CHAPTER TWO

NATURE OF CREATIVITY
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Nature of Creativity

Creativity is the capacity of persons to produce new, previously unknown compositions, products or ideas. It may be imaginative activity or thought synthesis involving formation of new patterns and combinations of information derived from past experience, the transplanting of old relationships of new situations and may involve the generation of new correlates. It must be purposeful, goal directed and not mere idle fantasy. It may take the form of an artistic, literary or scientific production or it may even be purely procedural. Creativity does not happen, it needs appropriate seed, soil and climate.

2.1 EARLY DEVELOPMENT:

The induction of the word ‘Intelligence’ was mainly due to the writings of Herbert Spencer and of Francis Galton in the nineteenth century and the word came into general use considerably later.

Since intelligence is one of the most complex of mental processes, it is not easy to define it. Therefore a number of definitions have come up. Each one has defined intelligence for the specific purpose in his own way. However, all the definitions could be grouped into one of the following three groups. (a) One group of definitions places the emphasis on adjustment or adaptation of the individual to his total environment or limited aspect of it (b) A
second group of definitions state that intelligence is the ability to
learn and (c) still another group defines intelligence as ability to
carry out abstract thinking.

All the above categories of definitions are not mutually
exclusive. Obviously, ability to learn must provide the basic
ground for adjustment and adaptation in the ever-changing
situations in day-to-day life. A previous adjustment to a situation is
expected to have made a person wiser. In any new situation he
would encounter, he would start a fresh and there would be no
differences between an experienced person and an inexperienced
one.

Similarly the ability to carry out abstraction is also learnt by
experience, through contact with and perception of the objects,
events, qualities or relationships for which the symbols stand. It is
understood that, through the use of symbols and abstract thinking,
the man is able to enlarge his range of behavior in moderate,
concrete and specific situations and therefore has ability to adjust
and adapt to new or changing situations is also increased.

Wechsler (1958) defines intelligence as the aggregate or
global capacity of the individual to think rationally, to act
purposefully and to deal effectively with his environment. This is a
comprehensive definition and it encompasses the three views of
intelligence. Two new dimensions are, however, added in Wechsler's
definition. The definition states that an individual's intelligence is
revealed by his behavior as a whole ("global") and the intelligence
the intelligence involves behavior towards a goal, which may be more or less immediate (purposeful).

Theories of Intelligence

When one talks about intelligence it is implied that there is one principal kind of cognitive ability. From the time when Alfred Binet offered the world the first acceptable scale for the assessment of a person’s intelligence, those who were concerned about the nature of Intelligence, faced the important issue of whether that human commodity is a single, all-inclusive entity to a collection of many different abilities. There may be no single common ability involved in all kinds of intellectual tasks, and different kind of problems or situations may all require separate distinct skills.

Being a good experimental psychologist with investigations of thinking to his credit, Binet was well aware of the complexities of mental functioning. Asked to develop a means of distinguishing potentially slow learners in the Paris schools, he wisely extended the sampling of children’s capabilities in different kinds of task. Binet believed that individuals are not uniformly capable in all kinds of mental functions. In fact he thought that there are several kinds of memory abilities, and later experiences have proved him to be right Binet’s use of a single score was for pragmatic reasons. His aim was to make easy a single administrative decision on the placement of each child in one of two groups. He had also demonstrated that for every test item a common mental age value could be determined which may have implied for some that every
item was measuring the something. The common scale however was no indication that every item measures the same quality.

Following Binet, intelligent test developers, Lewis, Terman being the most prominent, were mostly unconcerned about the nature of what they were measuring. Their chief aim was to find something that worked, thus proceeding with a pragmatic rather than a scientific motivation. E.G. Boring (1923) made the unique suggestion that intelligence is whatever intelligence tests measure. He implied that recognized tests of intelligence should be studied scientifically to determination.

**Factor analysis: -**

Karl Pearson laid the foundation for a scientific method for studying such human variations when he devised the correlation method and its coefficient of correlation. A zero correlation between two tests of different skills indicated that they measure nothing whatever is common. A positive correlation indicated something in common and the higher the coefficient, the more in common. This is the basis for deriving information as to what tests do measure. The further steps needed are factor analysis and an interpretation of the factors in terms of psychological variables.

**The Two-Factor Theory: -**

Spearman (1927) stated that all intellectual activity is dependent primarily upon, and is an expression of 'general factor' common to all mental activities. The application of this concept in clinical practice assumes that there is a sufficient degree of positive
intercorrelation among intellectual abilities to warrant the conclusion that a single general ability is a significant component in performance on diverse intellectual tasks—such as verbal skills, perceptual capacities, abstract reasoning and the like.

Spearman postulated the ‘g’ factor, in the first place to explain correlations that he found to exist among diverse sorts of perceiving, knowing, reasoning and thinking. Using factor analysis as a tool, he concluded that all mental activity is to some extent dependent upon, and an expression of, this general factor and the magnitude of correlation coefficient found between the two forms of mental activity reveals the extent to which this ‘g’ factor is operative in each and common to both. Thus the amount of general factor operating in each activity will determine the size of the correlation between the two mental activities being measured. The types of material used in current tests of intelligence is word meaning, arithmetical reasoning, analogy, paragraph interpretation, perception of relationship in geometric forms, picture completion and others—all show significant degrees of positive correlations with one another. Later researches led some researchers to conclude that certain “group factors” are also present in some mental activities.

