitive to feedback from the staff and as such he plays the role of a 'straw boss'. Emotionally, he is at a distance from the teachers resulting in average 'Alienation'. His main aim is to get the job done at the cost of social needs satisfaction of the members. He wants to see that every work is done properly without setting an

example to stimulate the teachers. Hence, 'Humanized Thrust' is low.

5. Paternal Climate

This climate is characterized by the ineffective attempts of the principal to control the teachers as well as to satisfy their social needs. There is no unity among the teachers in task-accomplishment, and they pull in different directions. As such 'Disengagement' is high and 'Controls' is low due to the inability of the principal to control the teachers' activities.

As 'Disengagement' is high, teachers cannot establish friendly relationship among themselves. Hence, 'Intimacy' is low. The teachers perceive the principal's behaviour as highly dominated by 'Psychophysical Hindrance'. The teachers do not obtain social needs satisfaction. Emotionally, the principal is at a distance from the teachers. Therefore, 'Alienation' is average and group morale as well as 'Esprit' is low. The principal takes care about the human aspect of the teachers. He emphasizes production by setting examples by working hard, so 'Humanized Thrust' is high. His view is that 'Daddy knows best' and as such he does not allow the teachers to work in their own way. At the same time he does not ignore the interests of the teachers.

6. Closed Climate

This climate is characterized by a high degree of apathy on the part of all members of the organization. There is no unity among the teachers and they pull in different directions. As such 'Disengagement' is high. The teachers secure neither job satisfaction nor social needs satisfaction. 'Esprit' is very low, that is, group morale is very low. The behaviour of the principal is formal and highly impersonal, and as such 'Alienation' is high. The principal prefers to 'go by book' and never attempts to motivate the teachers through setting example by working hard himself. He is highly task-oriented, so 'Humanized Thrust' is low. He gives heavy work to the teachers without trying to facilitate them. As such 'Psychophysical Hindrance' is high. The principal believes in giving dictatorial directives in order to get the work done. He does not encourage socialization among the teachers. Hence, 'Intimacy' is low.

A diagrammatic description of these six organizational climates is given in Table-1.

Table-1: Diagramatic Description of Six Organizational Climates

	Group Behaviour Characteristics				Leader Behaviour Characteristics			
Climate	Disenga -gement	Aliena -tion	Espri t	Intimac y	Psychophy -sical Hindrance	Control s	Produc- tion Emphasi s	Humani -zed Thrust
Open	L	L	H	M	M	L	M	H
Autono- mous	L	M	H	H	H	M	L	L
Familiar	L	H	M	H	L	M	H	L
Controlle	L	M	M	L	M	H	H	L
d	H	M	L	L	H	L	L	H
Paternal	H	H	L	L	H	H	M	L
Closed								

Note: L = Low M = Moderate H = High

1.3.0 Study Area

The present study is conducted in the East Khasi Hills District of Meghalaya. To facilitate in a better understanding of the study and its results, a brief presentation is made further about the study area.

The State of Meghalaya is situated in the North-Eastern Region of India. Meghalaya, the 21st State of India, emerged as a full-fledged state on the 21st of January 1972. The term Meghalaya literally means 'the abode of clouds'. It lies between 20°1'N and 26°5'N latitude and 85°49'E and 92°52'E longitude. According to 2001 census, the

population of the State is 23,06069. The State covers an area of 22,429 square kilometres.

At present, there are seven (7) administrative districts: 1. East Khasi Hills District, 2. West Khasi Hills District, 3. Ri-Bhoi District, 4. Jaintia Hills District, 5. East Garo Hills District, 6. West Garo Hills District, 7. South Garo Hills District. The State is predominantly inhabited by the tribes – the Khasis, the Jaintias and the Garos. The principal languages in Meghalaya are Khasi and Garo with English as the official language. Over the years, the literature in the Khasi and the Garo languages have developed. These languages have emerged in the list of Modern Indian Languages (MIL). Now both Khasi and Garo languages are taught as one of the subjects of study upto the post-graduate level in the State.

Meghalaya is basically an agricultural state with about 80 per cent of its total population depending entirely on agriculture for their livelihood. A Matrilineal social order prevails in the State of Meghalaya. It is a system characterized by a relatively better status that a woman is accorded in society. In comparison to her counterparts in patrilineal and patriarchal society, she enjoys a better position and is looked at with more respect. Therefore, it comes as no surprise that even female responses to literacy is not so variant from the male's. According to the

2001 census, the literacy rate of Meghalaya is 63.31 per cent with males having 66.14 per cent and females having 60.41 per cent of literacy.

Over the years a number of schools have sprung in Meghalaya, which are run by different types of management and are located in different areas. At present, there are four types of management of secondary schools in Meghalaya. They are (i) Government schools (ii) Deficit schools (iii) Aided Schools and (iv) Unaided schools. A brief idea about these four types are given as follows.

i. *GOVERNMENT SCHOOLS*: Government schools are fully financed and managed by the Government. Both the teaching staff and non-teaching staff fall under the category of Government employees. They are entitled to pension and gratuity at the time of retirement. The Government schools are directly under the State Department of Education.

ii. *DEFICIT SCHOOLS:* Those schools which fulfill the conditions prescribed by the Government are brought under Deficit system. Such schools get full amount of grant-in-aid according to their necessities. These schools are managed and staffed by the village Dorbars and minority institutions. The Managing Committee of these schools are to be approved by the

Government at regular intervals and generally, the Government reviews these schools every three years or so and grant-in-aid may be withdrawn if results are not satisfactory. Moreover, the teachers are not entitled to pension benefits.

iii & iv. *AIDED AND UNAIDED SCHOOLS* are under the management of educational trusts registered with the Government. They are run by Managing Committees approved by the Government and they function according to the rules framed by the Department of Education. Aided schools receive grants from the Government in the form of building grant, teachers' grant, furniture grant, library grant, sports and games grant, computer grant, etc. Unaided schools do not get any financial assistance from the Government. Villages where such schools exist and no Government help has been extended so far, are known as 'School-less Villages'.

The main responsibility of framing the curriculum and conducting of Board Examinations lie with the Meghalaya Board of School Education (MBOSE). The community also plays a significant role in setting up and in the maintenance of schools in the State.

The study is conducted in the East Khasi Hills District of Meghalaya. The earlier East Khasi Hills District was bifurcated in 1992

with the formation of Ri-Bhoi District being carved out of it. The present East Khasi Hills District has an area of 2748 sq.kms. and a population of 5,37,906 (Government of Meghalaya, 1998). It is a hill district predominantly inhabited by the scheduled tribes. It may, however, be noted that although there is an increase in the literacy rate in the region, but there is not much advance of science and technology. Moreover, a wide disparity exists between urban and rural students, and between tribal and non-tribal students with regards to their development in different aspects of the educational scenario. Thus a need was felt to take a closer look into the situation.

1.4.0 Need For The Study

In man's successful progress throughout the savage state, he has been largely indebted to his curiosity and desire to penetrate the mysteries of nature, to gain a knowledge of hidden things and thus discovering the elixir of life. It was his skill and scientific imagination out of which science gradually emerged. Science has greatly added to the dignity and sublimity of human civilization. Science has been acclaimed as an 'angel' of creative ideals. Creative thinking is an ultimate answer to man's problems, innovations of new ideas and things and ultimately

the civilization of life. The value and worth of this potential is unlimited and its significance can hardly be over-emphasised.

In the modern era of science and technology, there is an increasing demand for science and technical courses. Specific cognitive abilities are essential for every combination of courses which may serve as predictors of one's success in that area of study. Creative thinking ability is one of the cognitive abilities which determines the students' performance and attainment in the present educational system. Creative talent should be blossomed when it is still potential and attempts should be made to provide an environment – sociological, psychological and educational best suited to the needs of creative children.

Science provides the greatest outlet for creative activity, so much necessary for any field of human knowledge. Science is considered as an important subject in the school curriculum because man's future depends to a large extent on scientific advances and development of productive activity. Due to the immense need and value to all children, science is made as one of the core subjects in both elementary and secondary stages of education.

As has earlier been stated, the importance of science as a core subject in the school curriculum is emphasized by the Education

Commission (1964-66). The study of science develops 'scientific attitude' and trains in 'scientific method' among learners. Development of a positive attitude towards science is of great importance as it serves as a complement to creative thinking ability.

A congenial school atmosphere is important in the development of students in various dimensions. This atmosphere is mostly determined by the type of working relations that exists between the head and the teachers in the school. This is nothing but the school organizational climate. Different school organizational climates affect students in different ways, and to ignore variations in the organizational climate is to limit the understanding of the various ways students think and feel. Thus, it may be said that the organizational climate of a school plays a vital role in the development of creative thinking ability and positive attitude towards science.

Meghalaya is predominantly a tribal state which is quite remote and has its own social and organizational setting. Thus, in a way, it is more or less disadvantaged and there is not much advance in the field of science. The Report of the Meghalaya Education Commission (1977) also stated that the teaching of science is far from satisfactory. Creative thinking ability and positive attitude towards science promote the learning of science in students. As already indicated, organizational

climate in the schools is a contributing factor in this direction. East Khasi Hills District of Meghalaya provides a wide variety of secondary schools run under different types of management. It is of importance to find out how the creative thinking ability and attitude towards science have been developed in the secondary schools of different types of management and belonging to different organizational climates. Towards this end the present study is undertaken.

1.5.0 Statement of the Problem

The problem under study reads as "Creative Thinking Ability and Attitude towards Science among Students of Secondary Schools having Different Organisational Climates".

1.5.1 Conceptual Definitions of the Terms Used

The following conceptual definitions for the different key terms used in the study are given below:

i. **Creative Thinking:** Creative thinking is that type of thinking which involves mainly the use of divergent production abilities which enable a person to think in different directions and find out new solutions to problems.

ii. **Attitude:** An attitude is the degree of positive or negative affect associated with some psychological object.

iii. **Organisational Climate:** It refers to the different types of interaction that takes place between members of an organization (such as a school) when they fulfill their prescribed roles while satisfying their individual needs.

In the context of a 'school', it is the resulting-condition, within the school, of social interaction among the teachers and between the teachers and the principal.

1.5.2 Operational Definitions of the Terms Used

i. **Creative Thinking:** It is the score obtained on the Verbal Test of Creative Thinking developed by Baqer Mehdi (1985).

ii. **Attitude:** It is the score obtained on the Attitude Scale developed by the investigator to measure the attitude towards science of secondary school students.

iii. **Organisational Climate:** It is the climate of the schools (organizations) as identified by the tool School Organizational Climate Description Questionnaire (SOCDQ) developed by Motilal Sharma (1978).

1.6.0 Objectives of the Study

The objectives of the present study are as follows:

I To find out the creative thinking ability of secondary school students in East Khasi Hills District of Meghalaya and further –

i. to find out whether any significant difference exists among students belonging to schools of different types of management in their creative thinking ability.

ii. to find out whether any significant difference exists among students of classes VIII, IX and X in their creative thinking ability.

iii. to find out whether any significant difference exists among students belonging to schools with different organisational climates in their creative thinking ability.

iv. to find out whether any significant difference exists between students of rural and urban secondary schools in their creative thinking ability.

v. to find out whether any significant difference exists between tribal and non-tribal secondary school students in their creative thinking ability.

II. To find out the attitude towards science of secondary school students in East Khasi Hills District of Meghalaya and further –

i. to find out whether any significant difference exists among students belonging to different types of management in their attitude towards science.

ii. to find out whether any significant difference exists among students of classes VIII, IX and X in their attitude towards science.

iii. to find out whether any significant difference exists among students belonging to schools with different organisational climates in their attitude towards science.

iv. to find out whether any significant difference exists between students of rural and urban secondary schools in their attitude towards science.

v. to find out whether any significant difference exists between tribal and non-tribal secondary school students in their attitude towards science.

1.7.0 Hypotheses

With reference to the above mentioned objectives, the following hypotheses were formulated:

I

i. There is no significant difference among students belonging to schools of different types of management in their creative thinking ability.

ii. There is no significant difference among students of Classes VIII, IX and X in their creative thinking ability.

iii. There is no significant difference among students belonging to schools with different organisational climates in their creative thinking ability.

iv. There is no significant difference between students of rural and urban secondary schools in their creative thinking ability.

v. There is no significant difference between tribal and non-tribal secondary school students in their creative thinking ability.

II

i. There is no significant difference among students belonging to schools of different types of management in their attitude towards science.

ii. There is no significant difference among students of classes VIII, IX and X in their attitude towards science.

iii. There is no significant difference among students belonging to schools with different organisational climates in their attitude towards science.

iv. There is no significant difference between students of rural and urban secondary schools in their attitude towards science.

v. There is no significant difference between tribal and non-tribal secondary school students in their attitude towards science.

The next chapter presents a review of related literature.

CHAPTER - II

REVIEW OF RELATED LITERATURE

2.1.0 Introduction

In this chapter, an attempt has been made to present a review of the related literature and studies in the area of creative thinking ability, attitude towards science and organizational climate which are relevant to the present study. The studies are grouped under the following headings keeping the objectives of the present investigation under consideration, so as to get a meaningful background of the present research.

i) Studies on Creative Thinking Ability.

ii) Studies on Attitude towards Science

iii) Studies on Organizational Climate

iv) Studies on Creative Thinking Ability and Attitude towards Science.

v) Studies on Creative Thinking Ability and Organizational Climate.

2.2.0 Studies on Creative Thinking Ability

In spite of the fact, that a great deal of philosophical and theoretical attention is being paid to art and creativity, research in creativity has been receiving serious attention only very recently. In fact, studies on creativity are still scanty.

Passi (1972) investigated the creativity of higher secondary students of classes IX, X and XI of Punjab, Haryana and Chandigarh in relation to some other variables. The study reported that urban students were significantly better than rural students in their creative thinking ability. A related study was conducted by Gilitwala (1978). In this study, Mehdi's tests of creativity were administered to 960 students drawn from standards VIII to XI of secondary schools of Surat, Valsad, Bharuch and Dangs districts of South Gujarat. The study reported that there was a significant difference between the mean creativity scores of the samples of rural and urban students where the urban students scored higher than their rural counterparts. Pandey (1981) investigated the creativity of secondary school students from classes VIII to X of government high schools and from intermediate colleges of Kumaun division. The sample was selected from twenty-five institutions on the basis of stratified random sampling technique, comprising of 400 students. The study also stated that the urban students scored significantly higher than the rural students in their creativity scores.

Similar findings were reported by the studies of Bhaskara (1982), Singh (1982), Rao (1982), Sharma (1986) and Trimurthy (1987) which showed that the urban students were superior than their rural counterparts in creative thinking ability. Gupta (1988) studied the

creative development of secondary school students and reported that the creativity of rural students were lower than those of the corresponding urban students. Further, it was also found that creativity had a tendency to raise from the age of 11 (Grade VI) and continues to do so upto Grades VIII and IX. After this stage there appeared a sharp decline.

Tanuja (1990) conducted a study on the development of creativity components among junior high school students in Agra. The study revealed that females were significantly superior to males in creativity. There were also differences in creativity between rural area students and urban area students. Similar findings were found by Reddy (1990) where the sample of the study comprised of 900 children belonging to classes VIII, IX and X. The study reported that urban children were more creative than rural children. Further, the study revealed that there was a significant difference between the creativity of classes VIII, IX and X.

Strauss and Strauss (1968) conducted a wider cross-cultural study and observed clear cut differences in American and Indian students. But in both the societies boys were significantly higher in creative thinking ability than girls. Related studies were conducted by Ganeja (1972), Jain (1972), Rawat and Agarwal (1977), Badrinath and

Satyanarayan (1979) and Sharma (1979) who reported that boys were significantly superior to girls in creative thinking ability.

Srivastava (1982) investigated the relationship of creativity with some other variables. The sample for the study consisted of 365 male and 455 female high school students. Bhaskara (1982) carried out a study to assess the creativity of students of standard VI in the Bangalore city of Karnataka, from two urban and two rural schools. Singh (1982) investigated the creative thinking of high school students studying in Grades VIII, IX and X randomly drawn from nine high and higher secondary schools situated in five districts of Himachal Pradesh. Sharma (1982) studied the creativity of higher secondary school students in relation to some variables. The sample consisted of 481 students (230 boys and 251 girls) of class IX and from 23 different government, private-aided, public and central schools of Delhi. Non-verbal test of creative thinking (Baqer Mehdi) was used to collect the data. Trimurthy (1987) conducted a study to find out the creative thinking ability of secondary school students in the context of some psycho-socio factors. The sample comprised of 603 pupils selected from classes VIII, IX and X of secondary schools in Arunachal Pradesh. Dave (1981) also investigated the creativity of secondary school students. The sample for the study consisted of 10 per cent of the

schools randomly drawn out of each of the 6 geographical units of Gujarat State. The sample consisted of 1238 boys and 776 girls drawn from rural (N=560) and urban (N=454) areas Bhogayata (1986) studied the creativity of class X students of Gujarati-medium secondary schools in Bhavnagar district. Stratified random cluster technique was employed to draw the sample, consisting of 1014 students with 671 boys and 343 girls and 685 urban and 329 rural students. All the above studies reported that boys were significantly superior to girls in creative thinking ability.

Contrary to the above studies was the report by Yamamoto (1960) who found that girls were high in creativity than boys in spite of boys being higher on their I.Q. scores than girls. Neufeld (1964), Dauw (1966), Littlejohn (1967) and Fletcher (1968) also reported that girls were high in creative thinking ability than boys. Similarly, Passi (1971), Bedi (1974), Rawat and Garg (1977), Arora (1978) and Jarial (1981) also reported that girl students were significantly superior to boys in both verbal and non-verbal tests of creative thinking. Again, related studies were conducted by Deshmukh (1979), Tripathi (1983), Gupta (1988) and Tanuja (1990) which showed that girls excelled the boys in creativity. Shashi (1992) studied the development pattern of creative thinking among Navodaya Vidyalaya students, comprising of classes

VII, VIII and IX. The study revealed that there was a significant difference between boys and girls on dimensional scores of fluency, flexibility and originality, as well as on the total creativity score, where girls tended to be more creative than boys.

On the other hand, certain studies by Pogue (1964), Olshin (1964), Castle (1965), Mayhon (1966), Karsten (1968), Jackson (1968), Burns (1969), Helson (1970), Torrance and Phillips (1971), Kloss (1972), and Ward and Cox (1974) have shown that there is no sex difference with respect to creative thinking ability.

Pareek (1966) investigated with the purpose to study the development of creative thinking ability at different age levels and to study the relationship between creative thinking and other factors. The study revealed that the mean creative thinking scores increased with the increase in age. No significant difference was found between the creative thinking of boys and girls. Similar findings were reported by Rao (1982) and Bindal (1984) who stated that there was no significant difference between boys and girls in their creative thinking ability. Rao (1982) also found that the performance level of grade X students in creativity was superior to that of grade IX students in Tamil Nadu.

Boonsathron (1988) studied the creative thinking ability of higher secondary school students in Bangkok and found out that there was no

significant difference between the mean performance of boys and girls and the students of grade XI had higher creative thinking ability than those of grade X. Related studies were conducted by Reddy (1990) and Kumar (1992) who reported that there was no sex difference with regards to students' creative thinking ability. Jayaswal (1977) also found out that there was no difference between male and female science group trainees in their creativity scores. Chaudhary (1983) conducted a study on the trends of creative thinking ability of pupils of age group 11 to 13^{+} in relation to some variables. Desai (1987) investigated the creative thinking ability of higher secondary students of Gujarat state. Both the studies revealed that there was no significant difference between rural and urban students in their creative thinking ability.

The above review of studies on creative thinking highlights that this variable has been studied by researchers in relation to the difference between rural-urban, boys-girls, as well as between different classes. There are differences in their findings to pinpoint the superiority of a particular group. But they do indicate the importance of the types of groupings within the samples, as considered by researchers.

2.3.0 Studies on Attitude Towards Science

Many experiments have been carried out in the field of measuring attitudes and opinions. There is much literature on attitude towards science, but it is concerned only with defining and developing it. But little is done about the measurement of attitude towards science, particularly at the school level.

Caldwell and Lundeen (1931) reported that high school pupils had a favourable attitude towards science. Downing (1936) found that there was a fairly uniform and gradual increase in attitude towards science from grade VIII through grade XII. Baumel and Berger (1965) revealed that the students who scored high in the attitude scale were not necessarily those with high grades in science and the students who scored low in the attitude scale were not necessarily those with low grades in science. Studies of Curtis, Blair, and Goodson and Vicklund reported that pupils who engage in wide reading in general science develop a more positive attitude towards science than those who study only single subject (Rao, 1997).

Prakash (1968) conducted a study to find out the attitude of class VIII students towards science. The major findings were: a) achievement in science and pupils' attitude towards science were

positively related. b) The pupils in urban areas scored more in science than those in rural areas. c) Girls scored higher than boys on the attitude scale. Kumar (1992) studied about the development of attitude towards science among secondary school students in relation to the teaching of science and their achievement. The study revealed that: a) In the average group, there was significant difference in the attitude scores of boys and girls. However, no significant difference was found in the attitude scores of urban and rural pupils. b) In the high group, the mean scores of boys and girls did not differ significantly in their attitude towards science, and the mean scores of urban and rural students differed significantly in their attitude towards science. c) In the low group, the mean scores of boys and girls did not differ significantly with respect to their attitude towards science.

Dani (1984) conducted a study on the science attitude and cognitive styles of higher secondary students. Kumar (1991) has examined the attitude of secondary school students towards science in Cuddalore educational district of Tamil Nadu. Malviya (1991) studied the attitude towards science among school-going adolescents of Madhya Pradesh. An attitude scale (Likert method of summated rating scale five-point) was the tool used to collect the data. These above

three studies also reported that there was a significant difference between urban and rural students in their attitude towards science.

On the other hand, Darchhingpuii (1988) investigated the science achievement, attitude towards science and problem solving ability among the male and female college students in Mizoram. The study revealed that male students were superior to the female students in their attitude scores. Similarly, Kar (1990) and Malviya (1991) reported that boys were found to be more favourably disposed towards science than girls.

Contrary to the above findings, was the study conducted by Sood (1974). The major objective of the study was to construct an attitude scale so as to measure the differences of attitude towards science and scientists between male and female students and teachers. The sample of the study comprised of 1000 students and teachers, from 7 English medium schools of Delhi and Rajasthan. The study revealed that the sample reflected positive attitude towards science and no significant difference was found between boys and girls in their attitude toward science. Shinde (1982) and Dani (1984), similarly reported that there was no significant difference between boys and girls in their attitude towards science. Williams (1983) studied the attitude of high school students towards science in Tamil Nadu. It was

found that on the whole the students' attitude towards science was favourable but there was a wide disparity in their attitudes. This disparity was accounted by one's attitude towards science, one's attitude towards science education and one's socio-economic status. Singh (1986) examined the attitude and achievement in science of high school students. The sample consisted of 300 students (150 males and 150 females) selected from high schools of Manipur Central District. An attitude scale developed by the investigator was used as a tool to collect the data. The study revealed that no significant difference was found between boys and girls in their attitude scores.

Srivastava (1983) studied the attitude towards science of arts and science students in Rajasthan. A total sample of 480 students was selected through a stratified constant sampling process. It was found that science students scored higher than arts students on the science attitude scale. Moreover, non-tribal students had a more positive attitude towards science than their counterparts belonging to the scheduled castes and scheduled tribes. Sharma (1990) investigated the incidence of science literacy, attitude towards science and the personality traits of certain groups of students and teachers in Rajasthan. The study stated that there was a significant difference between tribal and non-tribal students in their attitude towards science.

However, Rao (1990) studied the attitude towards science among secondary school students in Tamil Nadu, comprising of a sample of 600 students studying in class IX. The study revealed that the students studying in private schools and rural schools had a more favourable attitude towards science.

The studies reviewed above show that researchers have attempted to measure the attitude towards science among school students. There are researches to find out the differences between urban school students and rural school students; between boys and girls; and between scheduled tribes and other groups. There are few studies who have tried to find out the relationship that could exist between attitude towards science and achievement in science among students.

2.4.0 Studies on Organizational Climate

In India, the movement of identification of organizational climate started at the beginning of the seventies. This has resulted in a number of studies being carried out in this area.

Bayti (1970) made a comparative study of the organizational climate in Rajasthan schools and found that rural schools were superior with respect to Esprit, Intimacy, Aloofness, Humanized Thrust

and Hindrance to those of urban ones. On the other hand, urban schools were superior to their rural counterparts with respect to Disengagement, Production Emphasis and Consideration. The organizational climate of a school was found to have an effect on the students' achievement. Pillai (1974) studied the organizational climate of 190 secondary schools in Tamil Nadu. The study revealed that the performance of students was significantly better in open and autonomous climate schools than in schools of other types. Esprit, Humanized Thrust, Disengagement and Hindrance were found to significantly increase the level of performance of students in schools.

Similarly, Sharma (1968) conducted a study to find out the organizational climate of government and private schools in relation to the students' academic achievement. The study revealed that there was no significant difference between government and private schools and the organizational climate of a school was significantly related to the students' achievement. The study of Rao (1977) also reported the same findings, that the organizational climate of a school is significantly related with the academic achievement of students.

Kumar (1978) found out that the type of management and the organizational climate were not related. Further, the study revealed that achievement indices of students were positively related to their

organizational climates, though the study was done with colleges. The rural colleges had more open-type climate than the urban colleges, and the private colleges had more open-type climate than the government colleges. Related studies were conducted by Shah (1981), Varshneya (1981) and Upadhyaya (1984) who reported that the organizational climate was significantly and positively related to students' academic achievement, where it was maximum under the open climate and least under the controlled climate. Pandey (1981) investigated the organizational climate of government and private secondary schools of Garhwal region. A sample of 30 per cent of secondary schools was randomly selected from each of the 5 districts of Garhwal Mandal. The sample consisted of 500 teachers from 28 government and private secondary schools located both in the rural and urban areas. The study reported that the secondary schools of urban areas differed from those of rural areas with respect to organizational climate and that the government secondary schools differed in their organizational climate from private secondary schools. In another study conducted by Pandey (1985), it was found out that rural schools were more open than those in urban areas. This study belonged to the category of descriptive survey of a co-relational nature. The sample in this study included 34 secondary schools drawn from a population of 138 secondary schools

of Allahabad district through the stratified random sampling technique. A total of 404 teachers of these schools participated in this study.

Desales (1978) investigated the effect of school climate on pupils' development in Gujarat, Maharashtra and Goa. Amarnath (1980) made a comparative study of the organizational climate of government and privately managed higher secondary schools in Jullundur district of Punjab. The sample of the study comprised the principals of all the 32 higher secondary schools and at least 9 teachers from each of these schools. Natarajan (1992) studied the organizational climate of higher secondary schools of Tiruppattur Educational District. All these studies revealed that there was no positive relationship between the organizational climate and academic achievement of students. Certain studies like Joshi (1980), Shah (1981), Baraiya (1985), Singh (1988) and Nasema (1997) reported that there was no significant difference between urban and rural schools and between government and private schools with respect to their organizational climates.

Khan (1987) studied the organizational climate of secondary schools. 70 secondary schools from Gujarat and 20 Kendriya Vidyalayas from all over India formed the sample of the study. It was found that 31 per cent of the secondary schools had a closed climate,

20 per cent had an open climate, 18 per cent had a controlled climate, 13 per cent had an autonomous climate and 5 per cent had a familiar climate, indicating thereby that the majority of the schools in the study were having a closed climate. Chakraborti (1990) studied the organizational climate of secondary schools in West Bengal. It was reported that the paternal climate was the most frequently perceived climate, followed by 'controlled', 'familiar', 'open', 'autonomous' and 'closed' climates. Jayajothi (1992) investigated the organizational climate of Central Schools in Madras and found out that most of the schools had a closed climate, followed by 'open', 'controlled', 'familiar' and 'paternal' climates. Solanki (1992) found that the secondary schools differed among themselves in their organizational climate and that the organizational climate appeared to be independent of organizational management and location of the schools.

A look into the above studies indicate that researchers have tried to identify the school organizational climates in different parts of the country. Some have tried to find out what type of climate the schools of different types of management have. Some studies have tried to find out rural-urban differences, if any, in relation to the different types of organizational climates of the schools. There are a few studies

which have tried to find out any relationship between achievement of students and the school climate.

2.5.0 Studies on Creative Thinking Ability and Attitude Towards Science:

Creative thinking ability is one of the important cognitive abilities. It is considered as a potential leading to the development of scientific attitude. In order to have a positive attitude towards science, creative thinking ability is supposed to be a very influential factor. It is therefore expected that there will be a relationship between creative thinking *ability and attitude towards science of students*.

Focusing on creative thinking ability as an important variable for developing positive attitude towards science, Nair (1978) carried out a study in 6 secondary schools selected on the basis of stratified random sampling from North Parur and Kodungallur educdational sub-districts of Kerela. It was found that creative methods were important for positive attitude towards science and better attainment of higher objectives in science.