Since the intercorrelations among the various subtests are by no means perfect, Spearman postulated the existence of specific factors, called ‘s’ factors, each of which is specific to a particular type of mental activity. Thus the two-factor theory of Spearman states that all mental activities, have in common some of the
general factors, and each has its own specific factor. Of the kind of factors, the general one is regarded as the essential measure of intelligence.

**Early Models of Intelligence**

Factor analysis in Britain subsequent to Spearman’s led to the belief in other group factors of different degrees of generality with the growing number of factors in view, some efforts were made to see whether they could be logically related. The first kind of model suggested was of a hierarchical nature, as proposed by Burt (1949) and by Vernon (1950). These models were alike in placing Spearman’s ‘g’ at the apex. In Vernon’s model, immediately below ‘g’ were two broad abilities – V:ed (Verbal – educational) and k.m (special and practical) under V:ed were verbal and numerical abilities and under k.m came special and mechanical abilities.

**The Multifactor Theory:**

Intelligence is said to be constituted of a multitude of separate factors, or elements, each one being a minute element of ability. Any mental act, according to this theory of Thorandike (1927), involves a number of these minute elements operating together. Any other mental act involves a number of elements in combination. Hence, if performances on these two tasks are positively correlated the degree of correlation is due to the number of common elements involved in the two acts. If two types of mental activities A and B, are more highly correlated than are A
and C, the reason, according to the multifactor theory, would be that the first pairs has more elements in common than does the second pair. According to this theory, there is no such single factor as “general intelligence”.

**Thurston and his Multiple-Group Factors**

During 1930’s L.L. Thurston, gave birth to a quite different direction in factor analysis. His general theory viewed intelligence as a multi-dimensional phenomenon, each dimension in space representing a unique mental ability. He thought that his centroid method of factor analysis would discover abilities like Spearman’s group factors, but he apparently expected the basic factor to be of narrow scope.

After administering a large variety of test materials to college students and to High School and eighth-grade pupils, and after making correlational and factorial analysis of the results, Thurston and his collaborators (1941 and 1943) concluded that six primary factors emerged clearly enough for identification and use in test design and construction. They are briefly the following:

1. The number factor (N) “ability to do numerical calculations rapidly and accurately”
2. The verbal factor (V) “found in tests involving verbal comprehension”
3. The space factor (S) “involved in any task in which the subject manipulate an object imaginally in space”
4. The word fluency factor (W) “Involved whenever the subject is asked to think of isolated word at a rapid rate”

5. The reasonable factor (R) “Found in tasks that require the subject to discover a rule or principle in series or groups of letters”

6. The rote memory factor (M) “Involving the ability to memorize generally”

Though primary mental abilities were originally said to be functionally independent of each other, later work led Thurston to conclude that in addition to the primary abilities, there is a “second order general factor” because of positive and significant intercorrelations in these primary independent mental abilities.

On a closer look, the Spearman’s general factor theory and Thurston’s group factor theory seem quite close to one another while Spearman’s theory, which could be renamed as General factor-group factor theory, with primary emphasis on a general factor but due recognition of existence of a group factor. The group factor theory is a group factor theory with its recognition of existence of a second order general factor to explain its results. The narrowing of difference between these two theories is considered to be a significant scientific progress.

**Origin of the Structure-of-Intellect Model**

After five years of operation, the Aptitudes Research Project, has verified almost all the factors reported and added few more
more factors to the list. By that time, certain similarities and differences among the abilities were standing out, as were some parallels; thus an attempt was made to organize them.

The abilities could be grouped according to the kinds of mental processes involved. For example, comprehension, neurology, and fluency of ideas but the very same abilities could also be classified according to the kinds of information-featured visual, symbolic and semantic. A third way of classification dawned more slowly, but it became realized that sets of abilities were also similar in the form that, the items of information took classes, relations and systems. The grouping of the abilities in three different ways called for a cross-classification in three dimensions. Visually conceived this became a cubical figure (see fig 2.1). Such an arrangement was called a morphological model or a “product of sets”.

A fourth category of content was added on the basis of pure speculation. Aware of the fact that Spearman had found evidence for a “psychological” content category of information and that E.L. Thorndike (1920) had argued vigorously for a “social intelligence” that would involve the awareness of the mental states of others, it was hypothesized that this area would possess the same kinds of abilities as had already appeared in the other categories of information.
2.1.1 Guilford's Model:

The most prominent multifactor theorist of United States J.P. Guilford in the year 1967 with his associates developed a three-dimensional 'structure of Intellect model' as a way of organizing intellectual factors into a system. One dimension represents 'Operation' categories, a second dimension represents 'Content' categories and a third dimension represents 'Product' categories. Intellectual activities can be understood by the kind of 'Mental Operation' performed, the type of 'content' on which the operation is performed and what results is 'product'.

Process of operation: It consists five main groups of mental abilities:

I. Cognition: it refers to discovery, re-discovery or recognition

II. Memory: implies retention of what is cognized and recalling or recognizing.

III. Convergent thinking: is the type of thinking that results in the right or best answer.

IV. Divergent thinking is the thinking in different direction or searching for variety about goodness, suitability or adequacy of what we know, remember or think.

V. Evaluation: is reaching decisions about accuracy, goodness or suitability of information.
**Material or content:** It involves four factors.

I. **Figural content:** is material perceived through the senses

II. **Symbolic content:** it is composed of letters, digits and other conventional signs, usually organized in general systems (alphabet, number system)

III. **Semantic content:** it takes the form of ideas or verbal meanings

IV. **Behavioral content:** it refers to social intelligence or knowledge and understanding of ourselves and others

**Products:** They result from the application of operations to content. There are six general kinds of products.

I. **Units:** comprehending visual, auditory and symbolic units plus the knowledge of the meaning of words.

II. **Classes:** the ability to classify into words or ideas or concepts

III. **Relations:** the ability to perceive relationship between objects because of their figural or symbolic properties and the ability to discover relations in conceptual material.

IV. **Systems:** the ability to structure objects in space, to structure symbolic elements and the ability to structure problems in the preparation for solution.
V. Transformations: the ability to visualize what would happen to objects if they were changed, or to suggest changes in existing circumstances.

VI. Implications: the ability to extend expectations and project present information into the future.

According to Guilford each cell in the model is three-dimensional since it portrays the intersection of three variations.

I. Operations

II. Contents

III. Products.

There are five kinds of operations, four kinds of contents and six kinds of products. Therefore there are $5 \times 4 \times 6 = 120$ cells in the model, each representing a unique kind of ability.

Guilford believes that intellect is a logical structure composed of two main categories - memory and thinking. Thinking is sub-divided into cognition, production and evaluation. Production is further subdivided into convergent and divergent abilities. In this way there are five groups of intellectual factors characterized by certain operations. Each of five groups may be classified by two principles - the kind of product involved (the ability to know units, classes and the like) and the kinds of contents deal with (figural, symbolic, semantic and behavioral).
Altogether there are 120 little cubes or cells in the Model, each representing a unique kind of ability. Ability in any cell is unique by virtue of its own combination of one kind of operation, one kind of content, and one kind of product.

In 1988, J. P. Guilford published a paper entitled ‘Some Changes in the SI Model’. Two significant changes were made in the model. The first change has been reported in a 1977 book by J.P. Guilford entitled “Way Beyond the IQ’ Guide to Improving intelligence and creativity”. It involved a separation of the figural content column into ‘visual and auditory’ categories. More auditory abilities have been reported by Feldman (1969) and Horn (1973). These abilities are fitted into the original SI Model.
The change had been called for by the finding of a parallel set of six memory – retention abilities by Kamstra (1971). His long-term retention abilities were found to have substantial correlations with their short term mates as the one function depends somewhat upon the other. In the S.I. Model Guilford called a new column as ‘memory retention' and the former memory column as ‘memory recording’.

Memory includes not only recording and retention, but also retrieval of items of information from memory storage. Although it was previously recognized that both divergent and convergent production depend heavily on the retrieval of information from storage, something more seemed to be involved. Guilford realized that the ‘something more’ can be accounted for by other SI features and that one may regard the two SI functions as operations of retrieval ‘broad search’ in the one case and ‘focused search’ in the other.

Now the memory element has been differentiated into ‘memory recording’ and ‘memory retention’. These divisions are based on empirical evidences. Thus the revised SI model now contains five content categories viz., visual, auditory, symbolic, semantic and behavioural. Six operations viz., cognition, memory recording, memory retention, divergent production, convergent production and evaluation and the former six products viz., units, classes, relations, systems transformations and implications giving raise to 180 (5 × 6 × 6) factorial abilities.
Creative process has been viewed by Guilford as divergent thinking involving cognition, memory, production and evaluation. For him it involves problem solving and a host of aptitude factors of divergent thinking viz., fluency, flexibility, originality and elaboration. Originality is the most important one among the factors of creativity. There is also a factor known to be sensitivity to problems. Some convergent thinking factors involving redefinition of information have been found to be operative in creative thinking. Thus according to Guilford, creativity is a constellation of factors acting differently in different individuals. Guilford’s approach in the context of his structure of intellect theory has promoted factor based testing of creative abilities.

2.2 DEFINITIONS OF CREATIVITY

Creativity is the hallmark of all progress a search for new methods, ways, alternatives, possibilities, approaches, processes, and products has led to the change and advancement in all fields. Behind every invention, there is a creative mind. The world would not have moved, had the wheel been not invented. Thus it is an established fact that creativity and advancement go together. There is hardly any definition of creativity, which is acceptable to all.

Definitions vary, modes of identification vary, theories vary, research methods and results vary. Agreed upon only is that creative thinking is the highest of mental functions and creative production the peak of human achievement. The most widely applied definitions may be classified according to the emphasis placed on the product, the process or the experience of creativity.
Some definitions are formulated in terms of a manifest product. It is novel and useful. The criterion here is a statistically infrequent tangible response or idea that is adaptive and sustained to fruition.

Mckinnan (1963) defines creativity as “a process extended in time and characterized by originality, adaptiveness and realization”.