Singh (1978) also studied the effect of creative thinking ability on the development of positive attitude towards science among students of classes IX, X and XI. It was found in the study that creative thinking ability and attitude towards science were positively and significantly

related with the academic achievement of the students in science subjects.

Awasthy (1979) found that science students scored significantly higher than arts students in the three dimensions of creative thinking – fluency, flexibility and originality.

Sandhu (1979) studied the relationship of creativity with academic achievement in science subjects. The sample of the study consisted of 217 male students of class X, studying in various rural higher secondary schools of Punjab. The findings of the study revealed that the creativity of the students were significantly related to their achievement in science subjects, but the relationship became not significant when the effect of intelligence was partialled out.

Jhag (1979) conducted a study on a sample of 700 higher secondary school students of 15^{+}, drawn from the Bhopal division of Madhya Pradesh. Data was collected using Mehdi's Verbal Test of Creative Thinking. It was found out in the study that there was a significant relationship between creativity and attitude towards science. The study also revealed that there was a significant difference between urban and rural students in their attitude towards science and in creativity. Srivastava and Jha (1977) and Srivastava (1978) reported that science students were superior to arts and commerce students as

far as their achievement in creativity was concerned. As opposed to this finding, Jarial (1981) reported that arts students were significantly superior to science students in verbal creative thinking. But with regards to non-verbal creative thinking, it was again the science students who were found to be superior to arts students. Usmani (1981) holds that creative thinking ability and attitude towards science are significantly related.

Rai (1982) studied the process of problem-solving in creative and non-creative science students. The sample of the study consisted of 200 students from 2 secondary schools of Patna. Mehdi's Test of Creative Thinking was used as a tool to identify creative and non-creative students. It was found in the study that in order to have a positive attitude towards science, students needed more tasks as assignments which would enhance their creative thinking ability.

Gowalkar (1986) conducted a study on the science attitude, creativity and achievement of tribal students in Rajasthan. The study revealed that the non-tribal students were superior than the tribal students in their science attitude and creativity. Further, the study also revealed that creativity has a positive effect on the students' development of scientific attitude. A related study was carried out by Raina (1986) to find out the relationship between creativity and attitude

towards science. A sample of 1000 students (459 boys and 541 girls) was drawn from 2 Missionary schools, 8 Government schools and 14 private schools. The study reported that creativity was significantly related with attitude towards science. It also reported that students of private schools were more creative than their counterparts studying in Missionary Schools and Government schools.

On the other hand, Irudayaraj (1989) studied the relationship between creativity and achievement in science among class X students. The study reported that there was no significant relationship between science achievement and creativity of high school students.

Srivastava (1992) investigated creativity in relation to attitude towards science among higher secondary school students of Agra city. The major findings were:

i) In the field of creativity, boys having favourable attitude towards science were slightly better than those having unfavourable attitude towards science, whereas girls with favourable and unfavourable attitude towards science did not differ.

ii) The girls were superior to boys in creativity and in attitude towards science.

It may be noted from the above studies that researchers have shown that creative thinking and attitude towards science are related.

2.6.0 Studies on Creative Thinking Ability and Organizational Climate:

In order that this cognitive ability, that is, creative thinking ability, may be properly cultivated, a conducive school organizational climate is necessary. This is because, a student's creative thinking ability may be developed or regressed according to the type of climate prevailing in a particular school. Following are the studies, which have reported their findings on the influence of organizational climate on the creative thinking ability of students.

Sharma (1968) stated that schools having open and autonomous climates had a significantly high achievement index on the students' creativity scores, as compared with closed climate schools. Raina (1969) studied the role of school environment on creativity and found that students scored significantly high on creativity scores in open and informal schools as compared to the closed and formal schools.

Gupta (1974) investigated the institutional climate and classroom teaching behaviour in relation to creativity. A sample of 2000 boys and girls studying in grades VII to XI in Jammu city high and higher secondary schools was drawn for investigating the climates of these schools. The major findings of the study were:

i) There was no significant differences between the pupils studying in institutions with different types of institutional climates with respect to their scores on creativity.

ii) Institutional climate and creativity were found to be significantly related.

Pillay (1975) and Upadhye (1981) were suggestive of the effect of a stimulating school climate on the creative development of students. The study conducted by Mishra (1982) also showed that the school environment had a positive and significant relationship with the creative thinking ability of students.

Kumar (1984) studied the relationship between the school climate and creative thinking ability of class X students, out of which 808 were in Government managed schools and 443 in privately managed schools. The sample included 1251 students (971 boys and 280 girls). Dubey (1986) also studied the creative thinking of classes V and VI students of Allahabad and Kanpur. These studies revealed that a conducive school environment had a positive and significant effect on the creative thinking ability of students. Pradhan (1991) attempted to study the effect of school organizational climate on creativity, adjustment and academic achievement of secondary school students in Orissa. It was found in the study that the school

organizational climate had a significant effect on the students' creativity scores.

Rogers (1953) has speculated that maximizing the conditions of a conducive school climate, we maximize the likelihood of an emergence of constructive creativity. Similarly, Baylay (1957), Bloom (1968), Pace (1965) and Stern (1970) have viewed that school environment is a powerful tool in influencing the students' creative thinking ability. Coleman (1961) found that the organizational climate is an influential factor in facilitating high creativity scores among students. Studies conducted by Torrance (1964), Miruchin et.al (1969), Wilson, Stuckey and Langeyin (1972), Harckham and Erger (1972), Ruedi and West (1973), Wright (1974), Nogrady (1975), Schnee (1975), McPortland and Epstein (1975), Horwitz (1978) all reported that open classroom environment proved to be more creative.

Haddon and Lytton (1971) in an attempt to verify the differential effect of different school climates on creative thinking ability found that children in informal primary schools scored higher on tests of creative thinking than in formal schools. Contradictory result was found by Marburg (1970) who did not find any difference in the creativity scores of grade V elementary school students from open

climate schools and closed climate schools. Endo and Harpel (1982), Pascarella (1980) focussed on the importance of creating a favourable school environment which could encourage students to be active learners in the classroom which would foster creativity.

A look into the above studies indicate that researchers have worked on the hypothesis of development of creative thinking in students vis-à-vis the type of school climate. This suggests that it is generally felt that while studying creative thinking among students, school climate stands out to be a variable of some importance.

An overview of all the above mentioned researches show that very few of them have drawn the data over the variables from a tribal sample, particularly from the North-East. This collaborates with the need for the present study as highlighted in caption 1.4.0.

The details of the present study are given in the chapters that follow.

CHAPTER – III

METHODOLOGY AND PROCEDURE

3.1.0 Introduction

This chapter gives the details of the procedure followed to achieve the objectives of the present investigation. The study is a descriptive research. The chapter gives the details of the population and sample, tools used, collection of data, and the statistical measures used to analyse the data collected.

3.2.0 Population and Sample

There are 160 secondary schools in the East Khasi Hills District of Meghalaya, as per the list obtained from the office of the Inspector of Schools, East Khasi Hills District. This number covers those which are Government schools, Deficit schools, Aided schools and Unaided schools and which are located both in the urban areas as well as rural areas. These schools formed the population of schools for the study. The list of these schools is provided in Appendix-A.

The distribution of these schools according to the different categories is shown in Table 2.

Table 2: Showing the Distribution of Secondary Schools in the Population.

Area	Type of Management				Total
	Government	Deficit	Aided	Unaided	
Urban	2	41	30	28	101
Rural	-	12	32	15	59
Total	2	53	62	43	160

It was decided to include about 25 per cent of the population of schools in the sample, as it was felt that this number would be sufficient for the purpose of the study. Stratified sampling technique was used in drawing the sample of schools. Since there were only 2 Government schools in the population, one catering to boys and the other to girls, it was decided to include both of them in the sample. Table-3 gives the number of schools that were included in the sample.

Table 3: Number of Schools Included in the Sample.

Area	Type of Management				Total
	Government	Deficit	Aided	Unaided	
Urban	2	11	5	7	25
Rural	-	5	7	3	15
Total	2	16	12	10	40

(List of schools included in the study are given in Appendix-B).

One of the variables in the study is the organizational climate of schools. While analyzing the data, the schools included in the sample were reclassified according to the school climate they belonged to. The details regarding this is provided under the suitable place (see caption 4.2.4.0).

One Section each (selected randomly where required) of classes VIII, IX and X in these schools were taken. From each of these sections 10 students were randomly selected. From among them all those who responded on all the tools used in the study formed the sample.

Table-4 below shows the number of students who formed the sample for the study.

Table 4: Number of Students Included in the Sample (N=1185)

Area	Class	Type of Management				Tribal	Non-Tribal	Total	
		Government	Deficit	Aided	Unaided				
Urban	VIII	20	110	48	69	158	89	247	**Urban Total= 736**
	IX	20	110	50	68	156	92	248	
	X	20	110	44	67	161	80	241	
Rural	VIII	-	50	70	30	149	1	150	**Rural Total= 449**
	IX	-	50	69	30	143	6	149	
	X	-	50	70	30	148	2	150	
Total		**60**	**480**	**351**	**294**	**915**	**270**	**1185**	

It may be seen from the above Table that –

i. Total number of students from urban schools = 736

ii.	Total number of students from rural schools	=	449
iii.	Total number of students from Government schools	=	60
iv.	Total number of students from Deficit schools	=	480
v.	Total number of students from Aided schools	=	351
vi.	Total number of students from Unaided schools	=	294
vii.	Total number of Tribal students	=	915
viii.	Total number of Non-tribal students	=	270
ix.	Total number of students in class-VIII	=	397
x.	Total number of students in class-IX	=	397
xi.	Total number of students in class-X	=	391

Also, all the teachers teaching classes VIII, IX and X of these schools were taken to form the sample for the study for the purpose of deciding the organizational climate of the schools. The number of teachers from each of the schools is shown in Table-18 under caption 4.2.4.0 and the total number of them happened to be 246.The number of students in the 40 schools which were grouped under different school climates happened to be –

Open climate	239
Autonomous climate	119
Familiar climate	210
Controlled climate	85

Paternal climate	360
Closed climate	172

(See Table 23 under caption 4.2.4.0)

3.3.0 Tools Used

The following tools were used for the purpose of the study:

i. Verbal Test of Creative Thinking developed by Baqer Mehdi (1985) was used to measure the creative thinking ability of the secondary school students.

ii. An Attitude Scale to measure the attitude of secondary school students towards science was developed by the investigator. The details of the development of the tool are given further.

iii. School Organizational Climate Description Questionnaire (SOCDQ) developed by Motilal Sharma (1978) was used to find out the type of organizational climate prevailing in the schools under study.

The details of the tools used for the study are presented further.

3.3.1 Verbal Test of Creative Thinking

The Verbal Test of Creative Thinking developed by Baqer Mehdi (1985) is a tool for measuring the creative thinking ability of the secondary school students. The battery is meant to identify creative talent at all stages of education, except pre-primary and primary. The type of tasks included in the test have been chosen so that they could be most easily and economically administered over a wide range of sample starting from middle school.

The verbal test is a part of the total battery which consists of both verbal and non-verbal tests. The verbal test includes four sub-tests, namely, Consequences test, Unusual Uses test, Similarity test and Product Improvement test.

i. **Consequences Test:** The Consequences test consists of three hypothetical situations: (a) What would happen if man could fly like birds? (b) What would happen if our schools had wheels? (c) What would happen if man does not require any food to eat? The subject is required to think as many consequences of these situations as he can, and write them under each situation in the space provided. An example is given on the test booklet to acquaint the subjects with the nature of the test. The time allowed for the three problems is 5 minutes each.

ii. **Unusual Uses Test:** This test presents the subject with the names of three common objects – a piece of stone, a wooden stick and water. The subject is required to write as many novel, interesting and unusual uses of these objects as he may think of. The time allowed for the three tasks is 4 minutes each.

iii. **Similarity Test:** This test presents the subject with three pairs of words apparently different – tree and house, chair and ladder and air and water. It requires him to think and write as many novel relationships as possible between the two objects of each pair in the space provided. The time allowed for each pair of words is 5 minutes.

iv. **Product Improvement Test:** In this test, the subject is asked to think of a simple wooden toy of a horse and suggest addition of new things to it to make it more interesting for the children to play. The time allowed is 6 minutes.

The total time required for administering the test is 48 minutes in addition to the time necessary for giving instructions, passing out test booklets to the students and collecting them back. A copy of the Verbal Test of Creative Thinking is provided in Appendix-C.

Each of the four sub-tests cover the three dimensions of creative thinking ability – fluency, flexibility and originality. There is no right or

wrong answer. A scoring guide has been given in the manual, where each item is to be scored for fluency, flexibility and originality, using the scoring guide.

In scoring for fluency, the score is obtained by counting the number of all the unrepeated responses to the item in question.

In scoring for flexibility, the score is obtained by counting the number of categories. If out of eight responses given by the testee to an item, two have been given under category A, three have been given under category B, one has been given under category C and two have been given under category D, then the flexibility score for this item will be 4.

In scoring for originality, it is done on the basis of statistical uncommonness of responses. The more uncommon the response, the higher the originality weight. The weights for originality scoring have been determined on the basis of the following scheme. If a response has been given by 0.1 per cent to 0.99 per cent of the testees, then the response will get an originality weight of 5; if a response has been given by 1 per cent to 1.99 per cent of the testees, then the response will get an originality weight of 4; if a response has been given by 2 per cent to 2.99 per cent of the testees, then the response will get an originality weight of 3; if a response has been given by 3 per cent to

3.99 per cent of the testees, then the response will get an originality weight of 2; and if a response has been given by 4 per cent to 4.99 per cent of the testees, then the response will get an originality weight of 1. Responses given by 5 per cent or more of the testees will get an originality weight of 0. In the scoring guide, the originality weights have been mentioned for all the original responses. It was found that all the responses of the sample were found mentioned in the scoring guide. Hence, as per the instructions in the manual, the originality weights were taken as such as given in the scoring guide. (A copy of the scoring guide is provided in Appendix-D).

The composite creativity score is obtained by converting the raw scores into standard scores (with a Mean=50 and SD=10) on all the three dimensions and then pooling them together.

The test-retest reliability coefficient for each of the three dimensions as well as for the whole test happens to be as follows:

Fluency	-	0.945
Flexibility	-	0.921
Originality	-	0.896
Total Creativity	-	0.959

These values are highly satisfactory.

The validity of the test is established against teacher ratings. The values for each of the three dimensions as well as for the whole test happens to be as follows:

Fluency	-	0.40
Flexibility	-	0.32
Originality	-	0.34
Total Creativity	-	0.39

All these values are reported as significant at 0.01 level.

3.3.2.0 Attitude Scale

As has already been mentioned in caption 1.5.1, the present study conceptually defines attitude 'as the degree of positive or negative affect associated with some psychological object', that object being science. Keeping this definition as the basis, an attitude scale to measure the attitude towards science for students of classes VIII, IX and X was developed. The procedure adopted was the method suggested by Likert (Method of Summated Ratings).

3.3.2.1 Development of the Attitude Scale

The details of the procedure involved in the development of the Attitude Scale to measure the attitude towards science of students of classes VIII, IX and X are given further.

3.3.2.1.1 Development of Statements

The statements for the Attitude Scale were developed through the following sources:

i. A critical review of the conceptual as well as research literature related to the field of science.

ii. Written statements given by 80 students, as to their feelings about science. These students were drawn from two secondary schools in Shillong, which were not included in the sample drawn and kept aside for the final data collection.

iii. Informal discussion with 3 teachers teaching science and 4 teachers teaching different subjects in the two secondary schools, which were the same used for obtaining the students' feelings about science.

Statements were written keeping in mind to have a balance between positive and negative ones. Statements thus developed were pooled together. The total number of such statements thus pooled happened to be 154. These tentatively selected statements were presented to experts to give their critical comments and suggestions to improve and modify them. On the basis of the experts' comments, some statements were modified and some statements were rejected. The process yielded 134 statements of which 70 were positive and 64

were negative statements. These statements were randomly arranged and suitable instructions for the students as to how to respond were also framed. Each statement was provided for a response on a 5-point Likert Scale, the points indicating the responses as 'Strongly Agree', 'Agree', 'Undecided', 'Disagree' and 'Strongly Disagree'. The responses were to be scored as 4, 3, 2, 1, 0 corresponding to the five points as stated above for positive statements. For the negative statements it was to be as 0, 1, 2, 3, 4. This provided the Pre-Tryout Form of the Attitude Scale. (A copy of the same is given in Appendix-E).

3.3.2.1.2 Administration of the Pre-Tryout Form of the Attitude Scale

The purpose of the pre-tryout was:

i. To find out the time taken by the students in responding to the attitude statements.

ii. To find out whether the students find difficulty in understanding the statements.

From among those schools which were not included in the sample drawn and kept aside for the final data collection, two schools – one from urban area and the other from rural area – were drawn randomly for the purpose of administering the pre-tryout form of the

Attitude Scale. All available students studying in classes VIII, IX and X of these schools formed the sample. The details of the name of the schools selected and the number of students drawn are shown in Table 5.

Table – 5: Details of the schools and the number of students drawn for the Pre-tryout of the Attitude Scale.

Number of Students

Sl.No.	Area	Name of the School	VIII	IX	X	Total
1	Rural	Mawphlang Secondary School	27	27	22	76
2	Urban	Brookside Adventist Secondary School	40	55	55	150
		Total	67	82	77	226

Thus, the sample for the pre-tryout happened to be 226 students of classes VIII, IX and X.

The pre-tryout form of the Attitude Scale was administered to the sample thus selected. It was found out that all the students could finish responding on the Attitude Scale within 45 minutes. However, it was also found that there was difficulty in understanding statements No.6, 8, 9, 34, 38, 45, 49, 58, 77 and 99 (refer Appendix-E). Therefore, these statements were modified and presented again to the experts for their comments and suggestions. In the process, statements No. 8, 9, 38, 58 and 99 were modified and retained. The other statements – No. 6, 34, 45, 49 and 77 were rejected. The process, thus yielded 129

statements out of the total of 134 statements. Out of the 129 statements, 69 were positive statements and 60 were negative statements. This resulted in the Draft Form of the Attitude Scale. A copy of this is given in Appendix-F.

3.3.2.1.3. Tryout of the Draft Form of the Attitude Scale.

The purpose of the tryout of the Draft Form of the Attitude Scale was to select statements which could differentiate students who had a high attitude towards science from students who had a low attitude towards science.

The sample for the tryout was randomly drawn from the list of schools which were not included in the sample for the pre-tryout and for the final data collection. This included 3 secondary schools, of which 2 were in the urban area and one in the rural area. All available students studying in classes VIII, IX and X of these schools formed the sample. The details of the names of the schools selected and the number of students drawn are shown in table 6.

Table 6: Details of the Schools and the number of students drawn for the Tryout of the Draft Form of the Attitude Scale.

Sl.No.	Area	Name of the School	No. of students			Total
			VIII	IX	X	
1.	Urban	Mawkhar Christian Secon.School,Shillong	23	32	43	98
2.	Urban	Nongthymmai Nepali Secon.School, Shillong	76	76	30	182
3.	Rural	Mawthuwan Presbyterian Secon.School,Sohiong	19	22	14	55
		TOTAL	118	130	87	335

Thus, the sample for the tryout happened to be 335 students of classes VIII, IX and X.

The Draft Form of the Attitude Scale was administered to the sample selected and the responses were scored according to the scoring scheme (refer caption 3.3.2.1.1.)

3.3.2.1.4 Item Analysis

The following procedure was followed in carrying out the item analysis and further in the selection of items.

i. The 335 scripts of the Attitude Scale which were scored (refer caption 3.3.2.1.3) were arranged in the order of total scores from highest to lowest.

ii. After arranging, the top 84 (covering top 25 per cent) answer scripts and the bottom 84 (covering bottom 25 per cent) answer

scripts were separated out. These two groups formed respectively the high and low groups.

iii. The 't' value for each of the statements was calculated using the following formula –

$$t = \frac{\overline{X}_H - \overline{X}_L}{\sqrt{\frac{\sigma^2_H}{N_H} + \frac{\sigma^2_L}{N_L}}}$$

Where, $\overline{X}_H$ = The Mean score on a particular statement for the high group.

$\overline{X}_L$ = The Mean score on the same statement for the low group.

σ_H = Standard Deviation on the same statement for the high group.

σ_L = Standard Deviation on the same statement for the low group

N_H = Number of subjects in the high group.

N_L = Number of subjects in the low group.

The 't' values obtained for each of the statements are given in Table-7. (arrangement of 't' values are presented in descending order).

Table 7: 't' values for each statement of the Draft Form of the Attitude Scale (Positive and Negative Statements)
(Arranged in the descending order of the 't' values for both the positive and negative statements)

Positive Statements			Negative Statements		
Sl.No.	Item No.	't' value	Sl.No.	Item No.	't' value
1	4	11.57**	1	117	8.50**
2	47	7.81**	2	78	7.93**
3	116	7.74**	3	72	7.76**
4	113	7.30**	4	50	7.42**
5	81	6.63**	5	53	7.24**
6	70	6.32**	6	102	7.00**
7	110	6.10**	7	124	6.94**
8	77	5.96**	8	27	6.85**
9	38	5.94**	9	114	6.80**
10	96	5.90**	10	28	6.60**
11	31	5.76**	11	7	6.49**
12	80	5.60**	12	23	6.48**
13	63	5.56**	13	103	6.40**
14	60	5.38**	14	104	6.20**
15	86	5.33**	15	37	6.19**
16	66	5.24**	16	69	6.05**
17	42	5.16**	17	62	5.76**
18	48	5.12**	18	33	5.74**
19	10	5.09**	19	14	5.61**
20	108	5.00**	20	44	5.61**
21	75	4.94**	21	40	5.58**
22	99	4.92**	22	107	5.24**
23	67	4.82**	23	91	5.22**
24	111	4.80**	24	97	5.20**
25	112	4.63**	25	94	5.13**
26	68	4.54**	26	83	5.00**
27	98	4.53**	27	125	4.74**
28	118	4.50**	28	82	4.68**
29	9	4.48**	29	20	4.38**
30	109	4.44**	30	123	4.25**

Table-7 contd...

Table –7 contd.

Positive Statements				Negative Statements		
Sl.No.	Item No.	't' value		Sl.No.	Item No.	't' value
31	49	4.40**		31	24	4.13**
32	128	4.35**		32	88	3.70**
33	52	4.33**		33	93	3.58**
34	121	4.30**		34	29	3.51**
35	43	4.25**		35	36	3.09**
36	79	4.11**		36	119	3.06**
37	1	4.11**		37	54	3.04**
38	26	4.07**		38	8	2.73**
39	101	4.00**		39	87	2.50*
40	35	4.00**		40	120	2.49*
41	15	3.97**		41	45	2.15*
42	115	3.94**		42	5	2.07*
43	51	3.90**		43	2	2.04*
44	57	3.73**		44	46	1.95 N.S.
45	12	3.73**		45	21	1.83 N.S.
46	106	3.70**		46	58	1.75 N.S.
47	30	3.50**		47	32	1.74 N.S.
48	100	3.49**		48	89	1.74 N.S.
49	56	3.47**		49	19	1.49 N.S.
50	126	3.13**		50	25	1.40 N.S.
51	59	3.08**		51	6	1.23 N.S.
52	64	2.93**		52	34	1.20 N.S.
53	95	2.75**		53	105	0.87 N.S.
54	65	2.72**		54	127	0.86 N.S.
55	18	2.59**		55	17	0.73 N.S.
56	11	2.57*		56	22	0.65 N.S.
57	3	2.51*		57	85	0.49 N.S.
58	71	2.45*		58	84	0.24 N.S.
59	122	2.40*		59	16	0.19 N.S.
60	76	2.39*		60	74	0.11 N.S.

Table-7 contd

Table –7 contd.

Positive Statements		
Sl.No.	Item No.	't' value
61	90	2.20*
62	55	1.99*
63	92	1.94 N.S.
64	129	1.88 N.S.
65	39	1.64 N.S.
66	61	1.63 N.S.
67	41	1.47 N.S.
68	13	1.23 N.S.
69	73	0.57 N.S.

Note: * - 't' value significant at 0.05 level. ** - 't' value significant at 0.01 level. N.S. – Not significant.

It was found that out of the 129 statements, the 't' values for 12 statements were significant at 0.05 level, the 't' values for 93 statements were significant at 0.01 level and for the remaining 24 they were not significant. From amongst the total of 69 positive statements, the 't' values for 7 statements were significant at 0.05 level, 55 statements were significant at 0.01 level and the remaining 7 were not significant. From amongst the total of 60 negative statements, 5 statements were significant at 0.05 level, 38 statements were significant at 0.01 level and the remaining 17 were not significant.

The above Table indicates that the 't' values were found to be significant at 0.01 level for 55 positive statements and for 38 negative

statements. In order to have an equal number of positive and negative statements in the Final Form of the Attitude Scale, it was decided to have –

i. All the 38 negative statements with 't' values significant at 0.01 level.

ii. 38 positive statements with highest 't' values significant at 0.01 level, thus rejecting 17 with the lowest 't' values significant at 0.01 level.

Thus, the selected statements included 38 positive and 38 negative statements, all having their 't' values significant at 0.01 level.

Table 8 presents the 't' values of the finally selected statements (which were included in the Final From of the Attitude Scale).

Table 8: 't' values obtained for the selected statements for the Final Form of the Attitude Scale.

Positive Statements				Negative Statements			
Sl.No.	Sl.No.of the statement in the Draft Form	Sl.No.of the statement in the Final Form	't' value	Sl.No.	Sl.No. of the statement in the Draft Form	Sl.No. of the statement in the Final Form	't' value
1	4	33	11.57	1	117	48	8.50
2	47	59	7.81	2	78	56	7.93
3	116	58	7.74	3	72	55	7.76
4	113	57	7.30	4	50	31	7.42
5	81	23	6.63	5	53	52	7.24
6	70	34	6.32	6	102	24	7.00
7	110	51	6.10	7	124	61	6.94
8	77	50	5.96	8	27	45	6.85
9	38	38	5.94	9	114	66	6.80
10	96	22	5.90	10	28	37	6.60
11	31	30	5.76	11	7	28	6.49
12	80	68	5.60	12	23	49	6.48
13	63	65	5.56	13	103	25	6.40

Table-8 contd...

Table-8 contd...

Positive Statements				Negative Statements			
Sl.No.	Sl.No.of the statement in the Draft Form	Sl.No,of the statement in the Final Form	't' value	Sl.No.	Sl.No. of the statement in the Draft Form	Sl.No. of the statement in the Final Form	't' value
14	60	64	5.38	14	104	63	6.20
15	86	76	5.33	15	37	41	6.19
16	66	47	5.24	16	69	60	6.05
17	42	26	5.16	17	62	53	5.76
18	48	39	5.12	18	33	35	5.74
19	10	29	5.09	19	14	27	5.61
20	108	71	5.00	20	44	40	5.61
21	75	42	4.94	21	40	36	5.58
22	99	46	4.92	22	107	73	5.24
23	67	62	4.82	23	91	32	5.22
24	111	8	4.80	24	97	70	5.20
25	112	54	4.63	25	94	69	5.13
26	68	43	4.54	26	83	67	5.00
27	98	75	4.53	27	125	74	4.74
28	118	5	4.50	28	92	21	4.68
29	9	44	4.48	29	20	18	4.38
30	109	72	4.44	30	123	17	4.25
31	49	4	4.40	31	24	14	4.13
32	128	20	4.35	32	88	10	3.70
33	52	19	4.33	33	93	13	3.58
34	121	2	4.30	34	29	12	3.51
35	43	16	4.25	35	36	9	3.09
36	79	15	4.11	36	119	7	3.06
37	1	11	4.11	37	54	6	3.04
38	26	1	4.07	38	8	3	2.73

(Note: All 't' values are significant at 0.01 level)

These selected statements were randomly arranged. These randomly arranged statements along with the instructions formed the Final Form of the Attitude Scale. A copy of the Final Form of the Attitude Scale is given in Appendix-G.

3.3.2.1.5 Validity of the Attitude Scale.

The statements for the Attitude Scale were developed through:

i. the review of the related literature, and

ii. individuals' expressions about their opinions towards science.

These statements were further subjected to experts' scrutiny. Thus, the process of the development of items ensures the content validity of the Attitude Scale.

3.3.2.1.6 Reliability of the Attitude Scale.

The reliability of the Final Form of the Attitude scale developed was established by the odd-even method.

From the secondary schools which were not included in the pre-tryout or the tryout stage in the development of the Attitude Scale, and also excluding those that were selected and kept aside for the final data collection, two schools (one rural and one urban) were randomly selected to form the sample of schools for establishing the reliability of the Attitude Scale. 20 students each from classes VIII, IX and X of both the two secondary schools

were selected. They formed the sample of students. Thus, the sample for establishing the reliability happened to be 120 students of classes VIII, IX and X. Details of this sample are shown in table-9.

Table 9: Sample drawn for establishing the reliability of the Attitude Scale.

Sl.No.	Area	Name of the School	No. of students			Total
			VIII	IX	X	
1	Rural	Nongkrem Secondary School	20	20	20	60
2	Urban	Laitumkhrah Presbyterian Secondary School	20	20	20	60
		TOTAL:	40	40	40	120

The Final Form of the Attitude Scale was administered to these 120 students. Scores on odd numbered statements and even numbered statements were found out for each of the students. Table-10 provides these odd and even scores thus obtained.

Table 10: Odd Scores and Even Scores obtained by the Reliability sample on the Attitude Scale.

Sl.No. of the student	Odd Score (X)	Even Score (Y)	Sl. No.of the Student	Odd Score (X)	Even Score (Y)
1	118	116	10	122	128
2	120	122	11	114	128
3	136	135	12	119	118
4	126	124	13	131	123
5	102	103	14	126	108
6	125	134	15	113	112
7	127	130	16	78	95
8	77	91	17	114	116
9	111	124	18	111	118

Table-10 contd..

Table 10 contd...

Sl.No. of the student	Odd Score (X)	Even Score (Y)	Sl. No.of the Student	Odd Score (X)	Even Score (Y)
19	106	104	51	126	116
20	137	131	52	110	100
21	113	110	53	111	98
22	108	130	54	121	108
23	91	104	55	103	101
24	115	118	56	127	121
25	93	99	57	112	108
26	138	145	58	126	138
27	128	127	59	99	110
28	112	107	60	113	114
29	117	118	61	110	103
30	96	97	62	117	97
31	133	132	63	129	126
32	115	109	64	109	115
33	134	122	65	83	85
34	134	122	66	120	125
35	115	108	67	81	88
36	123	113	68	106	107
37	105	104	69	116	105
38	110	120	70	108	109
39	119	112	71	94	95
40	89	82	72	111	110
41	119	124	73	109	98
42	99	97	74	103	103
43	136	131	75	102	99
44	87	89	76	120	113
45	115	110	77	101	103
46	96	114	78	93	70
47	130	134	79	89	96
48	87	97	80	119	107
49	116	120	81	89	105
50	109	114	82	97	110

Table-10 contd..

Table 10 contd...

Sl.No. of the student	Odd Score (X)	Even Score (Y)	Sl. No.of the Student	Odd Score (X)	Even Score (Y)
83	127	109	102	71	75
84	86	99	103	75	82
85	96	105	104	77	80
86	78	69	105	82	85
87	99	105	106	59	76
88	99	106	107	79	89
89	85	94	108	69	80
90	114	127	109	71	81
91	75	98	110	84	88
92	79	71	111	74	86
93	60	72	112	92	90
94	74	88	113	82	79
95	74	70	114	68	73
96	93	78	115	105	115
97	90	74	116	92	78
98	86	69	117	76	77
99	82	82	118	93	92
100	80	73	119	84	76
101	64	95	120	73	85

The odd-even reliability was calculated in the following way:

Odd Scores (x) — Even Scores (y)

$\Sigma x = 12296$ — $\Sigma y = 12423$

$\Sigma x^2 = 13, 06, 296$ — $\Sigma y^2 = 13, 26, 021$

$\Sigma xy = 13, 10, 410$

$N = 120$

$$r = \frac{N\Sigma xy - (\Sigma x)(\Sigma y)}{[N\Sigma x^2-(\Sigma x)^2][N\Sigma y^2-(\Sigma y)^2]}$$

(Refer Garrett, 1981)

Substituting the values in the above formula the value of r was found to be equal to 0.871.

That is $r = 0.871$

Applying Spearman-Brown Prophecy Formula to estimate the reliability of the full scale, the reliability of the full scale is:

$$r_{11} = \frac{2r}{1+r}$$

$$= \frac{2(0.871)}{1+0.871}$$

$$= \frac{1.742}{1.871}$$

$$= 0.93$$

Referring to Table-25 in Garrett (1981), the obtained value of r_{11} is significant at 0.01 level.

Therefore, the Odd-Even reliability of the Attitude Scale was found to be 0.93.

3.3.3 School Organizational Climate Description Questionnaire (SOCDQ)

School Organizational Climate Description Questionnaire (SOCDQ) developed by Motilal Sharma (1978), was used as a tool to find out the type pf organizational climate prevailing in the schools which were included in the sample for the final data collection.

The SOCDQ consists of 64 Likert type items which teachers use to describe the climate of their schools. The 64 items in the questionnaire are assigned to eight sub-tests, each one covering one dimension of the climate. These dimensions have been grouped under two categories, namely, 'Group Behaviour Characteristics' and 'Leader Behaviour Characteristics'. Each of these dimensions are briefly explained below.

I. Group Characteristics

i. Disengagement: It refers to the teachers' tendency to be "not with it". This dimension describes a group which is "going through the motions", a group that is "not in gear" with respect to the task at hand. In short, it focuses upon the teachers' behaviour in a task-oriented situation.

ii. Alienation: This refers to the behaviour patterns among the group (faculty), including the leader (the principal), which are characterized as highly formal and impersonal. It reveals the degree to which the principal 'goes by the book' and adheres to policies rather than dealing with the teachers in an informal, face to face situation. It also indicates the emotional distance between the group and the leader, and at the same time among the group members.

iii. Esprit: This refers to the morale. The teachers feel that their social needs are being satisfied, and that they are, at the same time, enjoying a sense of accomplishment in their job.

iv. Intimacy: It refers to the teachers' enjoyment of friendly social relations with each other. This dimension describes a social needs satisfaction which is not necessarily associated with task accomplishment.

II. Leader Behaviour Characteristics

v. Psycho-physical Hindrance: This refers to the feeling among the group members that the principal burdens them with routine duties, management demands and other administrative requirements which they consider as unnecessary. At the same time they perceive the principal as highly dictatorial in his behaviour. He is not adjusted to feedback from the staff, his style of communication tends to be unidimensional.

vi. Controls: It refers to the degree to which the principal's behaviour can be characterized as bureaucratic and impersonal in nature; although task-oriented in behaviour, the extent to which he tries to raise the degree of effectiveness and efficiency by helping the group work towards the common goal by providing adequate operational guidance and secretarial services.

vii. Production Emphasis: It refers to the behaviour of the principal which is characterized by close supervision of the staff. He is highly directive and plays the role of a 'straw boss'. His communication tends to go in only one direction, and he is not sensitive to feedback from the staff.

viii. Humanized Thrust: It refers to the behaviour of the principal which is marked by his attempts to motivate the teachers through personal example. He does not ask the teachers to give themselves any more than they willingly give of themselves. The behaviour of the principal, though unmistakably task-oriented, is at the same time characterized by an inclination to treat the teachers humanely and tender-heartedly. He attempts to do something extra for them in humanistic terms, and consequently his behaviour is viewed favourably by the teachers.

As mentioned earlier, all these eight dimensions are measured by 64 Likert type items which form 8 sub-tests, each dimension being measured by one sub-test. Table-11 presents the distribution of items over these sub-tests:

Table 11: Distribution of items in the SOCDQ under the Eight Sub-Tests.

Sl. No.	Name of the Sub-Tests	Sl.No. of the Items in the SOCDQ	Total No. of Items
1	Disengagement	1,8,21,32,36,44,52,55,57	9
2	Alienation	18, 30, 39,50	4
3	Esprit	3, 11, 17, 24, 33, 38, 45, 53, 58	9

Table-11 contd.

Table 11 contd..

Sl. No.	Name of the Sub-Tests	Sl.No. of the Items in the SOCDQ	Total No. of Items
4	Intimacy	5, 12, 25, 34, 40, 46, 54, 60, 61	9
5	Psycho-Physical Hindrance	9, 23, 26, 41, 47, 62	6
6	Controls	15, 20, 27, 42, 49, 63	6
7	Production Emphasis	6, 14, 28, 35, 43, 48, 64	7
8	Humanized Thrust	2,4,7,10,13,16,19,22,29,31,37,51,56,59	14
		TOTAL =	64

The SOCDQ can be administered individually or in group. The head of the institution is to be requested not to be present while administering the tool to the teachers. The respondents have to indicate their responses by choosing (encircling A, B, C or D on the answer sheet) one of the four points on the scale corresponding to (A) Rarely Occurs, (B) Sometimes Occurs, (C) Often Occurs, and (D) Very Frequently Occurs. There is no time limit, but it usually takes 10 to 15 minutes for answering all the items. A copy of the SOCDQ is provided in Appendix-H.

Scoring involves the assigning of 1, 2, 3 and 4 to the four choices indicated as above, namely, A, B, C and D. Then each respondent's eight sub-test scores are calculated by simple summation of item scores, subtest by sub-test, and dividing each of the eight sums by the number of items in the corresponding sub-test.

The author of SOCDQ has established the validity of the tool by using experts' agreements as well as the ratings of the inspectors. Reliability of the tool is found out by calculating the coefficients of internal consistency based on KR-20 (N=1915) and the values for the different sub-tests range between 0.34 and 0.81.

3.4.0 Data Collection

The heads of the 40 secondary schools drawn for the final data collection, were first contacted to seek their permission and co-operation in the administration of the tools. Before the tools were administered to the students, (Verbal Test of Creative Thinking and Attitude Scale), a rapport was established with them. The students were also requested to give their responses sincerely and frankly. Moreover, they were also assured that there were no right or wrong responses and that their responses would be kept strictly confidential and used only for research purposes.

The two tools (Verbal Test of Creative Thinking and Attitude Scale) were administered on the same day, one after the other. Before the administration of each of the tools, the students were clearly instructed as to how to respond to the tool. Only when the students understood the directions clearly, then they were asked to respond on the tool. The sequence of administration of the tools was Attitude Scale followed by Verbal Test of

Creative Thinking in each of the schools. It took about one hour for the students to complete both the tools. The procedure was followed the same in all the schools.

Regarding the data on the type of climate prevailing in the respective schools, the investigator first met the teachers teaching classes VIII, IX and X, and established a rapport with them. Then they were requested to respond on the SOCDQ. The teachers took about 10 to 15 minutes to complete their responses on the SOCDQ. The data from both the students and teachers in a school were collected on the same day.

3.5.0 Analysis of Data

The data were analyzed keeping in view the objectives of the study. Statistical techniques, namely, Mean, Standard Deviation, t-test and F-test were used wherever necessary. Details of the analysis are presented in Chapter-IV.

CHAPTER – IV

ANALYSIS OF DATA, RESULTS AND DISCUSSION

4.1.0 Introduction

This chapter presents the details of the data analysis. It also presents the results of the study and discussion of the results. The analysis of data is done keeping in accordance with the objectives of the study. To facilitate an easy reading, the objectives of the study are once again presented as under:

I To find out the creative thinking ability of secondary school students in East Khasi Hills District of Meghalaya and further –

i. to find out whether any significant difference exists among students belonging to schools of different types of management in their creative thinking ability;

ii. to find out whether any significant difference exists among students of classes VIII, IX and X in their creative thinking ability.

iii. to find out whether any significant difference exists among students belonging to schools with different organisational climates in their creative thinking ability;

iv. to find out whether any significant difference exists between students of rural and urban secondary schools in their creative thinking ability;

v. to find out whether any significant difference exists between tribal and non-tribal secondary school students in their creative thinking ability.

II To find out the attitude towards science of secondary school students in East Khasi Hills District of Meghalaya and further –

i. to find out whether any significant difference exists among students belonging to schools of different types of management in their attitude towards science.

ii. to find out whether any significant difference exists among students of classes VIII, IX and X in their attitude towards science.

iii. to find out whether any significant difference exists among students belonging to schools with different organisational climates in their attitude towards science.

iv. to find out whether any significant difference exists between students of rural and urban secondary schools in their attitude towards science.

v. to find out whether any significant difference exists between tribal and non-tribal secondary school students in their attitude towards science.

The raw data obtained in the study are presented in Appendix-I.

4.2.0 Creative Thinking Ability of Secondary School Students

As stated earlier in the previous chapter, the creative thinking ability was measured by administering the Verbal Test of Creative Thinking developed by Baqer Mehdi (1985) to the sample of students. The test provided three scores separately for fluency, flexibility and originality dimensions of creative thinking, for each of the students. The raw scores thus obtained were converted into standard scores by following the procedure given below.

i. Mean and SD for the total raw scores on each dimension of creativity were calculated. They were found to be as follows:

Fluency	Flexibility	Originality
$N_1 = 1185$	$N_2 = 1185$	$N_3 = 1185$
$M_1 - 30.23$	$M_2 = 21.58$	$M_3 = 10.80$
$SD_1 = 9.50$	$SD_2 = 5.28$	$SD_3 = 5.64$

ii. The raw scores on each dimension were converted into standard scores by using the formula:

$$\text{Standard Score} = \frac{10}{SD}(X-M) + 50$$

Where, SD = Standard Deviation of raw scores on each dimension.

X = Raw Scores on each dimension

M = Mean of raw scores on each dimension.

iii. Using the conversion procedure as indicated in (ii) above, the raw scores obtained on each of the dimensions namely, fluency, flexibility and originality were converted into standard scores. The summation of all these three standard scores for each student gave the score for creative thinking ability. Using this procedure the scores for creative thinking ability for all the students were calculated. These scores formed the data for further analysis.

Mean and Standard Deviation were calculated for the creative thinking ability scores.

N = 1185

M = 149.89

SD = 27.45

Comparisons were to be made for the different groups in the sample in accordance with the objectives of the study. For this purpose suitable hypotheses were framed. The analysis of the data for testing these hypotheses are presented further.

4.2.1 Difference in Creative Thinking Ability Among Students Belonging to Schools of Different Management Types

Hypothesis 1: It states: *"There is no significant difference among students belonging to schools of different types of management in their creative thinking ability."*

To test this hypothesis F-test was employed. The details of the analysis are as follows:

Table 12: Details of Analysis of Creative Thinking Ability Scores for the Different Management Types of Schools (Total N = 1185)

Particulars	Government	Deficit	Aided	Unaided
Sum of Scores (ΣX)	10224	71743	52189	43467
Sum of squares of scores (ΣX^2)	1767348	11099511	8041489	6608727
Mean	170.4	149.46	148.69	147.85
SD	20.49	28.01	28.33	24.90
N	60	480	351	294

Table-13 presents the summary of ANOVA for creative thinking ability scores of secondary school students from Government, Deficit, Aided and Unaided schools.

Table 13: Summary of ANOVA for Creative Thinking Ability Scores of Secondary School Students From Government, Deficit, Aided and Unaided Schools.

Source of Variance	df	Sum of Squares (SS)	Mean Square (MS)	F
Among groups	3	27061.95	9020.65	12.31
Within groups	1181	865599.44	732.94	

The obtained value of F is significant at 0.01 level. Therefore, there is a significant difference among students belonging to schools of four types of management, namely, Government, Deficit, Aided and Unaided in their creative thinking ability.

Since the obtained value of F was significant, t-tests were carried to find out which of the pairs differs significantly

i. t-test between Government schools and Deficit schools.

Government Schools	Deficit Schools
$N_1 = 60$	$N_2 = 480$
$M_1 = 170.4$	$M_2 = 149.46$
$SD_1 = 20.49$	$SD_2 = 28.01$

$t = 7.12$

The obtained value of t=7.12 is significant at 0.01 level. Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability from

Government Schools and Deficit schools at 0.01 level. Further, it is seen that the Mean score of students in creative thinking ability from Government schools is significantly greater than that from the Deficit Schools.

ii. t-test between Government schools and Aided schools

Government Schools	Aided Schools
$N_1 = 60$	$N_2 = 351$
$M_1 = 170.4$	$M_2 = 148.69$
$SD_1 = 20.49$	$SD_2 = 28.33$

$t = 2.34$

The obtained value of t=2.34 is significant at 0.05 level. Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability from Government schools and Aided schools at 0.05 level. Further, it is seen that the Mean score of students in creative thinking ability from Government schools is significantly greater than that of the Aided schools.

iii. t-test between Government schools and Unaided schools.

Government Schools	Unaided Schools
$N_1 = 60$	$N_2 = 294$
$M_1 = 170.4$	$M_2 = 147.85$
$SD_1 = 20.49$	$SD_2 = 24.90$

$t = 7.47$

The obtained value of t = 7.47 is significant at 0.01 level. Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability from Government schools and Unaided schools at 0.01 level. Further, it is seen that the Mean score of students in creative thinking ability from Government schools is significantly greater than that of the Unaided schools.

iv. t-test between Deficit schools and Aided schools.

Deficit schools	Aided Schools
$N_1 = 480$	$N_2 = 351$
$M_1 = 149.46$	$M_2 = 148.69$
$SD_1 = 28.01$	$SD_2 = 28.33$

t = 0.39

The obtained value of t = 0.39 is not significant. Therefore, there is no significant difference between the Mean scores of students in their creative thinking ability from Deficit schools and Aided schools.

v. t-test between Deficit schools and Unaided schools.

Deficit Schools	Unaided Schools
$N_1 = 480$	$N_2 = 294$
$M_1 = 149.46$	$M_2 = 147.85$
$SD_1 = 28.01$	$SD_2 = 24.90$

$t = 0.83$

The obtained value of t = 0.83 is not significant. Therefore, there is no significant difference between the Mean scores of students in their creative thinking ability from Deficit schools and Unaided schools.

vi. t-test between Aided schools and Unaided schools.

Aided Schools	Unaided Schools
$N_1 = 351$	$N_2 = 294$
$M_1 = 148.69$	$M_2 = 147.85$
$SD_1 = 28.33$	$SD_2 = 24.90$

$t = 0.40$

The obtained value of t = 0.40 is not significant. Therefore, there is no significant difference between the Mean scores of students in their creative thinking ability from Aided schools and Unaided schools.

The t-value as obtained above are summarized below:

Table 14: Summary of the t-values obtained for differences between Mean Scores in Creative Thinking Ability of School Types.

Management types	t	Significance level
Between Govt. and Deficit schools	7.12	0.01
Between Govt. and Aided schools	2.34	0.05
Between Govt. and Unaided schools	7.47	0.01
Between Deficit and Aided schools	0.39	N.S.
Between Deficit and Unaided schools	0.83	N.S.
Between Aided and Unaided schools	0.40	N.S.

Comparing the Mean scores in creative thinking ability for the different management types, it can be concluded as follows:

Government Schools	>	Deficit Schools Aided Schools Unaided Schools

4.2.2 Difference in Creative Thinking Ability Among Students of Different Classes

Hypothesis 2: It states: *"There is no significant difference among students of classes VIII, IX and X in their creative thinking ability"*

To test this hypothesis F-test was employed. The details of the analysis are as follows:

Table 15: Details of Analysis of Creative Thinking Ability Scores for the different Classes (Total N = 1185)

Particulars	Class VIII	Class IX	Class X
Sum of Scores (ΣX)	57317	59784	60522
Sum of Squares of Scores (ΣX^2)	8558111	9270386	9688578
Mean	144.38	150.59	154.79
SD	26.70	25.96	28.63
N	397	397	391

Table 16 presents the summary of ANOVA for creative thinking ability scores of secondary school students from Classes VIII, IX and X.

Table 16: Summary of ANOVA for Creative Thinking Ability Scores of Secondary School Students From Classes VIII, IX and X.

Source of Variance	df	Sum of Squares (SS)	Mean square (MS)	F
Among groups	2	21646.85	10823.43	14.69
Within groups	1182	871014.54	736.90	

The obtained value of F is significant at 0.01 level. Therefore, there is a significant difference among students of classes VIII, IX and X in their creative thinking ability. Since the obtained value of F was significant, t-tests were carried to find out which of the pairs differs significantly.

i. t-test between class VIII and class IX

Class VIII	Class IX
$N_1 = 397$	$N_2 = 397$
$M_1 = 144.38$	$M_2 = 150.59$
$SD_1 = 26.70$	$SD_2 = 25.96$

$t = 3.32$

The obtained value of t = 3.32 is significant at 0.01 level. Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability from class VIII and class IX at 0.01 level. Further, it is seen that the mean score of students in creative thinking ability from class IX is significantly greater than that from class VIII.

ii. t-test between class VIII and class X.

Class VIII	Class X
$N_1 = 397$	$N_2 = 391$
$M_1 = 144.38$	$M_2 = 154.79$
$SD_1 = 26.70$	$SD_2 = 28.63$

t=5.28

The obtained value of t = 5.28 is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability from class VIII and class X at

0.01 level. Further, it is seen that the mean score of students in creative thinking ability from class X is significantly greater than that from class VIII.

iii. t-test between class IX and Class X.

Class IX	Class X
$N_1 = 397$	$N_2 = 391$
$M_1 = 150.59$	$M_2 = 154.79$
$SD_1 = 25.96$	$SD_2 = 28.63$

$$t = 2.15$$

The obtained value of t = 2.15 is significant at 0.05 level.

Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability from class IX and class X at 0.05 level. Further, it is seen that the Mean score of students in creative thinking ability from class X is significantly greater than that from class IX.

The t-values as obtained above are summarized below:

Table 17: Summary of the t-values obtained for difference between Mean Scores In Creative Thinking Ability of Different Classes.

Different classes	t	Significance level
Between class VIII and Class IX	3.32	0.01
Between Class VIII and Class X	5.28	0.01
Between class IX and Class X	2.15	0.05

Comparing the Mean scores in creative thinking ability for the different classes it can be concluded as follows:

Class X	>	Class IX	>	Class VIII

4.2.3.0 Identification and Classification of the Organizational Climate of Schools

Before analyzing the difference in creative thinking ability among schools of different organizational climates [Refer objectives I(iii) in Caption 4.1.0], it was imperative to identify the organizational climate of each school. For this purpose the scores obtained on the SOCDQ on the sample of secondary schools considered in the study (N=40) were taken into account. The obtained raw scores of the 40 secondary schools are given in Table-18.

TABLE 18: Raw Scores of the 40 Secondary Schools on SOCDQ.

School No.	No. of Teachers	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust
		I	II	III	IV	V	VI	VII	VIII
1	6	80	55	160	111	68	105	142	212
2	5	60	43	141	102	45	59	96	215
3	6	89	49	164	129	79	84	123	215
4	5	94	48	118	86	43	65	94	167
5	5	52	51	142	110	48	78	107	195
6	3	47	27	78	73	39	50	61	110
7	4	48	32	109	79	60	56	79	129
8	5	70	38	125	93	62	59	98	170
9	10	175	74	234	228	119	136	191	352
10	8	141	80	189	155	81	111	159	262
11	8	124	64	171	166	88	95	150	265
12	4	54	35	109	85	51	56	80	131
13	8	153	75	175	180	110	120	186	287
14	6	106	52	134	130	72	81	123	196
15	4	53	28	99	83	40	41	72	121
16	4	60	35	95	78	47	59	80	150
17	7	113	60	172	149	80	93	132	228
18	8	164	73	184	203	114	99	151	263

Contd...Table-18

Table-18 contd..

School No.	No. of Teachers	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust
		I	II	III	IV	V	VI	VII	VIII
19	7	87	54	179	145	65	112	136	279
20	7	104	46	157	145	92	75	154	197
21	5	55	62	138	107	48	68	107	139
22	9	156	75	225	165	100	117	177	340
23	10	148	88	224	197	104	137	193	320
24	9	147	79	237	212	121	134	191	352
25	10	152	92	249	231	105	133	183	357
26	6	88	56	143	126	75	100	115	232
27	4	56	44	99	69	47	64	70	160
28	10	129	87	265	232	132	152	191	347
29	6	76	55	162	133	47	85	111	265
30	10	148	73	210	172	110	116	189	296
31	5	45	46	134	121	36	93	120	209
32	7	122	63	180	172	105	115	152	201
33	3	44	31	77	71	37	47	64	112
34	6	74	59	179	120	68	93	126	256
35	5	67	43	130	95	47	68	94	206
36	5	77	38	116	87	56	57	87	171
37	4	42	42	119	93	40	65	90	161
38	4	82	39	91	83	41	52	78	141
39	3	45	22	86	59	36	39	58	104
40	5	70	47	134	97	58	88	117	175

The next step was to find out the Mean scores of each sub-test for each school separately. For this the raw scores of each sub-test of a school was divided by the number of teachers in the school. The result of this calculation then formed the mean scores for each school. The Mean scores of the 40 secondary schools are given in Table-19.

TABLE 19: 'Mean Scores' on Different Sub-Tests Of SOCDQ For The 40 Secondary Schools.

School No.	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust
	I	II	III	IV	V	VI	VII	VIII
1	13.33	9.17	26.67	18.5	11.33	17.5	23.67	35.33
2	12	8.6	28.2	20.4	9	11.8	19.2	43
3	14.83	8.17	27.33	21.5	13.17	14	20.5	35.83
4	18.8	9.6	23.6	17.2	8.6	13	18.8	33.4
5	10.4	10.2	28.4	22	9.6	15.6	21.4	39
6	15.67	9	26	24.33	13	16.67	20.33	36.67
7	12	8	27.25	19.75	15	14	19.75	32.25
8	14	7.6	25	18.6	12.4	11.8	19.6	34
9	17.5	7.4	23.4	22.8	11.9	13.6	19.1	35.2
10	17.63	10	23.63	19.38	10.13	13.88	19.88	32.75
11	15.5	8	21.38	20.75	11	11.88	18.75	33.13
12	13.5	8.75	27.25	21.25	12.75	14	20	32.75
13	19.13	9.38	21.88	22.5	13.75	15	23.25	35.88
14	17.67	8.67	22.33	21.67	12	13.5	20.5	32.67
15	13.25	7	24.75	20.75	10	10.25	18	30.25
16	15	8.75	23.75	19.5	11.75	14.75	20	37.5
17	16.14	8.57	24.57	21.29	11.43	13.29	18.86	32.57
18	20.5	9.13	23	25.38	14.25	12.38	18.88	32.88
19	12.43	7.71	25.57	20.71	9.29	16	19.43	39.86

Contd..Table-19

Table-19 Contd..

School No.	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust
	I	II	III	IV	V	VI	VII	VIII
20	14.86	6.57	22.43	20.71	13.14	10.71	22	28.14
21	11	12.4	27.6	21.4	9.6	13.6	21.4	27.8
22	17.33	8.33	25	18.33	11.11	13	19.67	37.78
23	14.8	8.8	22.4	19.7	10.4	13.7	19.3	32
24	16.33	8.78	26.33	23.56	13.44	14.89	21.22	39.11
25	15.2	9.2	24.9	23.1	10.5	13.3	18.3	35.7
26	14.67	9.33	23.83	21	12.5	16.67	19.17	38.67
27	14	11	24.75	17.25	11.75	16	17.5	40
28	12.9	8.7	26.5	23.2	13.2	15.2	19.1	34.7
29	12.67	9.17	27	22.17	7.83	14.17	18.5	44.17
30	14.8	7.3	21	17.2	11	11.6	18.9	29.6
31	9	9.2	26.8	24.2	7.2	18.6	24	41.8
32	17.43	9	25.71	24.57	15	16.43	21.71	28.71
33	14.67	10.33	25.67	23.67	12.33	15.67	21.33	37.33
34	12.33	9.83	29.83	20	11.33	15.5	21	42.67
35	13.4	8.6	26	19	9.4	13.6	18.8	41.2
36	15.4	7.6	23.2	17.4	11.2	11.4	17.4	34.2
37	10.5	10.5	29.75	23.25	10	16.25	22.5	40.25
38	20.5	9.75	22.75	20.75	10.25	13	19.5	35.25
39	15	7.33	28.67	19.67	12	13	19.33	34.67
40	14	9.4	26.8	19.4	11.6	17.6	23.4	35
ΣX	**590.57**	**354.82**	**1010.88**	**837.79**	**455.13**	**566.79**	**803.93**	**1423.67**
M	**14.76**	**8.87**	**25.27**	**20.94**	**11.38**	**14.17**	**20.10**	**35.59**
SD	**2.63**	**1.13**	**2.25**	**2.14**	**1.80**	**1.94**	**1.65**	**4.08**

The third step was to find out the Normative Z scores from the Mean scores given in Table-19. Normatively each sub-test was standardized across the sample of 40 secondary schools. For standardizing procedure a mean of 50 and a standard deviation of 10 was used. The formula is as follows:

$$Z = \frac{10}{SD}(X - M) + 50$$

Where, SD = Standard Deviation

M = Mean of 'Mean Scores' on each sub-test

X = 'Mean Score' on different sub-tests of SOCDQ.

The normative Z scores of 40 secondary schools thus obtained are given in Table 20.

TABLE 20: Normative Z Scores On Different Sub-Tests Of SOCDQ For the 40 Secondary Schools.