Torrance based his definition of creativity on an analysis of the diverse ways of defining creativity and the requirements for a definition, which keeps a program of research focused on factors affecting creative growth in context. He defined creativity as the “Process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies and so forth, identifying difficulty, searching for solutions, making guesses or formulating hypotheses about the deficiencies, testing and retesting these hypotheses (and possibly modifying and testing them) and finally communicating the results” (Torrance 1962, 1966). This definition describes a natural human process, and strong human needs are involved at each stage.

Some scholars, however, object to this definition. Ausubel objects on the ground that it does not distinguish between creativity as a highly particularized and substantive capacity and as a generalized constellation of abilities and traits. When the definition of creativity is spelled out in particular, the result, as Ausubel notes, is “a generalized constellation of intellectual abilities, personality variables, and problem solving traits” (Ausubel 1963, 99).
Creativity may be defined as the ability to discover new solutions to problems or to produce new ideas, inventions, or works of art. Levin defines it, as “Creativity is a special form of thinking, a way of viewing the world and interacting with it in a manner different from that of a general population”.

Passi has put it as “Creativity is a multidimensional (verbal and non verbal) attitude differentially distributed among people and includes chiefly the factors of seeing problems, fluency, flexibility, originality, inquisitiveness and persistency”.

J. S. Rajput (2000) is of the opinion that-

“Creativity is often conceived to be the ability to bring something new into existence. It is not a fixed and static quality but something that changes over time”.

Drevdahl defines “creativity is the capacity of a person to produce compositions, products or ideas which are essentially new or novel and previously unknown to the producer”.

These different definitions have one thing in common about creativity, which is the power of visualizing. Vision is the basic ingredient of creativity. As vision is the basis of creativity, creativity should be conceived, as a natural endowment of human being within human nature remains the capacity to go beyond the present status. New problems arise and motivate man to find new solutions. In this sense, man can be called the bearer of the creative process (Sen Gupta, 1984). “He is a unique representation of the
universe in whom the unconscious creativity of nature becomes conscious creativity" (Radhakrishnan 1960).

Paramesh (1972) is of the opinion that “Among several definitions, one definition of creativity which seems promising still, because of its operational nature is that of Wallach and Kogan” (1965). According to Wallach and Kogan (1965). Creativity, refers first to the production of associative content that id abundant and that is unique, second, the presence in the associator of a playful, permissive task attitude”.

If we try to analyse the above definitions we find out that the creation or discovery of something new is a central element. Therefore it can be concluded that creativity is the capacity or ability of an individual to create, discover or produce a new idea or object including the rearrangement or reshaping of what is already known.

2.3 SOME RELEVANT ASPECTS OF CREATIVITY

For many years, the person labeled ‘creative’ was considered to be someone who had produced a recognized work in the area of fine arts, a sculptor, painter, composer, etc. Gradually this concept was enlarged to include inventors who might bring forth novel products in almost any field of endeavour. Creativity was considered to be a characteristic of a few outstanding individuals, a trait that the common man might admire but never aspire to possess. More recently there has been growing conviction that every one has it in his power to be creative to some degree. Some
feel that this degree is inherited and some believe that it is developed as a characteristic of healthy mature personalities. Stenott opines, “Creativeness consists in marshalling the widest possible array of facts and ideas and then carefully searching for hither to unrecognized relationships between them”.

Some researches have expressed that creativity is, an outcome of a drive or is seen as a manifestation of an innate orientation of the organism, the term used for such criterion is ‘self actualization’ (Maslow 1959).

“Creativeness cannot be taught, it can only be released and guided” opines Mauree Applogate. A person who has never had the opportunity, guidance or experience in creating is less apt to be able to exercise his capacity than one who has been exposed to such circumstances. Curiosity combined with an individual’s ability to use language without which his knowledge could not be passed from one to another and the freedom and encouragement to act creatively give a man truly unique position in the universe.

Rogers (1963) has postulated that following three inner conditions are most closely associated with creativity.

1. Openness to experience i.e. tolerance to ambiguity.

2. An internal locus of evaluation, i.e., corresponding to ‘eureka feeling’.
3. The ability to toy with element and concepts, i.e., ability to play with ideas, colours, shapes, relationships, etc., in prelogical fashion.

2.3.1 Creativity from Philosophical standpoint

Indian philosophers, over the centuries have given deep and abiding thought to the theoretical and philosophical aspects of the process of creativity. According to them creativity is thought as a divine inspiration. Certain reformers, poets, philosophers like Plato, Kalidas, Tagore have supported this view that from moment to moment man is creative in his ability to innovate new forms. Often it is evidenced that painters, novelists, writers, dramatists, singers, dancers project their repressed desire through their creative abilities in their respective fields, Kant in his classical work ‘The Critique of Pure Reason’ says that creativity is natural and therefore it cannot be taught. Indian concept of creativeness is not based on any magical mysticism but on the needs of men and the realities of our nature. For a philosopher a creative thinker is one whose thinking leads to a result, which conforms criteria of values in one domain or another.

2.3.2 Creativity from Psychological standpoint

Psychologists differ in their views. Some have equated creativity with mental health; some have related it to personality development, while others restricted it to interplay of unconscious and conscious mind. Creativity as some believe, often results from repressed frustrated urges. Freud viewed it as often regarded as
incentive genius. Darwin’s theory of evolution points out that human creativity is the manifestation of creative force inherent in life in organic matter.

2.3.3 Creativity from Scientific stand point:

Scientifically creativeness involves an imaginative leap to a new perspective. The scientist searches for a hypothesis, which is likely to fit the facts, he is concerned with. He observes a phenomenon, which is obvious for others, seems to be problem to him. His mind starts working on it and it becomes the beginning of his discovery. A creative scientist is he who by his potential ability solves the problem and the ability of getting puzzled which makes him to differ from an average scientist, a social scientist approaches creativity with respect to interpersonal relationships. For him creativity is a social invention with human relationships. Therefore such a person is one who is intelligent and possesses sharp perceptions, subtle sensitivities, and respect for the individual, boldness to explain one’s point of view to stand for ones’ convictions.

2.3.4 Creativity as a Phenomenon

Creativity is a multiphase mental ability, which is amenable to change through the manipulation of environmental conditions and by systematic effort. From the following excerpt from McKinnon (1970) one can notice how creativity is a multifaceted phenomenon.
"Many are the meanings of creativity. Perhaps for most it denotes the ability to bring something new into existence, while for others, it is not an ability but the psychological process by which novel and valuable products are fashioned. For still others, creativity is not a process but a product”. Definitions of creativity however, range all the way from the nation that it is simple problem-solving to conceiving it as the full realization and expression of all of an individual’s unique potentialities creativity is indeed a multifaceted phenomenon.

Creativity is viewed as flexible, fruitful process, a novel product, a subjective experience. The conditions closely associated with creativity are openness to experience, ‘eureka feeling’, and ability to play with colours, shapes, and ideas spontaneously in prological fashion. No one knows at present how integration of thought occur in mind and the disturbing aspect regarding creativity seems to be the absence of adequate criteria there seems to be a judgment based on impressions and rationalization of impressions.

As there is no satisfactory criterion measure it is very difficult to give a clear-cut definition to creativity. In general, it may be stated that creativity occurs practically at all ages, in some aspects of all cultures, to some degree, in all fields of human work and endeavor.

Creativity remains mysterious and unanalysable to a layman. To some it is something emphasizing unusual combination, while
for others; it is a kind of thinking ranging from fantasy and daydreaming to logical reasoning.

Rhode (1961) identified the four different facets of creativity, the product, the process, the person and the press i.e., environmental press.

2.3.5 Creativity as a process

Creativity sometimes appears to be a process involved in problem solving situation. E. P. Torrance in his book "Guiding Creative Talent" defined it as "a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies and so forth, identifying difficulties, searching for new solutions, making guesses, formulating hypotheses and finding new ways. There is a general assumption that the process of creativity is similar in both fields of arts and science". According to Sinnott (1958) "Organic evolution is a truly creative process as the one described" in "Paradise Lost". He mentions that "one method operating in the process arranges the widest possible array of facts and ideas and then carefully searches for new relationships between them". He further quotes the example of inventions of Edison and Einstein to substantiate this viewpoint mentioned earlier.

Some view creativity an association of different contrasting ideas or elements. New ideas arise spontaneously in the mind of an individual who at that time may be thinking of something different.
Famous French mathematician Henri Poincaré’s insight into mathematics is quoted as an example.

John Dewey (1916) perceives the creative process as synonymous with thinking process. According to him the stages of thinking are:

a) The sensing of a problem

b) The observation of conditions

c) The formation of a conclusion

d) The rational elaboration of a suggested conclusion

e) The active experimental testing of the conclusion

As a process creativity has been explained in three ways.

1. As a sequential series of stages of activity.

2. As a vertical level of psychological functions.

3. As a type of mental forces.

From the point of view of types of mental operations, creative thinking is regarded as one of the various kinds of operations included in the higher mental processes and “is usually distinguished from other kinds of thinking largely in terms of non rational aspects”.

During such process there is need of random exploration and a clarification. Then ensues a period of preparation accompanied
by reading, discussing, exploring and formulating many possible solutions for eventual selection and perfection of ideas. These ideas are found in inventions, improved products and methods, novels, paintings, musical compositions etc.

Creative process when perceived as a deliberate process does not lay much stress on the perceptible stage of incubation or insight during the process itself. Some authors, while describing the creative process have emphasized the stage of incubation, illumination or insight.

Ghiselin (1952) describes, “Creative process is the process of change, of development, of evolution in the organization of subjective life”. It proceeds from a feeling of dissatisfaction with the established order and reaches fulfillment in the attainment of a new order. The creative individual he says, works from “the unrealized towards realization”. The new order that is created is, therefore, acceptable to consciousness.

Wallas (1926) and Guilford (1967) illustrated the main steps in the creative process in the following manner.

a) Identification of a need
b) Preparation and concentrated study of the problem
c) Incubation, period of conscious and sub-conscious gestation or synthesis of material
d) Illumination, insight, visualization of a solution
e) Elaboration and verification of concept.
A sudden flash of illumination or insight about the solution of the problem comes to his mind when actually he is thinking of something else. Such an insight cannot be logically thought of as a next step after the step two mentioned above unless the individual is either consciously or sub-consciously organizing the data relevant to the problem in an implied step called incubation.