School No.	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust	Mean	SD
	I	II	III	IV	V	VI	VII	VIII		
1	44.6	52.7	56.2	38.6	49.7	67.2	71.6	49.4	53.75	11.05
2	39.5	47.6	63.0	47.5	36.8	37.8	44.6	68.2	48.13	11.63
3	50.3	43.8	59.2	52.6	59.9	49.1	52.4	50.6	52.24	5.28
4	65.4	56.5	42.6	32.5	34.6	44.0	42.1	44.6	45.29	10.87
5	33.4	61.8	63.9	55.0	40.1	57.4	57.9	58.4	53.49	10.83
6	53.5	55.2	53.2	65.8	59	62.9	51.4	76.5	59.69	8.45
7	39.5	42.3	57.7	44.4	70.1	49.1	47.9	41.8	49.1	10.21
8	47.1	38.8	48.8	39.0	55.7	37.8	47.0	46.1	45.04	6.15
9	60.4	37.0	41.7	58.7	52.9	47.1	43.9	49.1	48.85	8.16
10	60.9	60.0	42.7	42.7	43.1	48.5	48.7	43.0	48.7	7.68
11	52.8	42.3	32.7	49.1	47.9	38.2	41.8	44.0	43.6	6.40
12	45.2	48.9	57.7	51.4	57.6	49.1	49.4	43.0	50.29	5.25
13	66.6	54.5	34.9	57.3	53.2	54.3	69.1	50.7	55.08	10.45
14	61.1	48.2	36.9	53.4	53.4	46.6	52.4	42.9	43.74	12.54
15	44.3	33.5	47.7	49.1	42.3	29.8	37.3	36.9	40.11	6.86
16	50.9	48.9	43.3	43.3	52.1	53.0	49.4	54.7	49.45	4.23
17	55.2	47.4	46.9	51.6	50.3	45.5	42.5	42.6	47.75	4.42
18	71.8	52.3	39.9	70.7	65.9	40.8	42.6	43.4	53.43	13.90
19	40.4	39.7	51.3	48.9	38.4	59.4	45.9	60.5	48.06	8.63

Table-20 contd..

Table-20 contd..

School No.	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust	Mean	SD
	I	II	III	IV	V	VI	VII	VIII		
20	50.4	29.7	37.4	48.9	59.8	32.2	61.5	31.8	43.96	12.86
21	35.7	81.2	60.4	52.1	40.1	47.1	57.9	30.9	50.66	16.13
22	59.8	45.2	48.8	37.8	48.5	44.0	47.4	55.4	48.36	6.78
23	50.2	49.4	37.3	44.2	44.6	47.6	45.2	41.2	44.96	4.27
24	56.0	49.2	54.7	62.2	61.4	53.7	57.2	58.6	56.63	4.24
25	51.7	52.9	48.4	60.1	45.1	45.5	39.1	50.3	49.14	6.25
26	49.7	54.1	43.6	50.3	56.2	62.9	44.4	57.5	52.34	6.62
27	47.1	68.8	47.7	32.8	52.1	59.4	34.3	60-.8	50.38	12.64
28	42.9	48.5	55.5	60.6	60.1	55.3	43.9	47.8	51.83	6.98
29	42.1	52.7	57.7	55.7	30.3	50.0	40.3	71.0	49.98	12.45
30	50.2	36.1	31.0	32.5	47.9	44.9	42.7	35.3	40.08	7.29
31	28.1	52.9	56.8	65.2	26.8	72.8	73.6	65.2	55.18	18.51
32	60.2	55.2	52.0	67.0	70.1	61.6	59.8	33.1	57.38	11.40
33	49.7	62.9	42.9	62.8	55.3	57.7	57.5	54.3	55.39	6.67
34	40.8	58.5	70.3	45.6	49.7	56.9	55.5	67.4	55.59	10.14
35	44.8	47.6	53.2	40.9	39.0	47.1	52.4	63.8	48.6	7.89
36	52.4	38.8	40.8	33.5	49.0	35.7	33.6	46.6	41.3	7.26
37	33.8	64.4	69.9	60.8	42.3	60.7	64.5	61.4	57.23	12.41
38	71.8	57.8	38.8	49.1	43.7	44.0	46.4	49.2	50.1	10.36
39	50.9	36.4	65.1	44.1	53.4	44.0	45.3	47.8	48.38	8.47
40	47.1	54.7	56.8	42.8	51.2	67.7	70.0	48.6	54.86	9.68

The final stage of analysis was to find out the profile scores of each school. For this purpose each sub-test normalized Z scores was ipsatively standardized within each school. Again for standardization procedure a Mean of 50 and standard deviation of 10 was used. The formula is as follows:

$$Z = \frac{10}{SD}(X - M) + 50$$

Where, SD = Standard Deviation

M = Mean

X = Normative Z score on different sub-test of SOCDQ.

These ipsatively standardized scores on each of the eight dimensions presented the school profile or the profile scores of each school.

These profile scores were compared with the prototypic profiles as provided in the manual of SOCDQ and a profile similarity score was calculated for each school. The similarity scores were computed by computing the absolute difference between each sub-test score in a school's profile and the corresponding score in the first prototypic profile, then in the second one and so on. A low sum indicates that the two profiles are highly similar whereas a large sum shows that the profiles are dissimilar. This similarity score helps in determining to what extent each school profile is congruent with the prototypic profile which

characterizes each of the six climates, thus helping in determining the organizational climate of each school.

The different schools were then categorized on the basis of types of school organizational climates. Table-21 presents the profile scores of each school along with the similarity scores grouped under the six organizational climates to which they belong.

TABLE 21: School Profiles And Similarity Scores Grouped Under The Six Organisational Climates.

Open Climate

School No.	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust	Similarity Scores
	I	II	III	IV	V	VI	VII	VIII	
S_2	43	50	63	49	40	41	47	67	48
S_3	46	34	63	51	64	44	50	47	43
S_8	53	40	56	40	67	38	53	52	43
S_{12}	40	47	64	52	64	48	48	64	48
S_{15}	56	40	61	63	53	35	46	45	45
S_{24}	49	32	45	63	61	43	51	55	59
S_{34}	35	53	65	40	44	51	50	62	68
S_{39}	53	36	70	45	56	45	46	49	48

Autonomous Climate

School No.	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust	Similarity Scores
	I	II	III	IV	V	VI	VII	VIII	
S_6	43	45	42	57	49	54	40	70	72
S_7	41	43	58	46	70	50	49	43	39
S_{28}	37	45	55	63	62	55	39	44	42
S_{29}	44	52	56	55	34	50	43	67	55

Table-21 contd..

Table-21 contd..

Familiar Climate

School No.	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust	Similarity Scores
	I	II	III	IV	V	VI	VII	VIII	
S_5	32	58	60	51	38	54	54	55	55
S_{21}	41	69	56	51	43	48	54	38	37
S_{31}	35	49	51	55	35	60	60	55	47
S_{33}	41	61	31	61	50	53	53	48	59
S_{35}	45	49	56	40	38	48	55	69	65
S_{37}	31	56	60	53	38	53	56	53	47
S_{40}	42	50	52	38	46	63	66	44	48

Controlled Climate

School No.	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust	Similarity Scores
	I	II	III	IV	V	VI	VII	VIII	
S_1	42	49	52	36	46	62	66	46	60
S_{19}	41	40	54	51	39	63	48	64	65
S_{27}	47	65	48	36	51	57	37	58	66

Table 21 Contd..

Table-21 contd..

Paternal Climate

School No.	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust	Similarity Scores
	I	II	III	IV	V	VI	VII	VIII	
S_4	69	60	48	38	40	49	47	49	60
S_9	64	35	41	62	55	48	44	50	53
S_{11}	64	48	33	59	57	42	47	51	43
S_{13}	61	49	31	52	48	49	63	46	59
S_{14}	64	54	45	58	58	52	57	49	49
S_{17}	67	49	48	59	56	45	38	38	48
S_{18}	63	49	40	62	59	41	42	43	43
S_{22}	67	45	51	34	50	44	49	60	48
S_{25}	54	56	49	68	54	44	34	52	53
S_{26}	46	53	37	47	56	66	38	58	55
S_{36}	65	47	49	39	61	42	39	57	29
S_{38}	71	57	39	49	44	44	46	49	47

Closed Climate

School No.	Disengagement	Alienation	Esprit	Intimacy	Psychophysical Hindrance	Controls	Production Emphasis	Humanized Thrust	Similarity Scores
	I	II	III	IV	V	VI	VII	VIII	
S_{10}	66	65	42	42	43	50	50	43	49
S_{16}	53	49	35	35	56	58	50	62	56
S_{20}	55	39	45	54	62	41	64	41	65
S_{23}	62	60	32	48	49	56	51	41	41
S_{30}	64	45	38	40	61	57	54	43	36
S_{32}	52	46	45	58	61	54	52	29	57

Table-22 presents the classification of 40 secondary schools in terms of their organizational climate.

Table-22: Secondary Schools Classified According to Organizational Climates. (N=40)

Open	Autonomous	Familiar	Controlled	Paternal	Closed
S_2	S_6	S_5	S_1	S_4	S_{10}
S_3	S_7	S_{21}	S_{19}	S_9	S_{16}
S_8	S_{28}	S_{31}	S_{27}	S_{11}	S_{20}
S_{12}	S_{29}	S_{33}		S_{13}	S_{23}
S_{15}		S_{35}		S_{14}	S_{30}
S_{24}		S_{37}		S_{17}	S_{32}
S_{34}		S_{40}		S_{18}	
S_{39}				S_{22}	
				S_{25}	
				S_{26}	
				S_{36}	
				S_{38}	
N = 8	N = 4	N = 7	N = 3	N = 12	N = 6

[**Note:** S indicates School No.]

The classification of the secondary schools according to the organizational climates thus formed provided the basis for data for analyzing the difference in creative thinking ability among schools of different organizational climates.

The students drawn from the 40 secondary schools were regrouped under the schools belonging to different organizational climates. This is shown in Table 23.

Table 23: Number of students included in the sample as classified Under schools belonging to Different Organizational Climates. (N=1185)

School climates	No. of students
Open	239
Autonomous	119
Familiar	210
Controlled	85
Paternal	360
Closed	172
Total	1185

4.2.3.1 Difference in Creative Thinking Ability Among Schools of Different Organisational Climates.

Hypothesis 3: It states : *"There is no significant difference among students belonging to schools with different organisational climates in their creative thinking ability".*

To test this hypothesis F-test was employed. The details of the analysis are as follows:

Table 24: Details of Analysis of Creative Thinking Ability Scores for the Different Organisational Climates.

	School Climates					(Total N = 1185)
Particulars	Open	Autonomous	Familiar	Controlled	Paternal	Closed
Sum of Scores (ΣX)	35245	18026	30339	11980	57202	24831
Sum of Squares of Scores (ΣX^2)	5386741	2802310	4527929	1751812	9319088	3729195
Mean	147.47	151.48	144.47	140.94	158.89	144.37
SD	28.14	24.55	26.26	27.30	25.28	28.98
N	239	119	210	85	360	172

Table-25 presents the summary of ANOVA for creative thinking ability scores of secondary school students of different organizational climates.

Table 25: Summary of ANOVA for Creative Thinking Ability Scores of Secondary School Students of Different Organisational Climates.

Source of Variance	df	Sum of Squares (SS)	Mean square (MS)	F
Among groups	5	49111.23	9822.25	13.73
Within groups	1179	843550.16	715.48	

The obtained value of F is significant at 0.01 level.

Therefore, there is a significant difference among students belonging to schools of different organisational climates in their creative thinking

ability. Since the obtained value of F was significant, t-tests were carried to find out which of the pairs differs significantly.

i. t-test between Open climate schools and Autonomous climate schools.

Open Climate Schools	Autonomous Climate Schools
$N_1 = 239$	$N_2 = 119$
$M_1 = 147.47$	$M_2 = 151.48$
$SD_1 = 28.14$	$SD_2 = 24.55$

$t = 1.39$

The obtained value of $t = 1.39$ is not significant.

Therefore, there is no significant difference between the Mean scores of students in their creative thinking ability of Open climate schools and Autonomous climate schools.

ii. t-test between Open climate schools and Familiar climate schools.

Open Climate Schools	Familiar Climate Schools
$N_1 = 239$	$N_2 = 210$
$M_1 = 147.47$	$M_2 = 144.47$
$SD_1 = 28.14$	$SD_2 = 26.26$

$t = 1.17$

The obtained value of $t = 1.17$ is not significant.

Therefore, there is no significant difference between the Mean scores of students in their creative thinking ability of open climate schools and familiar climate schools.

iii. t-test between Open climate schools and Controlled climate schools.

Open Climate Schools	Controlled Climate Schools
$N_1 = 239$	$N_2 = 85$
$M_1 = 147.47$	$M_2 = 140.94$
$SD_1 = 28.14$	$SD_2 = 27.30$

t = 1.88

The obtained value of t = 1.88 is not significant.

Therefore, there is no significant difference between the Mean scores of students in their creative thinking ability of open climate schools and controlled climate schools.

iv. t-test between Open Climate schools and Paternal climate schools.

Open Climate Schools	Paternal Climate Schools
$N_1 = 239$	$N_2 = 360$
$M_1 = 147.47$	$M_2 = 158.89$
$SD_1 = 28.14$	$SD_2 = 25.28$

t = 5.05

The obtained value of t = 0.05 is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability of open climate schools and paternal climate schools at 0.01 level. Further, it is seen that the Mean score of students in creative thinking ability of Paternal climate schools is significantly greater than that of Open climate schools.

v. t-test between Open Climate schools and Closed climate schools.

Open Climate Schools	Closed Climate Schools
$N_1 = 239$	$N_2 = 172$
$M_1 = 147.47$	$M_2 = 144.37$
$SD_1 = 28.14$	$SD_2 = 28.98$

$t = 1.08$

The obtained value of t=1.08 is not significant.

Therefore, there is no significant difference between the Mean scores of students in their creative thinking ability of open climate schools and closed climate schools.

vi. t-test between Autonomous climate schools and Familiar climate schools

Autonomous Climate Schools	Familiar Climate Schools
$N_1 = 119$	$N_2 = 210$
$M_1 = 151.48$	$M_2 = 144.47$
$SD_1 = 24.55$	$SD_2 = 26.26$

$t = 2.43$

The obtained value of $t = 2.43$ is significant at 0.05 level.

Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability of Autonomous climate schools and Familiar climate schools at 0.05 level. Further, it is seen that the Mean score of students in creative thinking ability of Autonomous climate schools is significantly greater than that of Familiar climate schools.

vii. t-test between Autonomous climate schools and Controlled climate schools.

Autonomous Climate Schools	Controlled Climate Schools
$N_1 = 119$	$N_2 = 85$
$M_1 = 151.48$	$M_2 = 140.94$
$SD_1 = 24.55$	$SD_2 = 27.30$

$t = 2.83$

The obtained value of $t = 2.83$ is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability of Autonomous climate schools and Controlled climate schools at 0.01 level. Further, it is seen that the Mean score of students in creative thinking ability of Autonomous climate schools is significantly greater than that of Controlled Climate schools.

viii. t-test between Autonomous climate schools and Paternal climate schools.

Autonomous Climate Schools	Paternal Climate Schools
$N_1 = 119$	$N_2 = 360$
$M_1 = 151.48$	$M_2 = 158.89$
$SD_1 = 24.55$	$SD_2 = 25.28$

$t = 2.83$

The obtained value of $t = 2.83$ is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability of Autonomous climate schools and Paternal climate schools at 0.01 level. Further, it is seen that the Mean score of students in creative thinking ability of Paternal climate schools is significantly greater than that of Autonomous climate schools.

ix. t-test between Autonomous climate schools and Closed Climate schools.

Autonomous Climate Schools	Closed Climate Schools
$N_1 = 119$	$N_2 = 172$
$M_1 = 151.48$	$M_2 = 144.37$
$SD_1 = 24.55$	$SD_2 = 28.98$

$t = 2.26$

The obtained value of $t = 2.26$ is significant at 0.05 level.

Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability of Autonomous climate schools and Closed climate schools at 0.05 level. Further, it is seen that the Mean score of students in creative thinking ability of Autonomous climate schools is significantly greater than that of Closed climate schools.

x. t-test between Familiar climate schools and Controlled climate schools.

Familiar Climate Schools	Controlled Climate Schools
$N_1 = 210$	$N_2 = 85$
$M_1 = 144.47$	$M_2 = 140.94$
$SD_1 = 26.26$	$SD_2 = 27.30$

$t = 1.02$

The obtained value of $t = 1.02$ is not significant.

Therefore, there is no significant difference between the Mean scores of students in their creative thinking ability of Familiar climate schools and Controlled Climate schools.

xi. t-test between Familiar climate schools and Paternal Climate schools.

Familiar Climate Schools	Paternal Climate Schools
$N_1 = 210$	$N_2 = 360$
$M_1 = 144.47$	$M_2 = 158.89$
$SD_1 = 26.26$	$SD_2 = 25.28$

$t = 6.41$

The obtained value of $t = 6.41$ is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability of Familiar climate schools and Paternal climate schools at 0.01 level. Further, it is seen that the Mean score of students in creative thinking ability of Paternal climate schools is significantly greater than that of Familiar climate schools.

xii. t-test between Familiar climate schools and Closed climate schools.

Familiar Climate Schools	Closed Climate Schools
$N_1 = 210$	$N_2 = 172$
$M_1 = 144.47$	$M_2 = 144.37$
$SD_1 = 26.26$	$SD_2 = 28.98$

$t = 0.03$

The obtained value of $t = 0.03$ is not significant.

Therefore, there is no significant difference between the Mean scores of students in their creative thinking ability of Familiar climate schools and Closed climate schools.

xiii. t-test between Controlled climate schools and Paternal climate schools.

Controlled Climate Schools	Paternal Climate Schools
$N_1 = 85$	$N_2 = 360$
$M_1 = 140.94$	$M_2 = 158.89$
$SD_1 = 27.30$	$SD_2 = 25.28$

$t = 5.52$

The obtained value of $t = 5.52$ is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability of Controlled climate schools and Paternal climate schools at 0.01 level. Further, it is seen that the Mean score of students in creative thinking ability

of Paternal climate schools is significantly greater than that of Controlled climate schools.

xiv. t-test between Controlled climate schools and Closed climate schools.

Controlled Climate Schools	Closed Climate Schools
$N_1 = 85$	$N_2 = 172$
$M_1 = 140.94$	$M_2 = 144.37$
$SD_1 = 27.30$	$SD_2 = 28.98$

$t = 0.93$

The obtained value of $t = 0.93$ is not significant.

Therefore there is no significant difference between the Mean scores of students in their creative thinking ability of Controlled climate schools and Closed climate schools.

xv. t-test between Paternal climate schools and Closed climate schools.

Paternal Climate Schools	Closed Climate Schools
$N_1 = 360$	$N_2 = 172$
$M_1 = 158.89$	$M_2 = 144.37$
$SD_1 = 25.28$	$SD_2 = 28.98$

$t = 5.63$

The obtained value of $t = 5.63$ is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of students in their creative thinking ability of Paternal climate schools and Closed climate schools at 0.01 level. Further, it is seen that the Mean score of students in creative thinking ability of Paternal climate schools is significantly greater than that of Closed climate schools.

The t-values as obtained above are summarized below in Table-26.

Table 26: Summary of the t-values obtained for difference between Mean Scores In Creative Thinking Ability Among Schools of different Organizational Climates.

Organizational Climates	t	Significance level
Between Open and Autonomous climate schools	1.39	N.S.
Between Open and Familiar climate schools	1.17	N.S.
Between Open and Controlled climate schools	1.88	N.S.
Between Open and Paternal climate schools	5.05	0.01 P > 0
Between Open and Closed Climate schools	1.08	N.S.
Between Autonomous and Familiar climate schools	2.43	0.05 A > F
Between Autonomous and Controlled climate schools	2.83	0.01 A > Co
Between Autonomous and Paternal climate schools	2.83	0.01 P > A
Between Autonomous and Closed climate schools	2.26	0.05 A > Cd
Between Familiar and Controlled climate schools	1.02	N.S.
Between Familiar and Paternal climate schools	6.41	0.01 P > F
Between Familiar and Closed climate schools	0.03	N.S.
Between Controlled and Paternal climate schools	5.52	0.01 P > Co
Between Controlled and Closed climate schools	0.93	N.S.
Between Paternal and Closed Climate schools	5.63	0.01 P > Cd

Comparing the Mean scores in creative thinking ability among schools of different organizational climates, it can be concluded as follows:

Paternal Climate	>	Open, Autonomous, Familiar, Closed and Controlled Climates.

Thus, it may be concluded that the students in schools having Paternal Climate surpass students from schools having all other climates in their creative thinking ability.

4.2.4 Difference in Creative Thinking Ability Between Rural and Urban Secondary School Students.

Hypothesis 4: It states: *"There is no significant difference between students of rural and urban secondary schools in their creative thinking ability."*

To test this hypothesis t-test was employed. The details of the analysis are as follows:

Rural Students	Urban Students
$N_1 = 449$	$N_2 = 736$
$M_1 = 144.45$	$M_2 = 153.21$
$SD_1 = 25.33$	$SD_2 = 28.15$

$t = 5.54$

The obtained value of t = 5.54 is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of rural secondary school students and urban secondary school students in their creative thinking ability at 0.01 level. Further, it is seen that the Mean score of students in creative thinking ability from urban schools is significantly greater than that from rural schools.

4.2.5 Difference in Creative Thinking Ability Between Tribal and Non-Tribal Secondary School Students.

Hypothesis 5: It states: *"There is no significant difference between tribal and non-tribal secondary school students in their creative thinking ability."*

To test this hypothesis t-test was employed. The details of the analysis are as follows:

Tribal Students	Non-tribal Students
$N_1 = 915$	$N_2 = 270$
$M_1 = 148.35$	$M_2 = 155.12$
$SD_1 = 27.05$	$SD_2 = 28.14$

$t = 3.51$

The obtained value of t = 3.51 is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of tribal and non-tribal secondary school students in their creative thinking ability at 0.01 level. Further, it is seen that the Mean score of non-tribal

students in creative thinking ability is significantly greater than that of the tribal students.

4.3.0 Attitude Towards Science of Secondary School Students.

As stated earlier in the previous chapter, the attitude scores were obtained by administering the Attitude Scale developed by the investigator to the sample. This formed the data for analysis of the secondary school students' attitude towards science.

Mean and Standard Deviation were calculated for the total scores.

N = 1185

M = 215.73

SD = 34.2

4.3.1 Difference in Attitude Towards Science Among Students Belonging to Schools of Different Management Types.

Hypothesis 6: It states: *"There is no significant difference among students belonging to schools of different types of management in their attitude towards science."*

To test this hypothesis F-test was employed. The details of the analysis are as follows:

Table 27: Details of Analysis of Attitude Scores for the Different Management Types of Schools (Total N = 1185)

Particulars	Government	Deficit	Aided	Unaided
Sum of Scores (ΣX)	13870	104890	73337	63544
Sum of Squares of Scores (ΣX^2)	3225944	23429110	15740907	14139914
Mean	231.17	218.52	208.94	216.14
SD	18.10	32.55	34.51	37.15
N	60	480	351	294

Table 28 presents the summary of ANOVA for the attitude scores of secondary school students from Government, Deficit, Aided and Unaided schools.

Table 28: Summary of ANOVA for Attitude Scores of Secondary School Students From Government, Deficit, Aided and Unaided Schools.

Source of Variance	df	Sum of Squares (SS)	Mean square (MS)	F
Among groups	3	34279.81	11426.60	9.98
Within groups	1181	1351957.32	1144.76	

The obtained value of F is significant at 0.01 level.

Therefore, there is a significant difference among students belonging to schools of four types of Management, namely, Government, Deficit, Aided and Unaided in their attitude towards science. Since the

obtained value of F was significant, t-tests were carried to find out which of the pairs differs significantly.

i. t-test between Government schools and Deficit schools.

Government Schools	Deficit Schools
$N_1 = 60$	$N_2 = 480$
$M_1 = 231.17$	$M_2 = 218.52$
$SD_1 = 18.10$	$SD_2 = 32.55$

$t = 4.57$

The obtained value of t = 4.57 is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of students in their attitude towards science from Government schools and Deficit schools at 0.01 level. Further, it is seen that the Mean score of students in attitude towards science from Government schools is significantly greater than that from the Deficit schools.

ii. t-test between Government schools and Aided schools.

Government Schools	Aided Schools
$N_1 = 60$	$N_2 = 351$
$M_1 = 231.17$	$M_2 = 208.94$
$SD_1 = 18.10$	$SD_2 = 34.51$

$t = 7.46$

The obtained value of t = 7.46 is significant at 0.01 level.

Therefore, there is a significant difference between the Mean scores of students in their attitude towards science from Government schools and Aided schools at 0.01 level. Further, it is seen that the Mean score of students in attitude towards science from Government schools is significantly greater than that from Aided schools.

iii. t-test between Government schools and Unaided schools.

Government Schools	Unaided Schools
$N_1 = 60$	$N_2 = 294$
$M_1 = 231.17$	$M_2 = 216.14$
$SD_1 = 18.10$	$SD_2 = 37.15$

$t = 4.71$

The obtained value of $t = 4.71$ is significant at 0.01 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science from Government schools and Unaided schools at 0.01 level. Further, it is seen that the mean score of students in attitude towards science from Government schools is significantly greater than that from Unaided schools.

iv. t-test between Deficit schools and Aided Schools.

Deficit Schools	Aided Schools
$N_1 = 480$	$N_2 = 351$
$M_1 = 218.52$	$M_2 = 208.94$
$SD_1 = 32.55$	$SD_2 = 34.51$

$t = 4.04$

The obtained value of $t = 4.04$ is significant at 0.01 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science from Deficit schools and Aided schools at 0.01 level. Further, it is seen that the mean score of students in attitude towards science from Deficit schools is significantly greater than that from Aided schools.

v. t-test between Deficit schools and Unaided schools.

Deficit Schools	Unaided Schools
$N_1 = 480$	$N_2 = 294$
$M_1 = 218.52$	$M_2 = 216.14$
$SD_1 = 32.55$	$SD_2 = 37.15$

$t = 0.90$

The obtained value of $t = 0.90$ is not significant.

Therefore, there is no significant difference between the mean scores of students in their attitude towards science from Deficit schools and Unaided schools.

vi. t-test between Aided schools and Unaided schools.

Aided Schools	Unaided Schools
$N_1 = 351$	$N_2 = 294$
$M_1 = 208.94$	$M_2 = 216.14$
$SD_1 = 34.51$	$SD_2 = 37.15$

$t = 2.54$

The obtained value of $t = 2.54$ is significant at 0.05 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science from Aided schools and Unaided schools at 0.05 level. Further, it is seen that the mean score of students in attitude towards science from Unaided schools is significantly greater than that from Aided schools.

The t-values as obtained above are summarized below:

Table 29: Summary of the t-values obtained for differences between mean score in Attitude towards Science of School types.

Management types	t	Significance level
Between Govt. and Deficit Schools	4.57	0.01
Between Govt. and Aided schools	7.46	0.01
Between Govt. and Unaided schools	4.71	0.01
Between Deficit and Aided schools	4.04	0.01
Between Deficit and Unaided schools	0.90	N.S.
Between Aided and Unaided schools	2.54	0.05

Comparing the mean scores in attitude towards science for the different management types, it can be concluded as follows:

Government Schools	>	Deficit Schools Unaided Schools	>	Aided Schools

4.3.2 Difference In Attitude Towards Science Among Students of Different Classes

Hypothesis 7: It states: *"There is no significant difference among students of classes VIII, IX and X in their attitude towards science."*

To test this hypothesis F-test was employed. The details of the analysis are as follows:

Table 30: Details of Analysis of Attitude Scores for the Different Classes. (Total N=1185)

Particulars	Class VIII	Class IX	Class X
Sum of Scores (ΣX)	83779	85806	86056
Sum of Squares of Scores (ΣX^2)	18251125	18960914	19323836
Mean	211.03	216.14	220.09
SD	37.93	32.34	31.32
N	397	397	391

Table-31 presents the summary of ANOVA for the attitude scores of secondary school students from classes VIII, IX and X.

Table 31: Summary of ANOVA for Attitude Scores of Secondary School Students From Classes VIII, IX and X.

Source of Variance	df	Sum of Squares (SS)	Mean square (MS)	F
Among groups	2	16274.15	8137.08	7.02
Within groups	1182	1369962.98	1159.02	

The obtained value of F is significant at 0.01 level.

Therefore, there is a significant difference among students of classes VIII, IX and X in their attitude towards Science.

Since the obtained value of F was significant, t-tests were carried to find out which of the pairs differ significantly.

i. t-test between Class VIII and Class IX.