Bruner (1962) is of the opinion that intuitive thinking does not advance in careful well defined steps but it tends to involve maneuver’s based on an implicit perception of the total problem. The thinker arrives at an answer which may be right or wrong, with little if any awareness of the process by which he reached it, he rarely can provide an adequate account of how he obtained his answer, and he may be unaware of just what aspects of problem situation he was responding to. Usually intuitive thinking rests on familiarity with domain of knowledge involved with its structure, which makes it possible for the thinker to leap abrest, skipping steps and employing short cuts in a manner that required a later reaching of conclusions by more analytic means, whether deductive or inductive. Thus it is difficult, presently, to give a precise definition for such intuition or illumination in terms of observable behaviour.

An associative basis of creative process was found out by Mednick (1962) in the following three ways.

Serendipity: Requisite associate elements may be evoked contiguously by contiguous environmental appearance of stimuli which elicit these associative elements. This sort of creative
solution is often dubbed serendipitous, for which we can give example of scientific discoveries and inventions.

**Similarity:** Requisite associate elements may be evoked in contiguity as a result of similarity of associative elements, example, creative writing, which explains homonymity, rhyme, and similarity in structure and rhythm in words or in objects they designate.

**Mediation:** The requisite associative elements may be evoked in contiguity through mediation of common elements i.e., bringing associative elements into contiguity with each other which is of great importance in those areas of endeavour where the use of symbols is mandatory.

Examining the individual variations underlying creative process, Mednick (1962) says that it is possible to deduce a number of variables, which explain individual differences in creativity. The existence of associate elements and their hierarchy, number of associations, personalities style's and the process of selection of creative combination have received attention from Mednick. In the absence of these elements collision, formation of ideas into new combinations do not arise.

Highly creative individual is thought to be more fluent in his thinking, being able to generate from his memory stores alternative ideas in great variety and large quantity. He is characterized by less stereotype and commonality. Creativeness is characterized not only
by the number of ideas generated but also by the specific requirements the solution meets in a given problem.

Creative process has been perceived both as a logical process of thinking that can be implied in the steps of scientific method from sensing a problem to experimental verification, and also as a process which has the phases of inculcation and illumination. In short, creativity is a process where the individual locates gaps in ideas, thinks of alternative solutions to a problem, persists on an idea does not easily agree to what is usually thought to be correct and has unique/ original ways of thinking or doing.

2.3.6 Creativity as a Product:

Creative means to create something, new, original and unique. New means the entity is marked by more than a certain degree of novelty or originality. This novelty according to Mackinnon (1970) must be able to solve a problem or accomplish some recognizable goal. He points out that true creativeness involves sustaining of original insight, evaluation, elaboration and developing of it to the fullest extent.

From the above point of view a painting, a pun, a poem, a mathematical theory or mechanical invention become a creative product.

Novelty seems to be a primary step irrespective of other positive qualities. Guilford also laid emphasis on the divergent production. However, he has conceptualized creativity in terms of mental abilities involved in creative achievement. His factor
analytic studies show the presence of divergent production in creative thinking, which he defines as “The generation of information from given information where the emphasis is on variety of output”.

To Jackson and Messick (1967) the first step is judgement of uniqueness and the second step is appropriateness of the product. In addition, not of these two they feel that the creative product is characterized by transformation and condensation.

The product resulting from process must fulfill the criteria of uniqueness, novelty, and appropriateness. This could be a product of insight, or elaboration of an original idea. Creativity is an activity resulting in new product of a definite social nature.

2.3.7 Creative person:

Certain personal qualities help the individual to be creative in his respective openness like curiosity, adventure, inquisitiveness, exploration etc. Qualities like risk taking, independent judgment, less authoritarian, accepting chances, persistent, awareness, humor, non-conformity, confidence, self sufficient, strong affection, (Torrence) fluency, flexibility, originality and elaboration in thinking, skepticism, intellectual playfulness (Guilford). Many more characteristics of creative persons at all levels whether they are in school or among adults. But the personality qualities of creative scientist or mathematician differ from creative writer as their respective fields differ from one another. One misconception about creative persons is that they are excentric. Actually they are
not. They may seem to be absentminded, sometimes very unconventional. They are essentially psychologically healthy people and mentally alert.

This component of creativity is also explained in terms of the condition of self-actualization. Creativity from this point of view involves “a fundamental change in personality structure” which occurs in the direction of fulfillment (Maslow, 1959). The criterion of self-actualization “identifies creativity with self-formation, and therefore implies that unless significant transformation occurs in personality during an activity, that activity will fall short of the creative”. Points out that this criterion asserts a connection between motivation and creativity, “for the self-actualizing person is characterized by an unusually strong motivational drive” Hallman (1963).