Class VIII	Class IX
$N_1 = 397$	$N_2 = 397$
$M_1 = 211.03$	$M_2 = 216.14$
$SD_1 = 37.93$	$SD_2 = 32.34$

$t = 2.04$

The obtained value of t = 2.04 is significant at 0.05 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science from class VIII and Class IX at 0.05 level. Further, it is seen that the mean score of students in attitude towards Science from class IX is significantly greater than that from Class VIII.

ii. t-test between Class VIII and Class IX.

Class VIII	Class X
$N_1 = 397$	$N_2 = 391$
$M_1 = 211.03$	$M_2 = 220.09$
$SD_1 = 37.93$	$SD_2 = 31.32$

$t = 3.65$

The obtained value of t= 3.65 is significant at 0.01 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science from class VIII and Class X at 0.01 level. Further, it is seen that the mean score of students in attitude towards science from Class X is significantly greater than that from Class VIII.

iii. t-test between Class IX and Class X.

Class IX	Class X
$N_1 = 397$	$N_2 = 391$
$M_1 = 216.14$	$M_2 = 220.09$
$SD_1 = 32.34$	$SD_2 = 31.32$

$t = 1.74$

The obtained value of t = 1.74 is not significant.

Therefore, there is no significant difference between the mean scores of students in their attitude towards science from Class IX and Class X.

The t-values as obtained above are summarized below:

Table 32: Summary of the t-values obtained for difference between mean scores in Attitude towards Science of Different Classes.

Different Classes	t	Significance level
Between Class VIII and Class IX	2.04	0.05
Between Class VIII and Class X	3.65	0.01
Between Class IX and Class X	1.74	N.S.

Comparing the mean scores in attitude towards science for the different classes it can be concluded as follows:

Class IX Class X	>	Class VIII

4.3.3 Difference in Attitude Towards Science Among Schools of Different Organisational Climates.

As stated earlier (refer Caption 4.2.4.0) the organizational climate of the schools was first identified and classified accordingly. The data obtained on the Attitude Scale were analysed according to this classification of schools falling under different organisational climates.

Hypothesis 8: It states: *"There is no significant difference among students belonging to schools with different organizational climates in their attitude towards science."*

To test this hypothesis **F**-test was employed. The details of the analysis are as follows:

Table 33: Details of Analysis of Attitude Scores for the Different Organisational Climates (Total N = 1185)

Particulars	School Climates					
	Open	Autonomous	Familiar	Controlled	Paternal	Closed
Sum of Scores (ΣX)	52234	25626	45404	16790	79512	36075
Sum of Squares of Scores (ΣX^2)	11720022	5704524	10022534	3461340	17878050	7749405
Mean	218.55	215.34	216.21	197.53	220.87	209.74
SD	35.67	39.55	31.30	41.28	29.65	32.63
N	239	119	210	85	360	172

Table 34 presents the summary of ANOVA for attitude scores of secondeary school students of different organizational climates.

Table 34: Summary of ANOVA for Attitude Scores of Secondary School Students of Different Organisational Climates.

Source of Variance	df	Sum of Squares (SS)	Mean square (MS)	F
Among groups	5	45800.37	9160.07	8.06
Within groups	1179	1340436.76	1136.93	

The obtained value of F is significant at 0.01 level.

Therefore, there is a significant difference among students belonging to schools of different organisational climates in their attitude towards science.

Since the obtained value of F was significant, t-tests were carried to find out which of the pairs differ significantly.

i. t-test between Open Climate schools and Autonomous Climate schools.

Open Climate Schools	Autonomous Climate Schools
$N_1 = 239$	$N_2 = 119$
$M_1 = 218.55$	$M_2 = 215.34$
$SD_1 = 35.67$	$SD_2 = 39.55$

$t = 0.75$

The obtained value of $t = 0.75$ is not significant.

Therefore, there is no significant difference between the mean scores of students in their attitude towards science of Open Climate schools and Autonomous Climate schools.

ii. t-test between Open Climate schools and Familiar Climate schools.

Open Climate Schools	Familiar Climate Schools
$N_1 = 239$	$N_2 = 210$
$M_1 = 218.55$	$M_2 = 216.21$
$SD_1 = 35.67$	$SD_2 = 31.30$

$t = 0.74$

The obtained value of $t = 0.74$ is not significant.

Therefore, there is no significant difference between the mean scores of students in their attitude towards science of Open climate schools and Familiar Climate schools.

iii. t-test between Open Climate schools and Controlled Climate schools.

Open Climate Schools	Controlled Climate Schools
$N_1 = 239$	$N_2 = 85$
$M_1 = 218.55$	$M_2 = 197.53$
$SD_1 = 35.67$	$SD_2 = 41.28$

$t = 4.17$

The obtained value of $t = 4.17$ is significant at 0.01 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science of Open Climate schools and Controlled Climate schools at 0.01 level. Further, it is seen that the mean score of students in attitude towards science of Open Climate schools is significantly greater than that of Controlled Climate schools.

iv. t-test between Open Climate schools and Paternal Climate schools.

Open Climate Schools	Paternal Climate Schools
$N_1 = 239$	$N_2 = 360$
$M_1 = 218.55$	$M_2 = 220.87$
$SD_1 = 35.67$	$SD_2 = 29.65$

$t = 0.83$

The obtained value of $t = 0.83$ is not significant.

Therefore, there is no significant difference between the mean scores of students in their attitude towards science of Open Climate schools and Paternal Climate schools.

v. t-test between Open Climate schools and Closed Climate schools.

Open Climate Schools	Closed Climate Schools
$N_1 = 239$	$N_2 = 172$
$M_1 = 218.55$	$M_2 = 209.74$
$SD_1 = 35.67$	$SD_2 = 32.63$

$t = 2.60$

The obtained value of t = 2.60 is significant at 0.01 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science of Open Climate schools and Closed Climate schools at 0.01 level. Further, it is seen that the mean scores of students in attitude towards science of Open Climate schools is significantly greater than that of Closed Climate schools.

vi. t-test between Autonomous Climate schools and Familiar Climate schools.

Autonomous Climate Schools	Familiar Climate Schools
$N_1 = 119$	$N_2 = 210$
$M_1 = 215.34$	$M_2 = 216.21$
$SD_1 = 39.55$	$SD_2 = 31.30$

$t = 0.21$

The obtained value of t=0.21 is not significant.

Therefore, there is no significant difference between the mean scores of students in their attitude towards science of Autonomous Climate schools and Familiar Climate schools.

vii. t-test between Autonomous Climate schools and Controlled Climate schools.

Autonomous Climate Schools	Controlled Climate Schools
$N_1 = 119$	$N_2 = 85$
$M_1 = 215.34$	$M_2 = 197.53$
$SD_1 = 39.55$	$SD_2 = 41.28$

$t = 3.09$

The obtained value of t = 3.09 is significant at 0.01 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science of Autonomous Climate schools and Controlled Climate schools at 0.01 level. Further, it is seen that the mean score of students in attitude towards science of Autonomous Climate schools is significantly greater than that of Controlled Climate schools.

viii. t-test between Autonomous Climate schools and Paternal Climate schools.

Autonomous Climate Schools	Paternal Climate Schools
$N_1 = 119$	$N_2 = 360$
$M_1 = 215.34$	$M_2 = 220.87$
$SD_1 = 39.55$	$SD_2 = 29.65$

$t = 1.40$

The obtained value of t = 1.40 is not significant.

Therefore, there is no significant difference between the mean scores of students in their attitude towards science of Autonomous Climate schools and Paternal Climate schools.

ix. t-test between Autonomous Climate schools and Closed Climate schools.

Autonomous Climate Schools	Closed Climate Schools
$N_1 = 119$	$N_2 = 172$
$M_1 = 215.34$	$M_2 = 209.74$
$SD_1 = 39.55$	$SD_2 = 32.63$

$t = 1.27$

The obtained value of $t = 1.27$ is not significant.

Therefore, there is no significant difference between the mean scores of students in their attitude towards science of Autonomous Climate schools and Closed Climate schools.

x. t-test between Familiar Climate schools and Controlled Climate schools.

Familiar Climate Schools	Controlled Climate Schools
$N_1 = 210$	$N_2 = 85$
$M_1 = 216.21$	$M_2 = 197.53$
$SD_1 = 31.30$	$SD_2 = 41.28$

$t = 3.76$

The obtained value of $t = 3.76$ is significant at 0.01 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science of Familiar climate schools and Controlled Climate schools at 0.01 level. Further, it is seen that the mean score of students in attitude towards science of Familiar Climate schools is significantly greater than that of Controlled Climate schools.

xi. t-test between Familiar Climate schools and Paternal Climate schools.

Familiar Climate Schools	Paternal Climate Schools
$N_1 = 210$	$N_2 = 360$
$M_1 = 216.21$	$M_2 = 220.87$
$SD_1 = 31.30$	$SD_2 = 29.65$

$t = 1.75$

The obtained value of $t = 1.75$ is not significant.

Therefore, there is no significant difference between the mean scores of students in their attitude towards science of Familiar Climate schools and Paternal Climate schools.

xii. t-test between Familiar Climate schools and Closed Climate schools.

Familiar Climate Schools	Closed Climate Schools
$N_1 = 210$	$N_2 = 172$
$M_1 = 216.21$	$M_2 = 209.74$
$SD_1 = 31.30$	$SD_2 = 32.63$

$t = 1.96$

The obtained value of $t = 1.96$ is significant at 0.05 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science of Familiar Climate schools and Closed Climate schools at 0.05 level. Further, it is seen that the mean score of students in attitude towards science of Familiar Climate schools is significantly greater than that of Closed Climate schools.

xiii. t-test between Controlled Climate schools and Paternal Climate schools.

Controlled Climate Schools	Paternal Climate Schools
$N_1 = 85$	$N_2 = 360$
$M_1 = 197.53$	$M_2 = 220.87$
$SD_1 = 41.28$	$SD_2 = 29.65$

$t = 4.92$

The obtained value of $t = 4.92$ is significant at 0.01 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science of Controlled Climate schools and Paternal Climate schools at 0.01 level. Further, it is seen that the mean score of students in attitude towards science of Paternal Climate schools is significantly greater than that of Controlled Climate schools.

xiv. t-test between Controlled Climate schools and Closed Climate schools.

Controlled Climate Schools	Closed Climate Schools
$N_1 = 85$	$N_2 = 172$
$M_1 = 197.53$	$M_2 = 209.74$
$SD_1 = 41.28$	$SD_2 = 32.63$

$t = 2.38$

The obtained value of t = 2.38 is significant at 0.05 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science of Controlled Climate schools and Closed Climate schools at 0.05 level. Further, it is seen that the mean score of students in attitude towards science of Closed climate schools is significantly greater than that of Controlled Climate schools.

xv. t-test between Paternal Climate schools and Closed Climate schools.

Paternal Climate Schools	Closed Climate Schools
$N_1 = 360$	$N_2 = 172$
$M_1 = 220.87$	$M_2 = 209.74$
$SD_1 = 29.65$	$SD_2 = 32.63$

$t = 3.79$

The obtained value of t = 3.79 is significant at 0.01 level.

Therefore, there is a significant difference between the mean scores of students in their attitude towards science of Paternal Climate schools and Closed Climate schools at 0.01 level. Further, it is seen that the mean score of students in attitude towards science of Paternal Climate schools is significantly greater than that of Closed Climate schools.

The t-values as obtained above are summarized below.

Table 35: Summary of the t-values obtained for difference between Mean scores in Attitude towards Science among schools of different Organisational Climates.

Organisational Climates	t	Significance level
Between Open and Autonomous Climate schools	0.75	N.S.
Between Open and Familiar Climate schools	0.74	N.S.
Between Open and Controlled Climate schools	4.17	0.01 O > Co
Between Open and Paternal Climate schools	0.83	N.S.
Between Open and Closed climate schools	2.60	0.01 O > Cd
Between Autonomous and Familiar Climate schools	0.21	N.S.
Between Autonomous and Controlled Climate schools	3.09	0.01 A > Co
Between Autonomous and Paternal Climate schools	1.40	N.S.
Between Autonomous and Closed Climate schools	1.27	N.S.
Between Familiar and Controlled Climate schools	3.76	0.01 F > Co
Between Familiar and Paternal Climate schools	1.75	N.S.
Between Familiar and Closed Climate schools	1.96	0.05 F> Cd
Between Controlled and Paternal Climate schools	4.92	0.01 P > Co
Between Controlled and Closed Climate schools	2.38	0.05 Cd > Co
Between Paternal and Closed Climate schools	3.79	0.01 P > Cd

Comparing the mean scores in attitude towards science among schools of different organisational climates, it can be concluded as follows:

Open Climate Paternal Climate	>	Closed, Controlled Climates
Autonomous Climate Familiar Climate	>	Controlled Climate

Thus, it can be concluded that the four organizational climates, namely, Open, Autonomous, Familiar and Paternal climates are the most conducive climates for developing a positive attitude towards science among secondary school students.

4.3.4 Difference In Attitude Towards Science Between Rural and Urban Secondary School Students.

Hypothesis 9: It states: *"There is no significant difference between students of rural and urban secondary schools in their attitude towards science."*

To test this hypothesis t-test was employed. The details of the analysis are as follows:

Rural Students	Urban Students
$N_1 = 449$	$N_2 = 736$
$M_1 = 214.62$	$M_2 = 216.41$
$SD_1 = 34.79$	$SD_2 = 33.82$

$t = 0.87$

The obtained value of $t = 0.87$ is not significant.

Therefore, there is no significant difference between the mean scores of rural secondary school students and urban secondary school students in their attitude towards science.

4.3.5 Difference in Attitude Towards Science Between Tribal and Non-Tribal Secondary School Students.

Hypothesis 10: It states: *"There is no significant difference between tribal and non-tribal secondary school students in their attitude towards science."*

To test this hypothesis t-test was employed. The details of the analysis are as follows:

Tribal Students	Non-tribal Students
$N_1 = 915$	$N_2 = 270$
$M_1 = 213.91$	$M_2 = 221.89$
$SD_1 = 33.47$	$SD_2 = 35.91$

$t = 3.26$

The obtained value of t=3.26 is significant at 0.01 level.

Therefore, there is a significant difference between the mean scores of tribal and non-tribal secondary school students in their attitude towards science at 0.01 level. Further, it is seen that the mean score of non-tribal students in attitude towards science is significantly greater than that of the tribal students.

4.4.0 Summary of the Results

A summary of the results obtained in the study is given below:

I.

(i) Regarding the creative thinking ability of secondary school students studying in different management types of schools, the significant differences show the following:

Government Schools	>	Deficit Schools Aided Schools Unaided Schools

(ii) Regarding the creative thinking ability of secondary school students studying in different classes, the significant differences show the following:

Class X	>	Class IX	>	Class VIII

(iii) Regarding the creative thinking ability of secondary school students studying in schools of different organisational climates, the significant differences show the following:

Paternal Climate	>	Open,Autonomous, Familiar, Closed and Controlled Climates

(iv) There is a significant difference between rural secondary school students and urban secondary school students in their creative thinking ability with urban secondary school students showing a higher mean score.

(v) There is a significant difference between tribal and non-tribal secondary school students in their creative thinking ability with non-tribal secondary school students showing a higher mean score.

II.

(i) Regarding the attitude of secondary school students towards science studying in different management types of schools, the significant differences show the following:

Government Schools	>	Deficit Schools Unaided Schools	>	Aided Schools

(ii) Regarding the attitude of secondary school students towards science studying in different classes, the significant differences show the following:

Class IX Class X	>	Class VIII

(iii) Regarding the attitude of secondary school students towards science studying in schools of different organisational climates, the significant differences show the following:

Open Climate Paternal Climate	>	Closed, Controlled Climates
Autonomous Climate Familiar Climate	>	Controlled Climate

(iv) There is no significant difference between rural secondary school students and urban secondary school students in their attitude towards science.

(v) There is a significant difference between tribal and non-tribal secondary school students in their attitude towards science, with non-tribal secondary school students showing a higher mean score.

4.5.0 Discussion of Results

The present study has looked into the creative thinking ability and attitude towards science among secondary school students belonging to schools with different organisational climates in East Khasi Hills District of Meghalaya. The investigation has brought into light certain differences between different classes, between schools under different

management types, between schools having different organisational climates, between rural and urban secondary school students, and between tribal and non-tribal secondary school students, with regards to their creative thinking ability and attitude towards science.

The results obtained in the study indicate that there is a significant difference among secondary school students belonging to four types of management – Government schools, Deficit schools, Aided schools and Unaided schools in their creative thinking ability. The mean creativity score of secondary school students from Government schools was much higher than of all other types of schools. Government schools in East Khasi Hills District of Meghalaya which are only two in number, unlike the Government schools of other States, run more or less like public schools in other parts of the country. There is a heavy rush for admission to such institutions, where mostly those coming from higher socio-economic status can gain admission. It might be said that such type of institutions cater mainly to the elite section of the masses, thus becoming a monopoly for the richer and the more advanced sections of the society. Hence, students in these institutions have better facilities and amenities to develop their talents and further to develop on an all-round basis.

A significant difference was found among secondary school students of Classes VIII, IX and X. This result supports the findings arrived at by Pareek (1966), Rao (1982) and Reddy (1990). Secondary school students of class X were found to be more superior in their creative thinking ability than those of classes IX and VIII, with class VIII having the least ability. This might be because of the increase in age and maturity of students which might have accounted for the greater development of creative thinking ability. At this juncture, as one sees the gradual increase in the creative thinking ability of students from class VIII through class X, it is also felt that schools under study, in general, also might be contributing to some extent the growth of creative thinking ability among its students. This might be the cumulative result of the teaching as well as the various activities that the students are provided for. Thus, it is felt that the creative thinking ability among the students increases as they move up the educational ladder where age, maturity and the activities in the school may act as the contributing variables.

Going further, the present investigation has also brought into light differences in creative thinking ability among secondary school students belonging to schools with different organisational climates. The results obtained in the study indicate that students from Paternal

climate schools scored significantly higher than the students from the other types of climates in their creative thinking ability. In Paternal climate, the principal looks to the completion of tasks by the teachers in the way he wants and at the same time is highly considerate towards the teachers. This type of a school climate may give a satisfying feeling among teachers in the Indian schools and thus the teachers may put in their sincere efforts in the development of students in all possible aspects. May be this gets reflected in the creative thinking ability of students also.

Another noteworthy finding of the present study is that urban secondary school students significantly showed more superiority than the rural secondary school students in their creative thinking ability. This finding supports many earlier findings like those of investigators Passi (1972), Gilitwala (1978), Pandey (1981), Bhaskara (1982), Rao (1982), Singh (1982), Sharma (1986), Trimurthy (1987), Gupta (1988) and Reddy (1990), who found that secondary school students from urban area have a higher mean creativity score than their counterparts from the rural area. This might be because of differences in the cultural background of the urban and rural area and the urban area providing varied stimulating environments.

The present study observed that non-tribal students had a significantly higher creative thinking ability than tribal students. Similar results were observed with regards to their attitude towards science also. The results obtained by Dutta (1979), Srivastava (1983) and Sharma (1990) also showed that non-tribal students had a more favourable attitude towards science than the tribal students. Creative thinking ability may be expected to have an effect on students' attitude towards science. It could enhance a more positive attitude towards science among secondary school students. Non-tribal secondary school students were found to be more creative with a more favourable attitude towards science than the tribal secondary school students. This finding highlights the need to stimulate creative thinking and to develop a positive attitude towards science among the tribal secondary school students. This difference between tribal and non-tribal secondary school students may be reasoned out as follows. Meghalaya is predominantly an agricultural State, where most of the people are engaged in agriculture. Mostly, tribal students coming from rural areas belong to poor family background, and are usually the first generation learners and hence they do not get proper guidance and encouragement at home to express their ideas and themselves freely. Again, families of such students are still superstitious and think that

science and technology will spoil their culture and tradition. Such is the situation among the illiterate tribal section and this might have contributed for the above results of the study.

Another reason for the non-tribal students to have higher creative thinking ability than the tribals might be because the former group is mostly comprised of the enlightened section of the non-tribal population from outside the State who are inhabiting and residing in Meghalaya. Some non-tribals who have been residing in the State over generations have greater chance of looking to and mixing with the non-tribals from outside the State.

A look into the results of the study indicates that the secondary school students have a positive attitude towards science, and that rural and urban secondary school students are on par in their attitude towards science. This may be because the students are becoming aware of the impact of science and technology even in a remote State like Meghalaya.

A significant difference was found among secondary school students belonging to four types of management, with regards to their attitude towards science. The mean attitude score of secondary school students from Government schools was significantly greater than that of the Deficit schools and Unaided schools, with these two excelling the

Aided schools. As was discussed earlier, the Government schools in the study are like public schools and hence would have all the facilities for a good science programme to operate. The Deficit schools get financial support to a large extent from the Government. The Unaided schools are schools with a good financial background getting supported by payments by the students. Hence, both the Deficit and the Unaided schools may be having sufficient funds to have better facilities and teachers for teaching science. The Aided schools which do not get a good financial support compared to the other three types of schools may find it difficult to have a good science laboratory and a qualified science teacher. The above reasons may be contributing towards the development of attitude towards science and hence the differences as found in the results of the study.

There also exists a significant difference between secondary school students of classes VIII, IX and X in their attitude towards science. The results obtained in the present investigation show that secondary school students of classes X and IX scored significantly greater than those of class VIII. It can be stated that as students start learning science more and more, they tend to become more aware of the importance of science, thereby being more favourably disposed towards science.

The present study has also indicated that there is a significant difference among secondary school students belonging to schools with different organisational climates, with respect to their attitude towards science. Secondary school students from Paternal climate schools, Open climate schools, Autonomous climate schools and Familiar climate schools were more favourably disposed towards the development of favourable attitude towards science than the Controlled and Closed Climate schools. Thus, it can be pointed out that a stultifying school environment which is controlled and closed, may offer less opportunity for the students to develop a favourable attitude towards science.

In conclusion, the present study has highlighted the importance of the role of physical, social and emotional environment in school in the development of creative thinking ability among its students as well as in the promotion of positive attitude towards science.

CHAPTER – V

SUMMARY

5.1.0 Introduction

Development of a nation depends much on the contribution of its citizens to it. This depends much on the abilities and attitudes of the younger generation, who are pre-adolescents and adolescents, a major part of them being students in high schools. It may also be said that in the present era, it is the progress in the field of science and technology that contributes much to the development of a nation. This requires creative thinking ability and a favourable attitude towards science among high school students. Education has a major role to play in this direction.

Creative thinking ability becomes a driving force if properly cultivated. Subjects like Science and Mathematics have a greater role to play than the rest of the school study subjects in the curriculum in the promotion of creative thinking. Thus, development of a positive attitude towards science becomes necessary. Such an attitude impels an individual to look at each problematic situation in an analytical fashion, to demand proof and adequate facts and results, which is sought for in this constantly changing society. This can be achieved

through the classroom teaching and various other activities that go on in the school as a whole.

School or to say the climate of a school plays a major role in the development of creative thinking ability and positive attitude towards science. The climate of a school could be studied by identifying the type of organizational climate in which it works.

Thus, if one has to realize the vision that our country should become a 'developed' one from the present status of 'developing' one, the younger generation, particularly those who are on the verge of blossoming into youth, have to be equipped with this ability – creative thinking ability along with a favourable attitude towards science.

Need for the Study

Science has greatly added to the dignity and sublimity of human civilization. Science has been acclaimed as an 'angel' of creative ideals. Creative thinking is an ultimate answer to man's problems, innovations of new ideas and things and ultimately the civilization of life. The value and worth of this potential is unlimited and its significance can hardly be over-emphasized.

Creative thinking ability is one of the cognitive abilities which determines the students' performance and attainment in the present

educational system. Creative talent should be blossomed when it is still potential and attempts should be made to provide an environment – sociological, psychological and educational – best suited to the needs of creative children.

Science provides the greatest outlet for creative activity, so much necessary for any field of human knowledge. Development of a positive attitude towards science is of great significance as it serves as a complement to creative thinking ability. A congenial school atmosphere, is important in the development of students in various dimensions. Thus, the organizational climate of a school plays a vital role in the development of students' creative thinking ability and positive attitude towards science.

East Khasi Hills District of Meghalaya provides a wide variety of secondary schools run under different types of management. It is of importance to find out how the creative thinking ability and attitude towards science have been developed in the secondary schools of different types of management and belonging to different organizational climates. Towards this end the present study is undertaken.

5.2.0 Statement of the Problem

The title of the problem under investigation is "Creative Thinking Ability and Attitude towards Science among Students of Secondary Schools having Different Organisational Climates".

5.2.1 Conceptual Definitions of the Terms Used

Conceptual definitions of the variables considered in the study are as follows:

i. **Creative Thinking**: Creative thinking is that type of thinking which involves mainly the use of divergent production abilities which enable a person to think in different directions and find out new solutions to problems.

ii. **Attitude:** An attitude is the degree of positive or negative affect associated with some psychological object.

iii. **Organisational Climate:** It refers to the different types of interaction that takes place between members of an organization (such as a school) when they fulfill their prescribed roles while satisfying their individual needs.

In the context of a 'school', it is the resulting condition, within the school, of social interaction among the teachers and between the teachers and the principal.

5.2.2 Operational Definitions of the Terms Used

Operational definitions of the variables considered in the study are as follows:

i. **Creative Thinking:** It is the score obtained on the Verbal Test of Creative Thinking developed by Baqer Mehdi (1985).

ii. **Attitude:** It is the score obtained on the Attitude Scale developed by the investigator to measure the attitude towards science of secondary school students.

iii. **Organisational Climate:** It is the climate of the schools (organizations) as identified by the tool School Organizational Climate Description Questionnaire (SOCDQ) developed by Motilal Sharma (1978).

5.3.0 Objectives

The following were the objectives of the study:

I To find out the creative thinking ability of secondary school students in East Khasi Hills District of Meghalaya and further –

i. to find out whether any significant difference exists among students belonging to schools of different types of management in their creative thinking ability;

ii. to find out whether any significant difference exists among students of classes VIII, IX and X in their creative thinking ability.

iii. to find out whether any significant difference exists among students belonging to schools with different organisational climates in their creative thinking ability.

iv. to find out whether any significant difference exists between students of rural and urban secondary schools in their creative thinking ability.

v. to find out whether any significant difference exists between tribal and non-tribal secondary school students in their creative thinking ability.

II To find out the attitude towards science of secondary school students in East Khasi Hills District of Meghalaya and further –

i. to find out whether any significant difference exists among students belonging to schools of different types of management in their attitude towards science.

ii. to find out whether any significant difference exists among students of classes VIII, IX and X in their attitude towards science.

iii. to find out whether any significant difference exists among students belonging to schools with different organisational climates in their attitude towards science.

iv. to find out whether any significant difference exists between students of rural and urban secondary schools in their attitude towards science.

v. to find out whether any significant difference exists between tribal and non-tribal secondary school students in their attitude towards science.

5.4.0 Hypotheses

With reference to the above mentioned objectives the following were the hypotheses:

I

i. There is no significant difference among students belonging to schools of different types of management in their creative thinking ability.

ii. There is no significant difference among students of classes VIII, IX and X in their creative thinking ability.

iii. There is no significant difference among students belonging to schools with different organisational climates in their creative thinking ability.

iv. There is no significant difference between students of rural and urban secondary schools in their creative thinking ability.

v. There is no significant difference between tribal and non-tribal secondary school students in their creative thinking ability.

II

i. There is no significant difference among students belonging to schools of different types of management in their attitude towards science.

ii. There is no significant difference among students of classes VIII, IX and X in their attitude towards science.

iii. There is no significant difference among students belonging to schools with different organisational climates in their attitude towards science.

iv. There is no significant difference between students of rural and urban secondary schools in their attitude towards science.

v. There is no significant difference between tribal and non-tribal secondary school students in their attitude towards science.

5.5.0 Methodology

The study is a piece of descriptive research. Details are as follows:

5.5.1 Population and Sample

The population for the study comprised all the secondary schools in the East Khasi Hills District of Meghalaya. About 25 per cent of schools from the population were drawn using stratified sampling technique, the strata being – types of management of schools, namely,

Government, Deficit, Aided and Unaided; and rural-urban. The sample of schools thus happened to be 40. From each of these schools 10 students each from classes VIII, IX and X were randomly drawn. Those who completely responded to all the tools of the study were included in the sample for analysis (N=1185).

All the teachers teaching classes VIII, IX and X in these schools were taken as the sample of teachers (N=246) for deciding the organisational climate of the schools.

5.5.2 Tools Used

The following tools were used to collect the data –

i. Verbal Test of Creative Thinking (by Baqer Mehdi, 1985)

ii. Attitude Scale (developed by the investigator)

iii. School Organizational Climate Description Questionnaire (SOCDQ) (by Motilal Sharma, 1978).