2.3.8 Creativity as Press:

Hallman calls press as environmental press. It is the condition of openness, which refers to “those characteristics of the environment, both the inner and the outer, the personal and the social, which facilitate the creative person’s moving from the actual state of affairs which he is in at a given time toward solutions which are only possible and as yet undetermined” Hallman (1963). The personal dimensions of openness include such traits as self-acceptance, sensitivity, tolerance of ambiguity and spontaneity. The social ones include all such conditions in the environment, which facilitate openness and are the opposite of authoritarianism.
2.4 FACTORS OF CREATIVITY

Expression of creativity depends on the complex interplay of many factors like personal qualities, skills, attitudes and motives, which are key factors to the realization of potentialities within everyone. Other than these certain personal and situational attributes are found to be more promising predictors of creative performance. In broader terms, a few components of memory, cognition and evaluation, convergent production and divergent production are also involved in creative work. Divergent production seems to be the most important for the production of ideas in both quantities as well as in quality as it involves originality, flexibility and ability to redefine. These intellectual aspects of creativity are relatively distinct components. Some of these intellectual components underlie some of the motivational forces in the creative person such as drive, dedication to work, resourcefulness, striving for general principles and desire for discovery.

According to Guilford (1975) there are four creative thinking abilities, fluency, flexibility, originality and elaboration. The intellectual operation for these abilities is divergent and it can apply to all content areas.

**Fluency:** Convergent production tests are concerned with measuring the ability to solve problems in as many ways as possible. Ideational fluency denotes skills in generating quantities of ideas in a language context. Associational fluency is the ability to produce many relationships or meaningful associations with a
given idea. It is evidenced by the quantity of synonyms a person can attach to any familiar word that has many meanings. Expressional fluency refers to skills in juxtaposing words to meet sentence structure requirements. According to Guilford individuals differ with respect to the rate which they can produce ideas. The rate of flow of new ideas is an index of fluency of thinking. A creative person has more fluency of ideas.

**Flexibility:** The skill of being able to discontinue an existing pattern of thought and shift to new pattern is called flexibility. Two subskills can be recognized, each having different content and product. Spontaneous flexibility deals with changes in direction of thinking when a person is not instructed to do so. Adaptive flexibility deals with changes in direction of thinking to solve problems. In this case the content is figural, such as geometric forms which the person uses to make as many objects as possible. According to Guilford individuals differ in their flexibility of thinking. Individuals who are rigid in their ways of thinking cannot reject the habitual and conventional ways and strike out new directions. A creative person is more flexible in his thinking.

**Originality:** The process of originality resembles that of ideational fluency. Thinking of unusual, uncommon, novel and off-the-beaten-track ideas, questions, suggestions solutions, or ways of doing things as a result of seeing new relationships, combining ideas, stretching beyond the obvious and common place, improving things on new lines and looking at the same thing from a new angle.
**Elaboration:** The process of elaboration is relevant to skills in planning and organization. Adding details to the basic idea, a figure or an object and making it fanciful. Looking into the implications of ideas. Elaboration is seen in facility in giving details to round out a complex innovation, such as an organized plan. The nature of the given system suggests the added embellishments.

**Redefinition:** According to Guilford, one more factor related to creativity is the ability to redefine the use for a particular object or redefine the interpretation of a situation. There are instances, when in a situation of emergency and in the absence of needed material, a creative individual could find a new substitute and solve the problem.

Persons who lack in ability to redefine are not able to see any other use for an object excepting the one to which they are accustomed. This is called functional fixity, which we see in the experiments with animals. The ape, though accustomed to using a stick for pulling banana finds it difficult to break the branch of a tree and use it as a stick. To him stick is so much a part of the tree that he cannot see it as a separate object, which can be used, as a tool. Hence the emphasis is on the ability of rearranging ideas, concepts or objects or to indicate the use of parts in new ways. Improvising in general, probably reflects the ability of redefinition.

Thus redefinition can be used for studying creativity. Guilford has developed a large number of tests of divergent thinking. These have been used as measures of creativity by him and other psychologists.
**Problem Sensing:**

This is one of the factor of creative learning and teaching process which is a part of Brain Storming. Brain Storming is useful for problems that can have multiple solutions and begins with a problem at hand, a perplexing situation, and an episode encountered by the group members, paradox, gaps in knowledge or some puzzling phenomena. Sometimes the leader has to bring such stimulant to the notice of the participants and has to develop and heighten concern about the problem. The problem usually is specific rather than general, familiar, simple and talkable. Osborn feels that if the problem is presented to the group several days before, it gives better results. But some will not agree with Osborn. They think, on the other hand, that such practice has got adverse effect. They feel that “in thinking about the problem, a participant considers many solutions. Some of these ideas may have been the ones that would trigger off a worthwhile idea by another. Another disadvantage of early disclosure is that the participant may become ego centrically involved with the idea he thinks worthwhile. He then becomes a less effective contributor” (Fange 1955). This argument seems to be logical, and moreover, Osborn himself has often presented the problem for brainstorming in the session itself in his creative problem solving courses. It would probably provoke more and spontaneous reactions if the problem were presented at the beginning.
2.5 CREATIVE THINKING

Thinking, problem solving and creating such things or thought, which are novel to the person, are some of the most complex activities of human beings. A problem cannot be solved without thinking and there are many such problems the solutions of which are novel for the individual and the group. To arrive at the solution the individual has to seek the help of imagination and has to seek the help of thinking and has to construct something new. The production of such thoughts and things, which are new to a person, involves problem solving. Thus we find that thinking, including reasoning, problem solving, imagination and creativity are related to one another.