The details regarding the tools used in the present study are presented further.

5.5.2.1 Verbal Test of Creative Thinking

The Verbal Test of Creative Thinking developed by Baqer Mehdi (1985) is a tool for measuring the creative thinking ability of the

secondary school students. The Verbal test is a part of the total battery which consists of both verbal and non-verbal tests. The verbal test includes four sub-tests, namely, Consequences test, Unusual Uses test, Similarity test and Product Improvement test, Each of the four sub-tests cover the three dimensions of creative thinking ability – fluency, flexibility and originality. Scoring is done for each of the three dimensions and the composite creativity score is obtained by converting the raw scores into standard scores (with a Mean=50 and SD=10) on all the three dimensions and then pooling them together.

The test-retest reliability coefficient for each of the three dimensions as well as for the total creativity is found out and it happens to be highly satisfactory. The validity of the test is established against teacher ratings and the values are reported to be significant at 0.01 level.

5.5.2.2 Attitude Scale

The Attitude Scale to find out the attitude of secondary school students towards Science was developed by the investigator. The development included pre-tryout, tryout and item analysis. The final form of the Attitude Scale consists of 76 statements (38 positive and 38 negative). The response is to be made for each statement on a 5-point

scale, the points being 'Strongly Agree', 'Agree', 'Undecided', 'Disagree' and 'Strongly Disagree'. The scoring scheme for the positive statements is 4, 3, 2, 1, 0 corresponding to the five points as stated already. Similarly, 0, 1,2,3, 4 are the scores for the corresponding points of the negative statements.

The content validity of the Attitude Scale was ensured through the steps taken for the development of items. The odd-even reliability of the Attitude Scale was established and it was found to be 0.93.

5.5.2.3 School Organizational Climate Description Questionnaire (SOCDQ)

School Organizational Climate Description Questionnaire (SOCDQ) developed by Motilal Sharma (1978), was used as a tool to find out the type of organizational climate prevailing in the schools. The SOCDQ consists of 64 Likert type items which teachers use to describe the climate of their schools. The 64 items in the questionnaire are assigned to eight sub-tests, each one covering one dimension of the climate. Responses are indicated by choosing (encircling A, B, C or D on the answer sheet) one of the four points on the scale corresponding to (A) Rarely Occurs, (B) Sometimes Occurs, (C) Often Occurs, and (D) Very Frequently Occurs. The SOCDQ provides a

score of 1 to (A), 2 to (B), 3 to (C) and 4 to (D). Then each respondent's eight sub-test scores are calculated by simple summation of item scores, subtest by subtest, and dividing each of the eight sums by the number of items in the corresponding sub-test.

The tool has been validated against experts' agreements as well as the ratings of the inspectors. The reliability coefficient of the tool by internal consistency ranged between 0.34 and 0.81 for the different sub-tests.

5.5.3 Data Collection

Formal permission was obtained from the head of each school covered by the sample. The researcher personally administered the two tools – Verbal Test of Creative Thinking and the Attitude Scale (refer caption 5.5.2) to classes VIII, IX and X students on the same day one after the other with a brief break in between. The same procedure was followed in all the sample schools.

Regarding the data on the type of climate prevailing in the sample schools, all the teachers teaching classes VIII, IX and X were requested to respond on the SOCDQ. The data from both the students and teachers in a school were collected on the same day.

5.5.4 Analysis of Data

For the scores on each of the sets of scores obtained on the different tools, Mean and Standard Deviation were found out. On the two tools (Verbal Test of Creative Thinking and Attitude Scale), the scores were grouped as belonging to:

i. Four types of school management
ii. Different classes of VIII, IX and X
iii. Different types of organizational climates
iv. Rural-Urban
v. Tribal-Non-tribal.

F-test was employed for testing each of the hypotheses relating to the four types of school management, different classes and different types of organizational climates. t-tests were carried out further in such cases where the 'F' value was found to be significant. t-tests were also carried out to test the rural-urban differences and tribal-non-tribal differences.

5.6.0 Summary of Results

The findings of the study are summarized as follows:

I

i. There exists a significant difference among students belonging to schools of different types of management in their creative thinking ability. Further, these differences are as shown below:

Government Schools	>	Deficit Schools Aided Schools Unaided Schools

ii. There exists a significant difference among students of classes VIII, IX and X in their creative thinking ability. Further, these differences are as shown below:

Class X	>	Class IX	>	Class VIII

iii. There exists a significant difference among students belonging to schools with different organisational climates in their creative thinking ability. Further, these differences are found to be as follows:

Paternal Climate	>	Open, Autonomous, Familiar, Closed and Controlled Climates

iv. Urban secondary school students have significantly higher creative thinking ability than rural secondary school students.

v. Non-tribal secondary school students have significantly higher creative thinking ability than the tribal secondary school students.

II

i. There exists a significant difference among students belonging to schools of different types of management in their attitude towards science. Further, these differences are as shown below:

Government Schools	>	Deficit Schools Unaided Schools	>	Aided Schools

ii. There exists a significant difference among students of classes VIII, IX and X in their attitude towards science. Further, these differences are as shown below:

Class IX Class X	>	Class VIII

iii. There exists a significant difference among students belonging to schools with different organisational climates in their attitude towards science. Further, these differences are found to be as follows:

Open Climate Paternal Climate	>	Closed, Controlled Climates
Autonomous Climate Familiar Climate	>	Controlled Climate

iv. There is no significant difference between students of rural and urban secondary schools in their attitude towards science.

v. Non-tribal secondary school students have significantly a more favourable attitude towards science than tribal secondary school students.

5.7.0 Suggestions for Further Research

i. Same type of studies may be replicated in different Districts of Meghalaya to get a comparative picture.

ii. Studies in depth may be conducted to find out the differences existing in creative thinking ability and attitude towards science between tribal and non-tribal secondary school students.

iii. An attitude scale may be developed for measuring the attitude of science teachers towards science.

iv. An investigation into the relationship between organizational climate and other variables of the secondary school students may be undertaken.

v. Investigations similar to the present study may be undertaken to make a comparative study of secondary school students and college students.

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NOTE: * First Survey of Research in Education.
** Second Survey of Research in Education.
# Third Survey of Research in Education.
+ Foruth Survey of Research in Education.
++ Fifth Survey of Research in Education.

APPENDIX – A

List of secondary schools forming the population for the study.

Sl.No	Name of the School
	Government
1	Shillong Public School, Shillong
2	Pine Mount Government School, Shillong
	Deficit (Rural)
3	Mawryn kneng Secondary School, Mawryngkneng
4	Nongkrem Secondary School, Nongkrem
5	Smit Secondary School, Smit
6	Good Shepherd Secondary School, Jongsha
7	St. Paul's Secondary School, Marbisu
8	Mawsynram Secondary School, Mawsynram
9	St. Anthony's Secondary School, Pynursla
10	Khadarblang Secondary School, Lyngkyrdem
11	Cherra Presbyterian Secondary School, Sohra
12	R.K. Mission Secondary School, Sohra
13	St. John Bosco Boys' Secondary School, Sohra
14	St. John Bosco Girls' Secondary School, Sohra
	Deficit (Urban)
15	Jail Road Boys' Secondary School, Shillong
16	R.B.A. Hindi Secondary School, Shillong
17	Lady Keane Girls' Secondary School, Shillong
18	Islamia secondary School, Shillong

Appendix-A contd

Appendix-A contd.

Sl.No	Name of the School
19	Mawkhar Christian Secondary School, Shillong
20	St. Dominic Savio's Secondary School, Shillong
21	K.J.P. Girls' Secondary school, Shillong
22	D.N.S. Wahlang Memorial Secondary School, Shillong
23	Synod Secondary School, Shillong
24	Mawprem Modern Secondary School, Shillong
25	Gorkha Pathsala Secondary School, Shillong
26	Anath Ashram Secondary School, Shillong
27	St. Joseph's Girls' Secondary School, Shillong
28	Seng Khasi Secondary School, Shillong
29	Sacred Heart Boys' Secondary School, Shillong
30	Sacred Heart Girls' Secondary School, Shillong
31	Nongkwar Secondary School, Shillong
32	Shillong Secondary School, Shillong
33	Laitumkhrah Bengali Girls' Secondary School, Shillong
34	Laitumkhrah Presbyterian Secondary School, Shillong
35	Laitumkhrah Asssamese Secondary School, Shillong
36	St. Anthony's Secondary School, Shillong
37	St. Mary's Girls Secondary School, Shillong
38	Auxilium Girls' Secondary School, Shillong
39	H. Elias Memorial Secondary School, Shillong

Appendix-A contd.

Sl.No	Name of the School
40	Umpling Boys' Secondary School, Shillong
41	M.L. Mizo Secondary School, Shillong
42	Little Flower Secondary School, Shillong
43	Laban Bengalee Boys' Secondary School, Shillong
44	Laban Bengalee Girls' Secondary School, Shillong
45	Laban Assamese Girls' Secondary School, Shillong
46	Laban Presbyterian Secondary School, Shillong
47	Lumparing Vidyapith Secondary School, Shillong
48	Rilbong P.N.C. Secondary School, Shillong
49	Shillong Vidyalaya Secondary School, Shillong
50	Gorkha Secondary School, Shillong
51	Shon Roy Basan Secondary School, Shillong
52	St. Gabriel's Secondary School, Shillong
53	Pomlum Secondary School, Shillong
54	Garo Union (Day) Secondary School, Shillong
55	Malki Presbyterian Secondary School, Shillong
	Aided (Rural)
56	Diengiei Secondary School, Mylliem
57	Nongpathaw Secondary School, Mawlaiteng
58	Pliti Syiem Memorial Secondary School, Laitkor
59	Mylliem Secondary School, Mylliem
60	Green Hills Secondary School, Sohryngkham

Appendix-A contd

Appendix-A contd.

Sl.No	Name of the School
61	Mawkhamu secondary School, Mawkhanu
62	Nongkrem Presbyterian Secondary School, Nongkrem
63	Riwar Mihngi Presbyterian Secondary School, Mawkynrew
64	Kong Barr Memorial Secondary School, Mawkynrew
65	Mawphlang Secondary School, Mawphlang
66	Nongspung Secondary School, Nongspung
67	Seng Khasi Secondary School, Marbisu
68	Stela Meris Secondary School, Wahlang
69	Sohiong Secondary School, Sohiong
70	Raid Lyngkhoi Secondary School, Lyngkhoi
71	Mawphlang Dist. Multipurpose Secondary School, Mawphlang
72	Pyndenglitha Secondary School, Nongspung
73	Tyrsad Secondary School, Tyrsad
74	Laitbah Union Secondary School, Lawbah
75	Laitmawsiang Secondary School, Mawtiehbah
76	Dist. Pyndemsohsaw Presbyterian Secondary School, Dangar
77	Laitlyngkot Secondary School, Laitlyngkot
78	Mahatma Gandhi Memorial Secondary School, Umniuhtmar
79	Raid Lyngkhat Proceeding Secondary School, Nongtyngur
80	Raid Nongshken Border Area Pro.second.School,Mawsherkhmut.
81	Kyntiew Shaphrang Ilaka Secondary School, Laitlyngkot

Appendix-A contd

Appendix-A contd.

Sl.No	Name of the School
82	Nongjri Pro.Secondary School, Nongjri
83	Tirot Singh Memorial Secondary School,Laitkynsew
84	Tirot Singh Memorial Secondary School,Mawkdok
85	Mawlong Sirdarship Secondary School, Mawlong
86	Shella Pro.Secondary School,Shella
87	St.Peter's Secondary School, Mawjrong
	Aided (Urban)
88	Balika Hindi Secondary School, Shillong
89	Reprekha Night Secondary School, Shillong
90	Arya Kenya Vidyalaya Secondary School,Shillong
91	Sein Jaintia Pro.Secondary School, Shillong
92	Christ Church Secondary School, Shillong
93	Mawlai Christian Night Secondary School, Shillong
94	Sun Rays' Secondary School, Shillong
95	Mawlai Presbyterian Secondary School, Shillong
96	Stephan Memorial Secondary School, Shillong
97	Buddha Vidya Neketan Secondary School, Shillong
98	Gandhi Buniyadi Secondary School, Shillong
99	St. Nanak Secondary School, Shillong
100	St. Jerome Secondary School, Shillong
101	Mawpat Presbyterian Secondary School, Shillong
102	Shillong Academy Secondary School, Shillong

Appendix-A contd

Appendix-A contd.

Sl.No	Name of the School
103	Mizo Modern Secondary School, Shillong
104	St. Margaret's Secondary School, Shillong
105	Arya Kenya Vidyalaya Secondary School, Shillong
106	Garo Union (Morning) Secondary School, Shillong
107	Nongthymmai Nepali Secondary School, Shillong
108	Eriben Presbyterian Secondary School, Shillong
109	Holy Child Secondary School, Shillong
110	Umpling ® Girls' secondary School, Shillong
111	Madanriting Presbyterian Secondary School, Shillong
112	Hill View Secondary School, Shillong
113	Madan Laban Nepali Secondary School, Shillong
114	Raid Laban Secondary School, Shillong
115	St. John Secondary School, Shillong
116	San Shnong Secondary School, Shillong
117	San Mer Secondary School, Shillong
	Unaided (Rural)
118	Raid Sadew Laitjem Secondary School, Sadew
119	Mt. Zion Secondary School, Sohryngkham
120	Holy Cross Secondary School, Mawkynrew
121	Tlong Umiam Secondary School, Sohiong
122	Mawthuwan Presbyterian Secondary School, Sohiong
123	Seng Khasi Secondary School, Krang

Appendix-A contd

Appendix-A contd.

Sl.No	Name of the School
124	St. Francis Xavier Secondary School, Sohklong
125	Rajapara Presbyterian Secondary School, Rajapara
126	Malai Sohmat Presbyterian Secondary School,Phlangwanbroi
127	Mawdon Mawpen Presbyterian Secondary School, Lawbah
128	Mawpdai Area Secondary School, Mawpdai
129	Pyndemsohsaw Presbyterian Secondary School, Pyndemsohsaw
130	Raid Shabong Border Area Secondary School, Pynsursla
131	Maurice Patrick King Memorial Secondary School, Laitryngew
132	St. Ursala Border Area Secondary School, Mawlong
	Unaided (Urban)
133	Christian Academy Secondary School, Shillong
134	Pearly Dew Secondary School, Shillong
135	All Saint Diocessan Secondary School, Shillong
136	Brookside Adventist Secondary School, Shillong
137	Loreto Convent secondary School, Shillong
138	St. Edmund's School, Shillong
139	St. Peter's Secondary School, Shillong
140	Kiddies Corner Secondary School, Shillong
141	St. Albert Secondary School, Shillong
142	St. John's Whitehall Secondary School, Shillong
143	Glakyn Academy English Secondary School, Shillong
144	Morning Star Secondary School, Shillong

Appendix-A contd

Appendix-A contd.

Sl.No	Name of the School
145	Doris Secondary School, Shillong
146	St. Xavier Secondary school, Shillong
147	Sunny Dale Secondary School, Shillong
148	Denmi Linda Persara Secondary School, Shillong
149	Providence Secondary School, Shillong
150	Seven Set Secondary School, Shillong
151	Queenie Secondary School, Shillong
152	Correngia Secondary School, Shillong
153	Jaiaw Presbyterian Secondary School, Shillong
154	Church of God (Ecclesia) Secondary School, Shillong
155	O.M. Roy Secondary School, Shillong
156	Phudmawri Presbyterian Secondary School, Shillong
157	Pynthorumkhrah Golflink Secondary School, Shillong
158	Pynthorumkhrah Presbyterian Secondary School, Shillong
159	St. Joseph's Secondary School, Shillong
160	Vilco Secondary School, Shillong.

APPENDIX – B

List of Secondary Schools Forming the Sample for the Study

School Code	Name of the School	Type of School
S^1	Pliti Syiem Memorial Secondary School, Laitkor	Aided
S^2	Synod Secondary School, Shillong	Deficit
S^3	Tirot Singh Memorial Secondary School, Laitkynsew	Aided
S^4	Smit Secondary School, Smit	Deficit
S^5	Green Hills Secondary School, Sohryngkham	Aided
S^6	Mt. Zion Secondary School, Sohryngkham	Unaided
S^7	Glakyn Academy English Secondary School, Shillong	Unaided
S^8	Lady Keane Girls' Secondary School, Shillong	Deficit
S^9	Jail Road Boys' Secondary School, Shillong	Deficit
S^{10}	Islamia Secondary School, Shillong	Deficit
S^{11}	Pine Mount Government School, Shillong	Government
S^{12}	Sein Jaintia Pro.Secondary School, Shillong	Aided
S^{13}	Shillong Academy Secondary School, Shillong	Aided
S^{14}	Shillong Public School, Shillong	Government
S^{15}	Mawrice Patrick King Memorial Secondary School, Laitryngew	Unaided
S^{16}	Madanriting Presbyterian Secondary School, Shillong	Aided
S^{17}	St. Margaret's Secondary School, Shillong	Aided
S^{18}	Mawprem Modern Secondary School, Shillong	Deficit

Appendix-B contd..

Appendix-B contd..

School Code	Name of the School	Type of School
S^{19}	Pearly Dew Secondary School, Shillong	Unaided
S^{20}	Holy Child Secondary School, Shillong	Aided
S^{21}	Umpling Boys' Secondary School, Shillong	Deficit
S^{22}	St. Edmund's School, Shillong	Unaided
S^{23}	Laitumkhrah Assamese Secondary School, Shillong	Deficit
S^{24}	Kiddies Corner Secondary School, Shillong	Unaided
S^{25}	St. Anthony's Secondary School, Shillong	Deficit
S^{26}	Sunny Dale Secondary School, Shillong	Unaided
S^{27}	St. John Bosco Boys' Secondary School, Sohra	Deficit
S^{28}	Sacred Heart Girls' Secondary School, Shillong	Deficit
S^{29}	St. Dominic Savio's Secondary School, Shillong	Deficit
S^{30}	St. Mary's Girls' Secondary School, Shillong	Deficit
S^{31}	All Saint Diocessan Secondary School, Shillong	Unaided
S^{32}	Pynthrumkhrah Golflink Secondary School, Shillong	Unaided
S^{33}	St. Peter's Secondary School, Mawjrong	Aided
S^{34}	St. John Bosco Girls' Secondary School, Sohra	Deficit
S^{35}	Tyrsad Secondary School, Tyrsad	Aided
S^{36}	St. Paul's Secondary School, Marbisu	Deficit
S^{37}	Mawryngkneng Secondary School, Mawryngkneng	Deficit
S^{38}	Mylliem Secondary School, Mylliem	Aided
S^{39}	Tlong Umiam Secondary School, Sohiong	Unaided
S^{40}	Nongpathaw Secondary School, Mawlaiteng.	Aided

Note: S - School

APPENDIX – C

Confidential

Consumable Booklet
Of

T C W

T.M. No.458715 **Dr. Baqer Mehdi** (New Delhi) *(English Version)*

Please fill up the following:-

Name: Age: Class

School/College:

Father's/Guardian's name: Occupation:

Home address: Date:

General Instructions

In this booklet you will find mentioned some Interesting problems which will require the use of your thinking ability and imagination to solve them. The purpose is to see how quickly and imaginatively you can think under situations which require novel ways of dealing with them. Read ezch problem carefully and apply your best thinking in giving the responses. **Write your responses either in English or in your mother tongue.** Responses have to be given briefly but clearly in the space provided under each problem.Give a serial number to each of your responses. There are no right or wrong responses to any of these problems. Therefore use your imagination to think of as many responses as you can.

The problems are divided into *Four Activties* Each Activity is separately timed. Within the time-limit for each Activity you may work on the different problems according to your speed. When you finish one problem, go to the next. If necessary, you may return to the previous one again for any addition you would like to make. Remember that you have not to go the next Activity until the time for the first Activity is over and you are told to proceed further.

At the end you will be given *5 minutes extra time*, which you may use at any problem of any Activity in which you want to do additional work.

Please do not omit any problem.

Estd. 1971

NATIONAL PSYCHOLOGICAL CORPORATION

4/230, KACHERI GHAT, AGRA 282 004

Activity 1

What will happen, if .....

DIRECTIONS

1. On this and the next page, you have been given some situations which will appear to you impossible. You have to think what would happen if such situations actually arise.
2. Give as many ideas as may come to your mind but try to think as many novel ideas as you possibly can. Ideas which you think no one else might have thought of what would be the best. Write your responses in the space provided for.
3. You will be given 15 MINUTES for this activity. After every five minutes you will be told the time so that you may move on to the next problem in the activity.

An example has been given which will help you to know what you have to do.

EXAMPLE

Question: What will happen if birds and animals start speaking like man?

Responses:
i. This word will change into a different kind of society.
ii. New leaders will emerge from amongst the animals.
iii. It is possible that a donkey will become our leader.
iv. It is also possible that he becomes our Prime Minister
v. Men may confide their secrets to their animal friends, etc.

PROBLEMS

1. What will happen if man flies like birds?

2. What will happen if your school is put on wheels?

3. What will happen if man does not require any food to eat?

Activity 2

NOVEL USES OF THINGS

Directions

1. On this and the next page, you have been given names of certain things which could be used in many different ways. You have to think in how many different and new ways the things may be used.
2. Write as many uses as you can, but do try to think also those which are novel, that is, those which you think no one else might have thought of.
3. You will be given 12 minutes for this activity. After every four minutes you will be told the time so that you may move on to the next item in the activity.

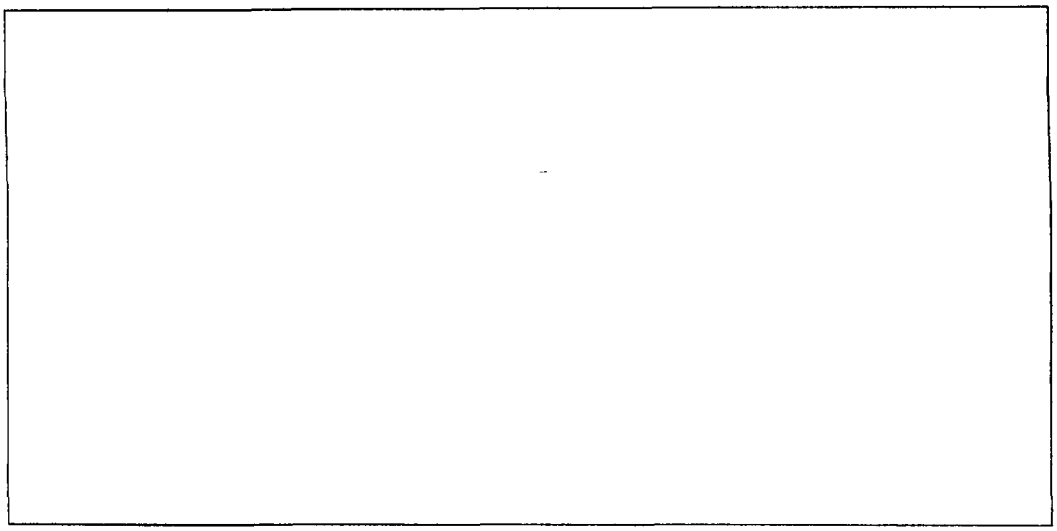
Below is given an example which will help you to know what you have to do.

Example: News-paper
Uses: i. To read the news.
ii. To make paper Toys.
iii. To get protection from the sun.
iv. To wrap something.
v. To cover a dirty place, etc.

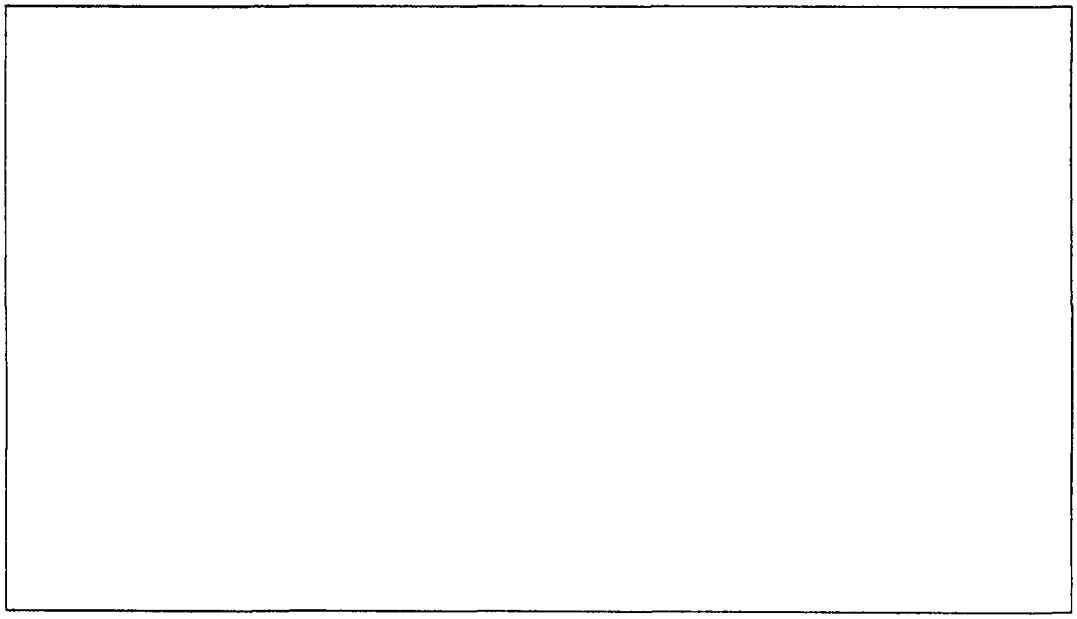
PROBLEMS

1. Piece of Stone

2. Wooden Stick



3. Water



Activity 3

SIMILARITIES

Directions

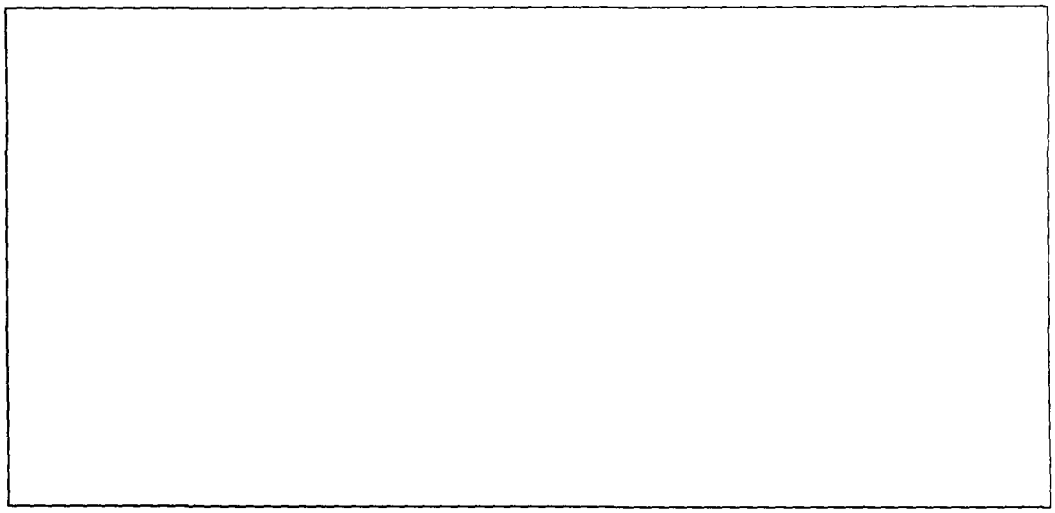
1. On this and the next page, you have been given pairs of word which can be related to each other in many different ways. You have to think in ho w many different and new ways are they related.
2. Write as many relationships as you can, but also try to think those which are novel, that is, those which you think no one else might have thought of.
3. You will be given 15 minutes for this activity. After every 5 minutes you will be told the time so that you may move on to the next problem in the activity.
   Below is given an example which will help you to know what you have to do.

Example: Man and animal
Relationship: (i) Both have life.
(ii) Both need food and water.
(iii) Both can fall ill.
(iv) Both are afraid of enemy.
(v) Both haave the experience of feeling cold and hot, etc.

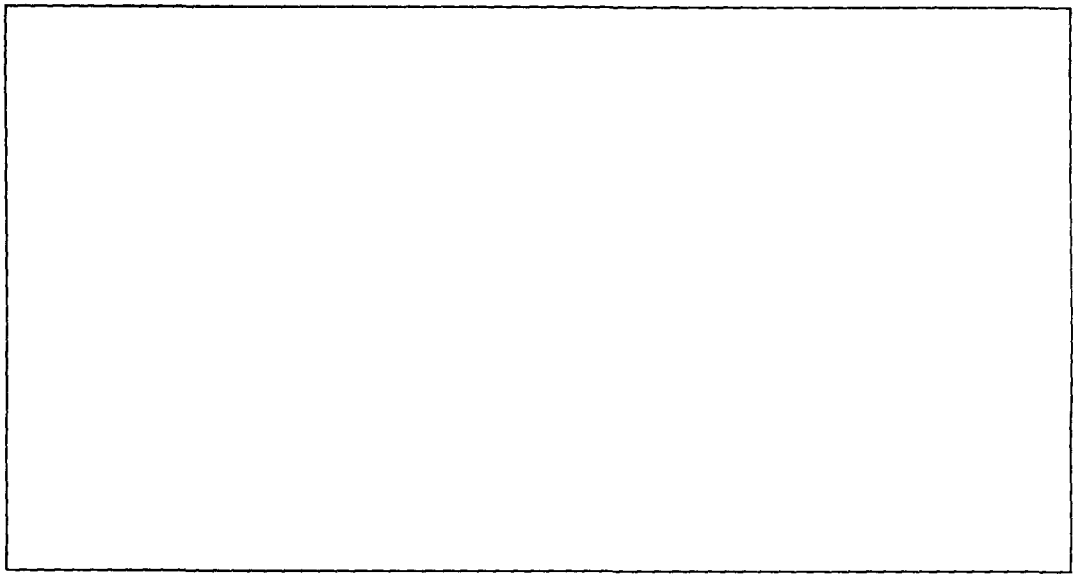
PROBLEMS

1.Tree and House

2. Chair and Ladder



4. Air and Water



Activity 4 Making Things More Interesting and Useful

Directions

Just keep in mind a simple model of a horse. You have to imagine in what ways you can change this simple model into an interesting and novel one for children to play with. You may think of adding any number of parts or accessories in order to make it really interesting and fascinating for children. Do not bother about the cost of the new parts or accessories that you would like to use in order to make the toy model interesting and fascinating for children.

Write all the ideas which come to your mind in a serial order in the space given bgelow.

You will be given 6 minutes for this activity.

Scoring Sheet

T C W

ACTIVITY 1

	Fluency	Flexibility	Originality
Item 1			
Item 2			
Item 3			
Total			

ACTIVITY 2

	Fluency	Flexibility	Originality
Item 1			
Item 2			
Item 3			
Total			

ACTIVITY 3

	Fluency	Flexibility	Originality
Item 1			
Item 2			
Item 3			
Total			

ACTIVITY 4

	Fluency	Flexibility	Originality
Item 1			

SCORE SUMMARY

	Fluency	Flexibility	Originality
Activity 1			
Activity 2			
Activity 3			
Activity 4			
GRAND TOTAL			

See back page for further instructions regarding originality scorings.

ORIGINALITY SCORING FOR RESPONSES NOT MENTIONED IN THE RESPONSE LIST

For any novel response not mentioned in the response list given in the manual, first of all briefly note it down in the space provided below giving the number of the activity and the item to which it belongs. Then, after you have scored all the test scripts, give it a score according to the scheme given in the manual and note the score in the appropriate column in the Scoring Sheet. In all probability, there will be very few such responses.

Activity	Item	Response	Originality Score

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APPENDIX – D

Scoring Guide

List of Categories and the Responses on Verbal Test of Creativity

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
(1) (Consequences)	1	A	Effect on transport and Travel	1. Disuse of vehicles 2. Disuse of aeroplanes 3. Disuse of parachute 4. Ease in travel	4
		B	Effect on Communication.	1. Disuse of telephone 2. Disuse of postal communication.	5
		C	Effect on Living Habits.	1. No Walking 2. Less privacy 3. No use of stairs 4. Living on trees possible 5. Need for tight clothes.	1 2
		D	Thrill of New Experience	1. Moon travel made easy 2. Travel to fairy land 3. Meeting with angels.	4 3
		E	Man-Bird Relationship	1. Competition between species 2. New Friendships 3. Hostility with birds.	2

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
		F	Self-Defence	1. Safety from fire 2. Safety from dangerous animals 3. Safety from flood.	
		G	Biological Changes	1. Legs will become shorter 2. Tail will be developed 3. Wings will be developed 4. Sharp visual activity 5. Brain will become more alert	5 4 3
		H	Overcoming Hurdles	1. No need for bridges 2. Going to hill top easier 3. Ditch crossing easier 4. Plucking of fruits from trees possible 5. Hunting will become easy	1 2
		I	Effect on Sports, Games Recreation	1. Ease in high jump 2. 2. New Sky games will be developed 3. Competition in flying	3 4 5
		J	Observation Facility	1. Can see from above 2. Spotting lost persons easier 3. Riot control easier	 2
		K	Effect on economy	1. Saving of money in travel 2. Loss to shoe industry 3. Loss to automobile Industry 4. Profit to goggle industry	 4 2 5

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
		L	Legal and Administrative Inmplications.	1. More thefts 2. Ease in smuggling 3. Ease in spying 4. More illegal crossing into other's territory	1 4
		M	Problems of Traffic Control	1. Need for new rules 2. No traffic jams 3. Crowding in air 4. Possibilities of more accidents	3 2
		N	Social and Political Consequences	1. New pattern of society will be evolved 2. Less number of suicides 3. Less number of deaths due to accidents 4. New types of housing problems.	4 2 2
		O	Psychological Consequences	1. Tensions reduced 2. Removal of inferiority complex	4 4
		P	Art, Literature and Poetry	1. New ideas for poets	3
I	2	A	Educational Implications	1. Rural population benefited 2. Increase in mobility 3. Ease in study 4. New concepts of education may develop 5. Admission	4 5
		B	Problem of Location	1. No address 2. Difficulty in searching school 3. Seasonal change in location	2 3

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
		C	Traffic Problem	1. Traffic jams, etc. 2. Accidents 3. Broad roads will be required	 1
		D	Inconveniences and Hazards	1. Reading inconveniences 2. Black board falling 3. Electricity connections 4. Water supply	4 5
		E	Psychological Effect	1. Lack of concentration 2. Less boredom	3 4
		F	Social Consequences	1. Unemployment 2. Will bring people and places nearer	4
		G	Economic Implications	1. Need for fuel, engine 2. Saving of money 3. No school bus	1 3 2
		H	Special Advantages to Pupils	1. No late coming 2. Ease in coming	
		I	Effect on School Building	1. Cracking of walls	3
		J	Amusement	1. Recreation 2. Tours	

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
I	3	A	Social Consequences	1. No begging	1
				2. No food problem	
				3. Relief to poor	2
				4. No population problem	
				5. No feeding problem	
				6. No famines	
		B	Effect on Man's Morals and Religion	1. No hoarding	
				2. More honestry	3
				3. No jealousy	1
				4. No fasting	4
		C	Change in Scientific Research	1. No agricultural research	1
				2. Chemical research will take new turn	2
				3. No Doctor	3
		D	Effect on Human Biology and Physique	1. Man will become machine	
				2. Live by water alone	2
				3. No digestive system	
				4. Lazy	4
					4
		E	Effect on economy and Occupation	1. No farming	
				2. No hotel	
				3. No unemployment	
				4. No food export	
				5. More cotton	3

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
		F	Effect on Sanitation	1. Disuse of lavatory 2. Decrease in pollution	3
		G	Amusement and Recreation	1. Joy of life reduced 2. More sports 3. Ease in long travel	3 2
		H	Psychological Implications	1. Deprivation 2. Lack of motivation 3. Less worries	 3
		I	Miscellaneous Responses	1. More time to study 2. Animal's position improved 3. No need for crockery 4. Saving of time 5. More time for love 6. More progress 7. No war	 1 3 4
II Unusual Uses	1	A	Games and Play	1. Doll 2. Throw in air 3. Wave in water	
		B	Instrumental Use	1. Lightening 2. Fire 3. Grinding 4. Sharpening 5. Plucking	 4

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
II Unusual Uses	2 Wooden Stick	C	Anti Social Use	1. Hurting 2. Damaging	
		D	Building Purpose	1. Repair 2. Plugging holes	2
		E	Defensive Use	1. Defence	1
		F	Decoration	1. As a show piece 2. As a present 3. To build path	3
		G	Weights	1. As paper weight	
		H	Scientific Use	1. To perform practical tests	
		I	Writing Use	1. For writing	
		J	Use as Support	1. Support	
		A	Self Defence	1. Saving Life	
		B	Anti-social Purpose	1. For hurting others 2. As a weapon	
		C	As an accessory	1. For writing 2. Plucking 3. Pointer 4. Flag hoisting	3

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
		D	Support	1. For supporting 2. Hanging things	
		E	Games & sports	1. Use as pole vault 2. Stand	4
		F	Decoration	1. As baton 2. Gift pieces	2
		G	Measurement	1. As foot	
		H	Domestic Use	1. House building 2. Furniture 3. To make hole 4. 4. Burning	1
	3 Water	A	Saving of life	1. Man 2. Animal 3. Plant	
		B	For cleaning Purpose	1. Washing clothes 2. Bath 3. Cleaning wounds 4. Cleaning (general) 5. Purification	3 2 4
		C	Play and Fun	1. Swimming 2. Sailing 3. Fountains 4. Throwing on others	5

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
		D	Industrial Uses	1. Solvent	1
				2. Steam	
				3. Ice	2
				4. Mixing	
		E	Destructive Use	1. Killing	
			Domestic and Everyday Use	1. Decoration	
				2. Extinguisher	
				3. Cooking	
		G	Miscellaneous Uses	1. Irrigation	
				2. Digestion	
				3. Drinking	
				4. Cooking	
III New Relationships	1 Tree and Building	A	Commonness in Physical Characteristics	1. Rigidity	
				2. Strength	
				3. Can be demolished	
				4. Need ground	
				5. Have foundation	
				6. Have climatic effect	4
				7. Can be burnt	
				8. Have definite size	2
		B	Place of Frequent Visits	1. For birds	
				2. For evil spirits	3
				3. For man	
				4. For animals	

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
		C	Shelter	1. Living 2. For shade 3. For hiding	5
		D	Place for Entertainment	1. Love and romance 2. Games (Indoor) 3. Debates	4 1
	2 Chair and Ladder	A	Commonness in Physical Characteristics	1. Breakability 2. Made of wood 3. Both have legs 4. May fall down 5. Moveable	 2 1
		B	Commonness in Everyday Use	1. Sitting 2. Climbing	
		C	Use in Games	1. Games 2. Sports	 2
		D	Sundry Responses	1. Lifeless 2. Both have Centre of gravity	 4 5

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
	3 Air and Water	A	Essential for life	1. Essential 2. Useful	
		B	Commonness in Chemical Properties	1. Can be mixed 2. Both have oxygen 3. Fluid 4. Fluent flow 5. No size 6. Expand on heating 7. Found everywhere 8. Both can be impure	 4 3 2
		C	Medium of Transfer	1. Disease 2. Goods	5
		D	Agents of change	1. Climatic 2. Cooling agent	 4
	3	E	Games and Play	1. Play and fun	
		F	Extinguisher	1. To extinguish fire	
IV Product Improvement	Toy Horse	A	Mechanical Arrangement	1. Can be mechanized 2. Open and shut mouth 3. Add amotor 4. Whistle	 4 2

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
		B	Construction Material	1. Transparent material	3
				2. Plastic	
				3. Iron	
				4. Wood	
		C	Decoration	1. Paint	
				2. Garland	
				3. Seat doll	
		D	Making Body parts Unusual	1. Unusual nose	
				2. Wings	1
				3. Illuminating eye	2
				4. Moveable ear	4
		E	Adding New Things	1. Cart	
				2. Wheels	
				3. Engine	
				4. Radio	
				5. Saddle	
				6. Handle	
				7. Chariot	
				8. Spectacles	4
				9. Seat	
				10. Briddle	
				11. Bell	
				12. Man on seat	

Appendix-D contd..

Appendix-D cont..

Activity No.	Item No.	Category Alphabet Serial	Category	Responses	Originality Weight
(1)	(2)	(3)	(4)	(5)	(6)
		F	Unusual Postures	1. Dancing 2. Jumping 3. Long Tail	
		G	Motion Arrangement	1. Moveable 2. Able to run	
		H	Electrification	1. Electrification	4

Appendix-D contd..

APPENDIX – E

PRE-TRYOUT FORM OF THE ATTITUDE SCALE

Name of the school_____

Name of the Student_____

Sex: Male/Female (M/F) _____

Class_____

Community: Tribal/Non-Tribal

Place: Date_____

Given below are some statements expressing opinions about science as a subject.

Please read each statement carefully and indicate your agreement or disagreement with it by indicating with a check "(✓)" in the appropriate column. A check "(✓)" placed under the column of 'SA' indicates 'Strongly Agree' while if placed under the column 'A' would indicate "Agree" similarly checks in other columns 'U', 'D' and 'SD' would indicate an opinion of 'Undecided', 'Disagree' or 'Strongly Disagree', respectively. Please indicate your responses frankly.

Kindly answer all the statements given in the next pages.

Sl. No.	STATEMENTS	SA	A	U	D	SD
1	If one makes an effort one can learn science					
2	Only intelligent students can learn science					
3	Science has enhanced the communication process					
4	Science is a must in today's technological world.					
5	The science teacher never help students in practical works					
6	The method of teaching science does not stimulate students towards effective learning.					
7	The science syllabus is too vast.					
8	Science education does not strengthen the democratic values of our society.					
9	Science makes us become an atheist.					
10	Models and charts are important for teaching science.					
11	Science has contributed a lot in uplifting the standard of living of the people of our country.					
12	Science encourages students to develop regular study habits.					
13	Science teaching helps to develop interest in the natural phenomena.					
14	Continuous assessment in science makes pupils work harder.					
15	Learning science is a sheer wastage of time.					
16	Science education develops ability in creative thinking.					
17	Poor teaching in science compels the students to go for private tuition.					
18	Everybody cannot understand the teaching of the science teacher very easily.					

Contd...Appendix-E

Sl. No.	STATEMENTS	SA	A	U	D	SD
19	Studying science increases the level of awareness.					
20	Learning science is an extra burden to the students.					
21	Nobody likes the science teacher.					
22	Science is the most tiresome among all subjects that we have to study.					
23	A student fails in examination because of less achievement in science,					
24	Science creates unnecessary tension among the students.					
25	Study of science is rather a dull affair.					
26	Students get discouraged when they obtain less marks in science subject than in other subjects.					
27	The knowledge of science offers scope for wider experience.					
28	The science text books are not useful.					
29	Science education is only for students belonging to higher income group.					
30	Science learning involves a great number of problems.					
31	Science education can make us become aware of the environment.					
32	Debate on science topics make one's knowledge more adequate.					
33	Science text books are very expensive.					
34	Science education helps to meet the manpower ned for national development.					
35	Learning of science makes man evil-minded.					
36	Scientific developments are threat to world's peace.					

Contd...Appendix-E

Sl. No.	STATEMENTS	SA	A	U	D	SD
37	Science is a favourite subject for many students.					
38	The social conditions are not changed through science education.					
39	I do not like even to see any paper related to science.					
40	I like my science teacher as she/he makes learning of science interesting.					
41	Learning of science enables a person to get a well paid job.					
42	No student likes science.					
43	Knowledge of science changes pupils' attitudes towards desired direction.					
44	My success in life depends on my success in science.					
45	By studying science we come to know the scientific explanation behind the working of some phenomena.					
46	The subject-matter of science is useful for success in competitive examinations.					
47	Science exhibitions do not help students in science learning.I					
48	Very few students have the opportunity to do science practical.					
49	Learning of science is useful for advancing self-reliance.					
50	Science is too complex for pupils to understand.					
51	The progress of humanity depends on the advancement in science.					
52	It is necessary to be highly attentive in science class.					
53	Basic knowledge of science is essential for everyone.					

Contd...Appendix-E

Sl. No.	STATEMENTS	SA	A	U	D	SD
54	Science encourages men to become more lazy.					
55	The contribution of science education in increasing the national productivity is significant.					
56	Science has turned the impossibilities into possibilities.					
57	Science is taught in schools so that teachers can get tuitions.					
58	Teaching of science does n ot help in eliminating narrow communal feelings.					
59	Science teaching in our country is very much modernised.					
60	Many desirable changes have taken place in our life because of science education.					
61	Learning science keeps us mentally active.					
62	It is difficult to answer a science test.					
63	Basic safety measures can be taught to the students through science education.					
64	Science is the foundation of modern civilization.					
65	Science as a school subject can help the students to develop scientific temper.					
66	What a joy it would have been if there were no subject like science.					
67	Though science is a hard subject, it is very useful.					
68	Malnutrition can be reduced through science education.					
69	Students are aware of ways in which the world is being changed by science and technology.					
70	The present 'space age' is the contribution of science.					

Contd...Appendix-E

Sl. No.	STATEMENTS	SA	A	U	D	SD
71	Working in a scientific field brings more fame.					
72	Without science no country can progress.					
73	Science is not an interesting subject.					
74	I wish I was allowed to do more experiments in the laboratory.					
75	A student feels proud when he does well in science.					
76	I do not like science as it is a confusing subject.					
77	Science cannot serve as a proper link language.					
78	The study of science enlightens one's mind.					
79	Most of the subject-matter of science cannot be understood easily.					
80	Science helps in developing logical thinking.					
81	The learning of science in secondary schools change the thinking habits of students in the positive direction.					
82	Skills and knowledge acquired by the learners will help them in this competitive world.					
83	Science teachers are not helpful in solving students' problems in learning science.					
84	Science has given man's life a reason to live and make it worthwhile.					
85	I want to continue studying science in future.					
86	Scientific knowledge helps the students to get admission in professional courses like engineering and medical.					
87	Scientists are persons without human considerations.					

Contd...Appendix-E

Sl. No.	STATEMENTS	SA	A	U	D	SD
88	The style of teaching science is not liked by the students.					
89	The study of science limits our social activities.					
90	Science has made men more insecure in today's civilized world.					
91	Learning science would result in my having confidence in myself.					
92	Science is bound to lead our society into godlessness.					
93	Science education is concentrated only in the urban areas.					
94	Scientific advancement leads towards destruction.					
95	Science promotes the academic career of the students.					
96	I don't understand why one should study science.					
97	The objectives of teaching science broadens the outlook of students.					
98	Some of the topics in science syllabi are useless.					
99	The evaluation procedure followed in science is not reliable.					
100	I find that learning science is very fascinating.					
101	Study tours should be organised in order to help us learn science better.					
102	It is boring to answer science examinations.					
103	Science is helping men to become more civilized.					
104	Science education enables one's mind to find out the ultimate truth.					

Contd...Appendix-E

Sl. No.	STATEMENTS	SA	A	U	D	SD
105	I like to sacrifice even my playtime to improve my performance in science.					
106	The teachers who teach us science are efficient and helpful.					
107	Science does not help in developing any constructive attitude in students.					
108	We do not have adequate books on science subject.					
109	Science education does not help in the personal development of the students.					
110	Science is a subject which is beyond our understanding level.					
111	Science is a valuable gift given to mankind to fulfill all his needs and make his wishes come true.					
112	The science teachers do not remove our difficulties and doubts whenever we ask.					
113	Science is useful in every walk of life.					
114	The knowledge of science gives rise to the questioning attitude of the mind.					
115	Developments in science represents the highest achievement of mankind.					
116	The content of science helps in removing superstitions among children.					
117	Career prospect of science student is bright.					
118	It is good that science is a compulsory subject in every school.					
119	Nobody should study science.					
120	Everybody likes to learn science.					
121	I like science because we can learn about facts.					

Contd...Appendix-E

Sl. No.	STATEMENTS	SA	A	U	D	SD
122	Science teachers are not properly trained.					
123	Science is one of the best subjects taught in school.					
124	Illustrations given in the science text books does not help us in learning science better.					
125	Science is a subject which is really frightening.					
126	Science education can make us become more aware of the modern technical developments.					
127	Through science education the people become more conscious of their own health.					
128	The day on which a science test is held is a hopeless day.					
129	Science is a very boring subject.					
130	Science has done more harm than good.					
131	Life is incomplete in today's world without the study of science.					
132	Many students think that they can never do well in science tests.					
133	Science education helps in acquiring basic skills which are essential for daily life.					
134	Science does contribute towards the development of personality.					

APPENDIX – F

DRAFT FORM OF THE ATTITUDE SCALE

Name of the school_____

Name of the Student_____

Sex: Male/Female (M/F) _____

Class_____

Community: Tribal/Non-Tribal

Place: Date_____

Given below are some statements expressing opinions about science as a subject.

Please read each statement carefully and indicate your agreement or disagreement with it by indicating with a check "(✓)" in the appropriate column. A check "(✓)" placed under the column of 'SA' indicates 'Strongly Agree' while if placed under the column 'A' would indicate "Agree" similarly checks in other columns 'U', 'D' and 'SD' would indicate an opinion of 'Undecided', 'Disagree' or 'Strongly Disagree', respectively. Please indicate your responses frankly.

Kindly answer all the statements given in the next pages.

Sl. No.	STATEMENTS	SA	A	U	D	SD
1	If one makes an effort one can learn science					
2	Only intelligent students can learn science					
3	Science has enhanced the communication process					
4	Science is a must in today's technological world.					
5	The science teacher never help students in practical works					
6	The Science syllabus is too vast.					
7	Learning Science leads to a society with no democracy.					
8	Science makes us not to believe in God.					
9	Models and charts are important for teaching science.					
10	Science has contributed a lot in uplifting the standard of living Of the people of our country.					
11	Science encourages students to develop regular study habits.					
12	Science teaching helps to develop interest in the natural phenomena.					
13	Continuous assessment in science makes pupils work harder.					
14	Learning science is a sheer wastage of time.					
15	Science education develops ability in creative thinking.					
16	Poor teaching in science compels the students to go for private tuition.					
17	Everybody cannot understand the teaching of the science teacher very easily.					
18	Studying science increases the level of awareness.					

Contd...Appendix-F

Sl. No.	STATEMENTS	SA	A	U	D	SD
19	Learning science is an extra burden to the students					
20	Nobody likes the science teacher					
21	Science is the most tiresome among all subjects that we have to study					
22	A student fails in examination because of less achievement in science					
23	Science creates unnecessary tension among the students.					
24	Study of science is rather a dull affair.					
25	Students get discouraged when they obtain less marks in science subject than in other subjects.					
26	The knowledge of science offers scope for wider experience					
27	The science text books are not useful.					
28	Science education is only for students belonging to higher income group.					
29	Science learning involves a great number of problems					
30	Science education can make us become aware of the environment					
31	Debate on science topics make one's knowledge more adequate.					
32	Science text books are very expensive.					
33	Learning of science makes man evil-minded.					
34	Scientific developments are threat to world's peace.					
35	Science is a favourite subject for many students.					
36	Learning science does not improve conditions in society.					

Contd...Appendix-F

Sl. No.	STATEMENTS	SA	A	U	D	SD
37	I do not like even to see any paper related to science.					
38	I like my science teacher as she/he makes learning of science interesting.					
39	Learning of science enables a person to get a well paid job.					
40	No student likes science.					
41	Knowledge of science changes pupils attitudes towards desired direction.					
42	My success in life depends on my success in science.					
43	The subject-matter of science is useful for succes in competitive examinations.					
44	Science exhibitions do not help students in science learning.					
45	Very few students have the opportunity to do science practical.					
46	Science is too complex for pupils to understand.					
47	The progress of humanity depends on the advancement in science.					
48	It is necessary to be highly attentive in science class.					
49	Basic knowledge of science is essential for everyone.					
50	Science encourages men to become more lazy.					
51	The contribution of science education in increasing the national productivity is significant.					
52	Science has turned the impossibilities into possibilities.					
53	Science is taught in schools so that teachers can get tuitions.					

Contd...Appendix-F

Sl. No.	STATEMENTS	SA	A	U	D	SD
54	Learning of science does not help in removing communal misunderstandings.					
55	Science teaching in our country is very much modernised.					
56	Many desirable changes have taken place in our life because of science education.					
57	Learning science keeps us mentally active.					
58	It is difficult to answer a science test.					
59	Basic safety measures can be taught to the students through science education.					
60	Science is the foundation of modern civilization.					
61	Science as a school subject can help the students to develop scientific temper.					
62	What a joy it would have been if there were no subject like science.					
63	Though science is a hard subject, it is very useful.					
64	Malnutrition can be reduced through science education.					
65	Students are aware of ways in which the world is being changed by science and technology.					
66	The present 'space age' is the contribution of science.					
67	Working in a scientific field brings more fame.					
68	Without science no country can progress.					
69	Science is not an interesting subject.					
70	I wish I was allowed to do more experiments in the laboratory.					

Contd...Appendix-F

Sl. No.	STATEMENTS	SA	A	U	D	SD
71	A student feels proud when he does well in science.					
72	I do not like science as it is a confusing subject.					
73	The study of science enlightens one's mind.					
74	Most of the subject-matter of science cannot be understood easily.					
75	Science helps in developing logical thinking.					
76	The learning of science in secondary schools change the thinking habits of students in the positive direction.I					
77	Skills and knowledge acquired by the learners will help them in this competitive world.					
78	Science teachers are not helpful in solving students' problems in learning science.					
79	Science has given man's life a reason to live and make it worthwhile.					
80	I want to continue studying science in future.					
81	Scientific knowledge helps the students to get admission in professional courses like engineering and medical.					
82	Scientists are persons without human considerations.					
83	The style of teaching science is not liked by the students.					
84	The study of science limits our social activities.					
85	Science has made men more insecure in today's civilized world.					
86	Learning science would result in my having confidence in myself.					
87	Science is bound to lead our society into godlessness.					

Contd...Appendix-F

Sl. No.	STATEMENTS	SA	A	U	D	SD
88	Science education is concentrated only in the urban areas.					
89	Scientific advancement leads towards destruction.					
90	Science promotes the academic career of the students.					
91	I don't understand why one should study science..					
92	The objectives of teaching science broadens the outlook of students.					
93	Some of the topics in science syllabi are useless.					
94	We cannot have faith in examinations conducted in science.					
95	I find that learning science is very fascinating.					
96	Study tours should be organised in order to help us learn science better.					
97	It is boring to answer science examinations.					
98	Science is helping men to become more civilized.					
99	Science education enables one's mind to find out the ultimate truth.					
100	I like to sacrifice even my playtime to improve my performance in science.					
101	The teachers who teaches us science are efficient and helpful.					
102	Science does not help in developing any constructive attitude in students.					
103	We do not have adequate books on science subject.					
104	Science education does not help in the personal development of the students.					

Contd...Appendix-F

Sl. No.	STATEMENTS	SA	A	U	D	SD
105	Science is a subject which is beyond our understanding level.					
106	Science is a valuable gift given to mankind to fulfill all his needs and make his wishes come true.					
107	The science teachers do not remove our difficulties and doubts whenever we ask.					
108	Science is useful in every walk of life.					
109	The knowledge of science gives rise to the questioning attitude of the mind.					
110	Developments in science represents the highest achievement of mankind.					
111	The content of science helps in removing superstitions among children.					
112	Career prospect of science students is bright.					
113	It is good that science is a compulsory subject in every school.					
114	Nobody should study science.					
115	Everybody likes to learn science.					
116	I like science because we can learn about facts.					
117	Science teachers are not properly trained.					
118	Science is one of the best subjects taught in school.					
119	Illustrations given in the science text books does not help us in learning science better.					
120	Science is a subject which is really frightening.					
121	Science education can make us become more aware of the modern technical developments.					

Contd...Appendix-F

Sl. No.	STATEMENTS	SA	A	U	D	SD
122	Through scdience education the people become more conscious of their own health.					
123	The day on which a science test is held is a hopeless day.					
124	Science is a very boring subject.					
125	Science has done more harm than good.					
126	Life is incomplete in today's world without the study of science.					
127	Many students think that they can never do well in science tests.					
128	Science education helps in acquiring basic skills which are essential for daily life.					
129	Science does contribute towards the development of personality.					

APPENDIX – G

FINAL FORM OF THE ATTITUDE SCALE

Name of the school_____

Name of the Student_____

Sex: Male/Female (M/F) _____

Class_____

Community: Tribal/Non-Tribal

Place: Date_____

Given below are some statements expressing opinions about science as a subject.

Please read each statement carefully and indicate your agreement or disagreement with it by indicating with a check "(✓)" in the appropriate column. A check "(✓)" placed under the column of 'SA' indicates 'Strongly Agree' while if placed under the column 'A' would indicate "Agree" similarly checks in other columns 'U', 'D' and 'SD' would indicate an opinion of 'Undecided', 'Disagree' or 'Strongly Disagree', respectively. Please indicate your responses frankly.

Kindly answer all the statements given in the next pages.

Sl. No.	STATEMENTS	SA	A	U	D	SD
1	The knowledge of science offers scope for wider experience.					
2	Science education can make us become more aware of the modern technical developments.					
3	Science makes us not to believe in God.					
4	Basic knowledge of science is essential for everyone.					
5	Science is one of the best subjects taught in school.					
6	Learning of Science does not help in removing communal misunderstandings.					
7	Illustrations given in the science text books does not help us in learning science better.					
8	The content of science helps in removing superstitions among children.					
9	Learning Science does not improve conditions in society.					
10	Science education is concentrated only in the urban areas.					
11	If one makes an effort one can learn science.					
12	Science learning involves a great number of problems.					
13	Some of the topics in science syllabi are useless.					
14	Study of science is rather a dull affair.					
15	Science has given man's life a reason to live and make it worthwhile.					
16	The subject-matter of science is useful for success in competitive examinations.					
17	The day on which a science test is held is a hopeless day.					
18	Nobody likes the science teacher.					

Contd...Appendix-G

Sl. No.	STATEMENTS	SA	A	U	D	SD
19	Science has turned the impossibilities into possibilities.					
20	Science education helps in acquiring basic skills which are essential for daily life.					
21	Scientists are persons without human considerations.					
22	Study tours should be organised in order to help us learn science better.					
23	Scientific knowledge helps the students to get admission in professional courses like engineering and medical.					
24	Science does not help in developing any constructive attitude in students.					
25	We do not have adequate books in science subjects.					
26	My success in life depends on my success in science.					
27	Learning science is a sheer wastage of time.					
28	Learning science leads to a society with no democracy.					
29	Science has contributed a lot in uplifting the standard of living of the people of the country.					
30	Debate on science topics make one's knowledge more adequate.					
31	Science encourages men to become more lazy.					
32	I don't understand why one should study science.					
33	Science is a must in today's technological world.					
34	I wish I was allowed to do more experiments in the laboratory.					
35	Learning of science makes man evil minded.					

Contd...Appendix-G

Sl. No.	STATEMENTS	SA	A	U	D	SD
36	No student likes science.					
37	Science education is only for students belonging to high income group.					
38	I like my science teacher as she/he makes learning of science interesting.					
39	It is necessary to be highly attentive in science class.					
40	Science exhibitions do not help students in science learning.					
41	I do not like even to see any paper related to science.					
42	Science helps in developing logical thinking.					
43	Without science no country can progress.					
44	Models and charts are important for teaching science.					
45	The science text books are not useful.					
46	Science education enables one's mind to find out the ultimate truth.					
47	The present 'space-age' is the contribution of science.					
48	Science teachers are not properly trained.					
49	Science creates unnecessary tension among the students.					
50	Skills and knowledge acquired by the learners will help them in this competitive world.					
51	Developments of science represents the highest achievement of mankind.					
52	Science is taught in schools so that teachers can get tutions.					

Contd...Appendix-G

Sl. No.	STATEMENTS	SA	A	U	D	SD
53	What a joy it would have been if there were no science subjects.					
54	Career prospect of science students is bright.					
55	I do not like science as it is a confusing subject.					
56	Science teachers are helpful in solving students problems in learning science.					
57	It is good that science is a compulsory subject in every school.					
58	I like science because we can learn about facts.					
59	The progress of humanity depends on the advancement of science.					
60	Science is not an interesting subject.					
61	Science is a very boring subject.					
62	Working in a scientific field brings more fame.					
63	Science education does not help in the personal development of the students.					
64	Science is the foundation of modern civilization.					
65	Though science is a hard subject, it is very useful.					
66	Nobody should study science.					
67	The style of teaching science is not liked by the students.					
68	I want to continue studying science in future.					
69	We cannot have faith in examinations conducted in science.					
70	It is boring to answer science examinations.					

Contd...Appendix-G

Sl. No.	STATEMENTS	SA	A	U	D	SD
71	Science is useful in every walk of life.					
72	The knowledge of science gives rise to the questioning attitude of the mind.					
73	The science teachers do not remove our difficulties and doubts whenever we ask.					
74	Science has done more harm than good.					
75	Science is helping men to become more civilized.					
76	Learning science would result in my having confidence in myself.					

Contd...Appendix-G

APPENDIX – H

SCHOOL ORGANIZATIONAL CLIMATE DESCRIPTION QUESTIONNAIRE (SOCDQ)

Dr. Motilal Sharma
Reader in Education
Department of Education
South Gujarat University
Surat (Gujarat)

PLEASE DON'T WRITE OR MAKE ANY MARK
ON OR INSIDE THIS BOOKLET

INSTRUCTIONS

The items in this Questionnaire describe behaviour conditions that occur within a school. Please indicate to what extant each of these descriptions characterizes your school. Please do not evaluate the items in terms of "good" or "bad" behaviour but read each item carefully and respond in terms of how well the statement describes your school.

The description scale on which to rate the items is printed at the top of each column in the answer sheet. **Please read the instruction and indicate your answer by drawing a circle around one of the four letters.**

Here is an example for your help.

	Rarely Occurs A	Some Times Occurs B	Often Occurs C	Very Frequently Occurs D
(1) Teachers at this School call each other by their first name	A	B	(C)	D

In this example the respondent has drawn circle around C to indicate that this type of behaviour occurs 'often' in this school.

You may mark any other alternative.

After you have answered the questionnaire the behaviours or conditions that have been described as typical by the majority of staff members will be examined and a portrait of the organizational climate of your school will be constructed from this description.

Now you mark answers as exemplified above. **Please check that you have answered every item.**

There is no time limit, even then answer quickly BE CONFIDENT, THAT YOUR ANSWERS WOULD BE KEPT STRICTLY CONFIDENTIAL, MARK YOUR ANSWERS FRANKLY.

1. The mannerisms of teachers at this school are annoying.
2. The principal uses an example by working hard himself
3. The morale of the teachers is high.
4. The principal uses constructive criticism.
5. Teacher's closest friends are from the staff members of this school.
6. The principal makes all class scheduling decisions.
7. The principal is well prepared when he speaks at school function.s
8. There is a small group of teachers who always oppose the majority.
9. Routine duties interfere with the job of teaching.
10. The principal explains his reasons for criticism to teachers.
11. The teachers accomplish their work with great vim, vigour and pleasure.
12. Teachers invite other staff members to visit them at home.
13. The principal looks out for the personal welfare of teachers.
14. The principal schedules the work for the teachers.
15. Staff meetings are organized according to a tight agenda.
16. The principal is in the building before teachers arrive.
17. Teachers at this school show much school spirit.
18. Teachers leave the grounds during the school day.
19. The principal tells teachers of new ideas he has run across.
20. The rules set by the principal are never questiond.

21. Teachers exert group pressure on non-conforming staff members.
22. The principal is easy to understand.
23. Principal exerts pressure that every work must be done according to his will.
24. Custodial service is available when needed.
25. Teacher's know the family background of other staff members.
26. Teachers' diary requires too much work.
27. School secretarial service is available for teachers use.
28. The principal checks the subject matter ability of teachers.
29. The principal helps teachers to solve personal problems.
30. The principal evaluates teachers' behaviour strictly according to rules.
31. The principal does personal favours for teachers.
32. Teachers seek special favours from the principal.
33. Most of the teachers here accept the faults of their colleagues.
34. Teachers talk about their personal life to other staff members.
35. The principal gives suggestions to correct teachers' mistakes.
36. Teachers interrupt other staff members who are talking in staff meetings.
37. The principal helps teachers finish their work.
38. School supplies are readily available for use in class work.
39. Teachers are contacted by the principal each day.

40. Teachers have fun socializing together during school time.
41. Administrative paper work is burdensome at this school.
42. Teachers are informed of the results of a supervisor's visit.
43. The principal ensures that teachers work to their full capacity.
44. Teachers ask non-sensical questions in staff meetings.
45. In staff meetings there is feeling of "let's get things done".
46. Teachers work together preparing administrative reports.
47. Staff meetings are mainly principal's reports.
48. Extra duty for teachers is posted conspicuously.
49. Sufficient time is given to prepare administrative reports.
50. The principal goes out of his way to help teachers.
51. The principal helps staff members settle their minor differences.
52. Teachers ramble when they talk in staff meetings.
53. Teachers organize curricular activities in a group spirit.
54. Teachers enjoy lunch hour together.
55. Teachers at this school stay by themselves.
56. The principal invites suggestions from the teachers in scheduling school activities.
57. Teachers talk about leaving this school.
58. Teachers spend time after school with students who have individual problems.

59. The principal tries to get financial benefits for the teachers.

60. There is considerable laughter when teachers gather informally.

61. Teachers socialize together in small selected groups.

62. The principal runs the staff meeting like a business conference.

63. Instructions for the operation of teaching aids are available.

64. The principal reminds the teachers of their duties very often.

Indian Adaptation of OCDQ by Halpin and Crofts 1963

SCHOOL ORGANIZATIONAL CLIMATE DESCRIPTION QUESTIONNAIRE

ANSWER-SHEET

Name of the School_____ Place_____ District_____ State_____

Headmaster/Teacher_____ Age_____ Sex_____ Stay in the present School_____

Number of teachers in the School_____ Number of Students in the school_____

Item No.	Rarely occurs	Some times occurs	Often occurs	Very Frequ-ently Occurs	Item No.	Rarely occurs	Some times occurs	Often occurs	Very Frequ-ently occurs	Item No.	Rarely occurs	Some times occurs	Often occurs	Very Frequ-ently occurs	Item No.	Rarely occurs	Some times occurs	Often occurs	Very Frequ-ently occurs
1	A	B	C	D	17	A	B	C	D	33	A	B	C	D	49	A	B	C	D
2	A	B	C	D	18	A	B	C	D	34	A	B	C	D	50	A	B	C	D
3	A	B	C	D	19	A	B	C	D	35	A	B	C	D	51	A	B	C	D
4	A	B	C	D	20	A	B	C	D	36	A	B	C	D	52	A	B	C	D
5	A	B	C	D	21	A	B	C	D	37	A	B	C	D	53	A	B	C	D
6	A	B	C	D	22	A	B	C	D	38	A	B	C	D	54	A	B	C	D
7	A	B	C	D	23	A	B	C	D	39	A	B	C	D	55	A	B	C	D
8	A	B	C	D	24	A	B	C	D	40	A	B	C	D	56	A	B	C	D
9	A	B	C	D	25	A	B	C	D	41	A	B	C	D	57	A	B	C	D
10	A	B	C	D	26	A	B	C	D	42	A	B	C	D	58	A	B	C	D
11	A	B	C	D	27	A	B	C	D	43	A	B	C	D	59	A	B	C	D
12	A	B	C	D	28	A	B	C	D	44	A	B	C	D	60	A	B	C	D
13	A	B	C	D	29	A	B	C	D	45	A	B	C	D	61	A	B	C	D
14	A	B	C	D	30	A	B	C	D	46	A	B	C	D	62	A	B	C	D
15	A	B	C	D	31	A	B	C	D	47	A	B	C	D	63	A	B	C	D
16	A	B	C	D	32	A	B	C	D	48	A	B	C	D	64	A	B	C	D

CONFIDENTIAL
Don't write below this line

Factors	Raw Scores
I	
II	
III	
IV	
V	
VI	
VII	
VIII	

*Scored by*_____

Date_____

APPENDIX – I
RAW DATA OBTAINED IN THE STUDY

		Scores on Creative Thinking Ability Test			Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
S_1R	1	102	136	98	139	168	174
	2	124	141	179	138	169	225
	3	131*	150	148	136*	156	164
	4	122	133*	144	147	165*	250
	5	134	123	215	170	165	249
	6	112	119	100	160	162	175
	7	152	113	191	193	171	188
	8	116	116*	110	150	175*	172
	9	119	114*	89	154	126*	149
	10	135	123*	92	155	182*	154
S_2U	1	163	124	122	267	206	245
	2	161	176	150	216	224	275
	3	120	207	132	231	229	251
	4	152	190	157	180	232	260
	5	182	152	139	274	218	257
	6	157	203	175	195	213	229
	7	201	200	169	211	215	235
	8	130	161	181	242	214	266
	9	171	211	171	244	204	256
	10	188	184	176	262	192	252
S_3R	1	168	183	146	237	259	244
	2	149	145	187	248	261	246
	3	182	167	213	238	228	189
	4	161	178	181	184	262	190
	5	173	178	152	256	220	154
	6	151	178	205	170	275	192
	7	112	125*	223	195	222*	173
	8	166	162	166	203	175	195
	9	185	156	59	206	161	43
	10	138	-	140	235	-	223

		Scores on Creative Thinking Ability Test			Scores on Attitude Scale	
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
S_4R	1	126	158	206	243	242	277
	2	102	189	161	215	200	237
	3	140	175	185	256	226	260
	4	145	151	112	215	240	227
	5	122	150	149	283	228	220
	6	128	155	118	240	252	214
	7	132	170	146	252	226	225
	8	153	171	126	224	237	222
	9	106	158	146	225	256	224
	10	125	158	160	230	223	230
S_5R	1	187	166	141	225	202	233
	2	142	154	146	247	221	254
	3	162	144	169	169	186	220
	4	155	134	85	237	215	243
	5	142	144	178	256	210	253
	6	130	136	181	240	196	222
	7	147	143	175	204	201	236
	8	129	164	155	250	186	250
	9	136	151	156	254	194	266
	10	136	171	174	255	184	225
S_6R	1	141	109	138	248	221	260
	2	147	145	173	239	234	230
	3	125	130	129	247	233	253
	4	123	109	148	126	231	255
	5	143	173	188	83	221	244
	6	116	175	142	111	240	225
	7	134	167	141	210	228	211
	8	165	120	141	242	185	230
	9	123	130	130	206	195	209
	10	108	145	168	231	228	239

Appendix-I contd..

Scores on Creative Thinking ABILITY TEST					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
S_7U	1	123	181	181	166	237	283
	2	103	119	179	108	219	274
	3	141	107	162	117	242	255
	4	130	142	132	180	250	242
	5	122	150*	144	154	228*	227
	6	151	144	179	198	241	201
	7	168	132	177	202	238	211
	8	127	104	224	189	203	236
	9	147	169	139	275	233	209
	10	-	87	165	-	157	229
S_8U	1	112	122*	106	226	247*	220
	2	105*	151*	161	240*	273*	228
	3	132*	105*	128*	209*	226*	202*
	4	126*	161	122*	211*	219	242*
	5	126*	103	143*	266*	211	237*
	6	119*	128	158	242*	224	210
	7	111	116*	129	161	190*	155
	8	105	130*	153	189	179*	248
	9	151*	136	149	270*	213	250
	10	118*	127	165	234*	162	252
S_9U	1	121*	164*	138*	174*	221*	203*
	2	129	100*	144*	174	130*	199*
	3	124*	116*	165*	220*	152*	216*
	4	117*	141*	155*	196*	231*	210*
	5	106*	108*	111*	173*	133*	167*
	6	125*	152*	150*	236*	258*	218*
	7	152*	192*	120*	236*	201*	140*
	8	104*	162*	158*	217*	218*	161*
	9	98*	167*	204*	203*	216*	164*
	10	139*	137*	119*	231*	240*	182*

Appendix-I contd..

Appendix-I contd..

Scores on Creative Thinking ABILITY TEST					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{10}U$	1	146*	141*	152*	140*	197*	236*
	2	68	196*	146	127	193*	242
	3	114*	103*	178*	131*	182*	257*
	4	103*	128*	146	149*	204*	218
	5	92*	136*	165*	177*	177*	214*
	6	112	130	169*	156	223	226*
	7	102	129*	118	152	193*	232
	8	100*	98*	102	156*	184*	205
	9	125	88*	145*	143	166*	212*
	10	189*	170*	146*	247*	145*	218*
$S_{11}U$	1	179	142*	166	234	214*	262
	2	188	194*	189	208	263*	239
	3	150	182	208	213	234	267
	4	215	204	193	216	253	249
	5	174	147	171	262	232	238
	6	219	186*	162	234	222*	259
	7	166	213*	185	223	229*	231
	8	161	200*	179	250	229*	248
	9	157	168	135	245	226	214
	10	161	182	166	228	231	233
$S_{12}U$	1	112	108	134	142	112	243
	2	125	137	116	156	118	195
	3	142	127	120	195	208	142
	4	104	140	137	185	199	207
	5	121	147	156	201	203	211
	6	91	137	152	155	187	210
	7	86	147	135	174	193	223
	8	84	110	119	152	208	206
	9	86	127	135	171	179	214
	10	101	115	137	177	194	166

Appendix-I contd..

Appendix-I contd..

Scores on Creative Thinking Ability Test					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{13}U$	1	191	160	135	153	177	216
	2	187*	150	161*	246*	238	220*
	3	192*	150	150	266*	136	252
	4	161	193*	144	142	215*	204
	5	117*	197	183	166*	207	240
	6	165	201	206*	224	192	218*
	7	163	152*	183*	221	247*	209*
	8	157*	150	141	222*	204	183
	9	152*	174*	233*	220*	233*	245*
	10	138	163*	215*	185	219*	246*
$S_{14}U$	1	145	154	181	192	218	272
	2	185	178*	162	223	233*	246
	3	132	162*	185	200	255*	249
	4	138	196	184	207	241	231
	5	156	141	165	208	241	210
	6	146	161	180	219	220	211
	7	134	162	159	232	233	223
	8	161	149	171	205	225	230
	9	165	168	159	203	251	227
	10	166	181	156	201	244	234
$S_{15}R$	1	153	111	177	277	251	278
	2	150	159	161	250	189	250
	3	175	149	175	200	220	265
	4	143	149	148	227	243	259
	5	132	134	152	237	248	221
	6	126	165	152	256	258	220
	7	149	166	129	249	259	240
	8	95	163	191	267	224	250
	9	134	139	170	194	256	229
	10	131	134	169	277	277	216

Appendix-I contd..

Scores on Creative Thinking Ability Test					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{16}U$	1	105	114	80	213	151	227
	2	172	102	145	226	169	207
	3	127	123	121	154	174	232
	4	134	148	139	152	180	186
	5	173	124	-	154	165	-
	6	191*	158	-	222*	226	-
	7	143	135	-	176	191	-
	8	157	162	-	235	219	-
	9	-	147	-	-	174	-
	10	-	152	-	-	218	-
$S_{17}U$	1	146*	164	153*	260*	184	229*
	2	150*	172*	134*	246*	206*	239*
	3	154*	169	177*	254*	204	209*
	4	164	176*	158*	244	202*	223*
	5	166*	154*	155*	210*	272*	204*
	6	161	126*	143*	214	232*	225*
	7	146*	172*	199*	235*	239*	244*
	8	125	160*	162*	226	233*	251*
	9	119*	168*	173*	217*	259*	245*
	10	168*	163*	158*	230*	249*	246*
$S_{18}U$	1	187*	188	162*	263*	249	223*
	2	153*	162*	161*	259*	238*	236*
	3	158*	183*	144*	209*	248*	192*
	4	141*	130*	142*	231*	267*	228*
	5	173*	133*	122*	274*	272*	222*
	6	156*	196	171	254*	259	255
	7	174	144	139	259	246	198
	8	147*	153	144	234*	273	213
	9	151*	170	171*	216*	269	186*
	10	169*	180	165	243*	268	204

Appendix-I contd..

Scores on Creative Thinking ABILITY TEST					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{19}U$	1	126	152	154	99	172	237
	2	114	144	143	164	196	210
	3	120	122	146	160	225	214
	4	116	124	137	134	148	202
	5	125	128	149	210	154	209
	6	141	123	142	219	115	199
	7	123	139	146	213	206	201
	8	146	111	-	198	153	-
	9	149	-	-	224	-	-
	10	194	-	-	265	-	-
$S_{20}U$	1	172*	151*	215*	275*	236*	266*
	2	149*	168	155	242*	202	244
	3	165	196*	158*	254	260*	248*
	4	150	200	164*	241	245	212*
	5	168*	148	136	218*	244	233
	6	200	156	170	216	235	237
	7	166	184*	197*	222	256*	196*
	8	195*	191*	228	226*	224*	206
	9	165	159*	161	246	230*	222
	10	171*	161*	170	266*	188*	222
$S_{21}U$	1	115*	176*	189*	174*	253*	180*
	2	130*	163*	181*	165*	219*	237*
	3	142	177*	175*	232	204*	235*
	4	138*	124*	155*	155*	214*	239*
	5	158*	136*	236*	254*	182*	241*
	6	162*	187*	201*	231*	217*	173
	7	144*	151*	187*	227*	220*	216*
	8	142*	157	124*	166*	227	182*
	9	161*	157*	178*	228*	219*	216*
	10	141*	148*	146*	177*	237*	200*

Appendix-I contd..

Scores on Creative Thinking ABILITY TEST					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{22}U$	1	154*	169	158*	274*	175	234*
	2	206*	149	178	239*	144	228
	3	130*	144*	210	243*	250*	261
	4	151*	185	119	228*	235	63
	5	129*	154*	164*	217*	260*	259*
	6	141*	181	153*	207*	182	201*
	7	140*	150	150*	271*	217	215*
	8	181*	146	136*	228*	155	247*
	9	161*	136	122*	281*	204	233*
	10	136*	129	174*	209*	216	226*
$S_{23}U$	1	105	129	110	221	190	234
	2	101	139	116	224	230	212
	3	79	115*	121	226	222*	205
	4	125*	127	182*	225*	221	205*
	5	127*	155	170*	152*	248	230*
	6	120	148*	164	179	203*	233
	7	127*	139	164*	224*	218	175*
	8	117*	103	154*	153*	173	250*
	9	115*	151*	158*	160*	224*	209*
	10	146*	137*	148*	207*	191*	215*
$S_{24}U$	1	167	174	170	266	281	232
	2	161	229	168	193	238	225
	3	132	131	155	237	219	218
	4	171	170	164	244	231	246
	5	186*	185	167*	238*	240	251*
	6	182*	168*	188*	210*	220*	234*
	7	193	175	229	248	227	234
	8	198*	189*	156	259*	289*	217
	9	170	162*	162	198	204*	231
	10	146	171	169	132	264	235

Appendix-I contd..

Scores on Creative Thinking ABILITY TEST					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{25}U$	1	158	149	180	220	225	216
	2	186	166	251*	213	201	236*
	3	212*	175	201*	240*	192	209*
	4	148	190	218	214	230	171
	5	209	155	202	233	228	223
	6	153	203	166	191	217	218
	7	182	173*	219	208	200*	245
	8	135	142*	195*	201	218*	23(9*
	9	158*	216	192	199*	212	247
	10	189	195	174	237	214	163
$S_{26}U$	1	156	145*	156	263	211*	214
	2	174	151*	188	257	201*	211
	3	201	166	163	263	232	211
	4	176	174	209	254	201	219
	5	163	135	124	207	216	236
	6	160	146	143	224	235	257
	7	183	150*	154	213	228*	199
	8	110	139	152	191	224	188
	9	113	150*	145	188	274*	212
	10	164	133	160	200	216	221
$S_{27}R$	1	169	176	92	259	205	205
	2	156	199	140*	263	215	248*
	3	175	173	161*	270	242	214*
	4	178	160	165	261	230	258
	5	129	161	188	222	241	268
	6	164	177	101	229	254	212
	7	175	218	129	224	202	175
	8	134	136	125	264	209	201
	9	159	147	141	270	218	195
	10	134	145	178	266	230	232

Appendix-I contd..

Scores on Creative Thinking ABILITY TEST					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{28}U$	1	168	144	198	250	274	247
	2	163	161	159	247	219	237
	3	194	138	185	213	240	216
	4	159	149	172	218	229	280
	5	154	172	186	224	283	263
	6	181	191	148	264	274	231
	7	161*	116	202	272*	253	263
	8	155	152	181*	243	208	260
	9	168	152	186	217	211	265*
	10	178	136	185	198	210	248
$S_{29}U$	1	171	151	169	153	183	205
	2	141	171	160	156	225	200
	3	149	162	163	85	202	183
	4	139	153	171	201	197	202
	5	147	141	163	195	212	207
	6	135	108	158	197	147	201
	7	164	131	164	194	183	221
	8	142	169	113	197	228	168
	9	167	150	150	209	200	171
	10	184	178	113	187	170	171
$S_{30}U$	1	168*	163*	151	261*	225*	206
	2	173*	173*	162	255*	217*	250
	3	182*	160*	152	245*	226*	213
	4	129	180*	214*	239	256*	254*
	5	152	180*	110	236	240*	172
	6	143	187*	170*	222	254*	233*
	7	154	176	109	260	213	206
	8	130	135	151	248	246	210
	9	191*	132	185	227*	220	200
	10	172*	149	159	224*	226	238

Appendix-I contd..

Scores on Creative Thinking ABILITY TEST					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{31}U$	1	126	142*	163	170	263*	209
	2	136	129*	140	162	242*	239
	3	106	140*	183*	166	235*	270*
	4	134*	145*	134*	261*	255*	239*
	5	155*	202*	109	220*	270*	242
	6	164*	150	158*	172*	258	250*
	7	143	144*	153*	248	266*	245*
	8	132*	242*	177*	252*	179*	252*
	9	141	128*	163*	214	240*	254*
	10	116	131	151	185	226	258
$S_{32}U$	1	132	121	126	173	248	211
	2	122	129	171	187	197	217
	3	108	112	161	154	181	213
	4	132	141	170	199	224	203
	5	159	132	119	132	238	183
	6	131	116	118	175	166	204
	7	136	117	119	143	176	202
	8	134	109	141	182	197	238
	9	123	110	118	228	258	181
	10	138	122	122	229	188	202
$S_{33}R$	1	148	173	120	221	227	220
	2	169	156	147	237	213	249
	3	220	154	166	241	231	246
	4	151	140	192	223	236	231
	5	164	180	165	221	214	239
	6	132	159	147	234	252	234
	7	165	183	141	253	277	203
	8	156	184	168	252	239	259
	9	154	198	157	212	233	262
	10	145	169	148	245	247	247

Appendix-I contd..

Scores on Creative Thinking Ability Test					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{34}R$	1	132	111	146	236	245	263
	2	111	154	163	221	250	204
	3	134	142*	122	185	226*	203
	4	109	160	118	231	265	258
	5	117	132	132	238	243	266
	6	106	143	148	221	233	147
	7	126	153	97	227	230	275
	8	124	134	118	221	268	206
	9	130	135	148	257	228	230
	10	143	143	141	243	256	258
$S_{35}R$	1	136	108	97	195	194	206
	2	149	95	169	226	158	253
	3	141	138	123	231	240	236
	4	109	102	149	240	245	247
	5	123	133	153	208	276	233
	6	86	122	124	221	218	199
	7	102	125	124	208	208	222
	8	113	129	98	242	215	195
	9	107	110	127	225	230	243
	10	125	114	146	239	235	231
$S_{36}R$	1	108	137	158	184	255	223
	2	116	134	148	205	207	218
	3	124	160	189	220	224	232
	4	123	141	144	157	246	245
	5	131	123	148	224	207	246
	6	132	159	156	182	264	265
	7	158	137	157	248	225	241
	8	178	129	160	254	234	255
	9	141	130	113	224	225	219
	10	141	140	152	183	221	233

Appendix-I contd..

Scores on Creative Thinking Ability Test					Scores on Attitude Scale.		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{37}R$	1	144	119	200	219	218	175
	2	179	149	152	224	215	125
	3	143	122	141	171	115	145
	4	133	136	151	200	175	205
	5	92	92	100	160	215	210
	6	119	119	166	140	220	215
	7	89	170	123	180	215	213
	8	112	146	136	215	210	125
	9	166	142	112	225	215	210
	10	122	152	114	216	165	215
$S_{38}R$	1	183	183	146	175	170	165
	2	166	146	125	170	205	180
	3	156	152	161	220	210	185
	4	166	185	168	215	215	190
	5	145	182	112	210	205	195
	6	161	152	151	215	160	190
	7	166	151	183	210	165	200
	8	138	178	166	165	215	210
	9	162	126	185	160	210	165
	10	185	166	145	165	205	170
$S_{39}R$	1	127	126	158	200	176	170
	2	160	126	189	195	175	175
	3	146	127	127	180	225	184
	4	126	138	126	215	216	220
	5	125	146	149	210	176	200
	6	127	160	126	180	160	218
	7	140	125	189	172	202	214
	8	153	112	126	155	204	178
	9	189	151	122	160	205	166
	10	158	161	149	212	210	210

Appendix-I contd..

Scores on Creative Thinking ABILITY TEST					Scores on Attitude Scale		
School Code	Student No.	Class VIII	Class IX	Class X	Class VIII	Class IX	Class X
$S_{40}R$	1	167	153	111	172	230	216
	2	146	163	126	174	202	160
	3	106	109	118	222	204	185
	4	132	154	135	204	177	180
	5	111	148	132	201	160	206
	6	117	134	153	168	165	210
	7	148	143	97	180	180	166
	8	141	132	117	182	250	226
	9	130	148	143	185	200	238
	10	111	134	160	174	205	218

TOTAL NO. OF STUDENTS = 1185

Note: * - indicates Non-tribal students
U = Urban students
R = Rural students