Thinking like perceiving and remembering is a cognitive process. It depends both on perception and the memory of the material. However, it must be remembered that thinking can be about such events, happenings and experiences that have never occurred or perhaps may never occur.

There are various kinds of thinking such as, reveries, controlled association, reasoning, conceptual thinking, imagination, daydreams, night dreams, creative thinking and so on. These various kinds of thinking are not separate and distinct but grade into one another. The material made use of in all types of thinking is of the same kind and hence it is not possible to distinguish types of thinking by the objects of thought. Thinking may vary in at least two important ways.
1) In the kind and amount of control of the process by the thinking individual and

2) In the degree of correspondence between the original experience and the representation of that experience in the thought.

Psychological researches in the domain of thinking have revealed that there are a variety of thinking abilities and not all of them are of equal value from the point of view of production of new and useful ideas. Closely related to problem solving is another process, commonly known as creative thinking. The only difference in creative thinking is the solution arrived at is original and unique, nowhere else having thought of such a solution earlier. This difference can be at one or two levels. First, this may be at the perceptual level. It is quite possible that one individual sees a problem and the possible solution to the same where other has not. The second possible difference is at the conceptual level. Different people may conceptualise an occurrence or an event in different ways. Finally, the difference is at the level of insight or finding a solution.

A type of thinking now commonly designated as divergent thinking which enable a person to think in new directions and to arrive at novel solutions to problems is considered to be of much importance for creative work. Successful creative thinking involves a capacity for varied and rich imagination and also a capacity for extensive and intensive trial and error activity at an implicit level. Years ago, the famous educationist, psychologist, philosopher John
Dewey described the following stages in creative thinking i.e., observation, assimilation, incubation, experimentation and verification.

In recent years, creative thinking involves a type of thinking known as ‘divergent thinking’ slightly different from the convergent thinking involved in problem solving (Guilford 1966). This concept was first put forward by Guilford (1966) and his associates on the structure of Intellect. Convergent thinking involved the generation of ideas and facts from known information, and divergent thinking pertaining to new ideas or data, which minimally depend on known information. In terms of the end result, convergent thinking implies “a single already ascertained right response” whereas divergent thinking results in “a variety of responses involving fluency, with intelligence”. Convergent thinking is measured by an intelligence test while divergent thinking give a most obvious indication of what generally goes by the name of creativity.

According to Guilford “Divergent thinking makes excursion from the beaten tracks and seeks variety, convergent thinking follows the conventional path with the thinker using information at hand and arrives at one answer which other would reach. Creative thinking involves the same mental processes that are utilized in other forms of thinking, i.e., experience, association and expression. Mental impressions are received, recalled, reflected upon and applied.” The stages of creative thinking usually include preparation, a time of incubation and insight.
The predominant conceptions of creative thinking derive from sources as diverse as classical learning theory, psychometric models of intellect, and psychoanalysis, which do not, of course exhaust the variety of views.

The line of demarcation between creative thinking and reasoning or problem solving is not very clear. Some people have a view point that creative thinking is the same as problem solving. When a person is solving a problem he is creating something new to himself which was unknown to him when an inventor is working on his invention he is in actuality solving a problem which has arisen to him. It is because of this that there is hardly much difference between the steps of problem solving and creative thinking.

For associationists, thought is a chain of stimulus – response connections. A problem initiates a succession of previously learned responses to try out in the new situation. There is no fundamental difference between the higher and lower mental functions, between trail and error, logical or creative thought. The creative thinking process consists simply of the forming of associative elements into new combinations that are in some way useful. The more mutually remote the combinatory elements, the more creative the process or solution (Mednick 1976).

For Gestalt theorists, thought does not proceed through trail and error associations. It proceeds through cognitive reorganization of a problem situation where there is a structural gap between a solution and the situation where the gap is closed and the structural
trouble disappears. In creative thinking, the unstable structure of
the problem situation produces tensions, which the creator reduces
through a solution that needs these conditions. It does justice to the
facts, it fits the personalized view of the creator, it presents the
simplest possible structure for the complex set of problematic
conditions (Arnheim 1966).

Terman founded his 'Genetic Studies of Genius on the
assumption that the source of giftedness is in superior intellect, and
since the general intelligence test is the most valid measure of
intellect, a high IQ is the most valid index of giftedness. According
to this conception, ability to solve the kinds of problems presented
by the intelligence test is the principal ingredient of creative
thinking, and intelligence as represented by the IQ metric is the
primary determinant of creativity and even of genius.

Guilford desegregated the factors of intellect, distinguishing
especially between convergent and divergent thinking. Convergent
thinking is the generation of new information maximally dependent
on known information. In most intelligence tests problems are
given where the only acceptable solution is a single already known
solution. Divergent thinking is the generation of new information
minimally dependant on known information and the acceptable
response to a given problem may be a variety of emergent solutions
characterized by fluency, flexibility, originality and elaboration,
which are said to be the principal components of creativity.
Steps in Creative Thinking:

H.L.F Von Helmholtz has listed three steps for creative thinking and G.Wallas has added fourth one.

1) Preparation: One makes purposeful study, makes all the efforts to accumulate that information which has bearing upon a particular objective. At this stage one makes himself so familiar with the facts that they can be recalled without reference to notes or record.

2) Incubation: It is the period when the creative thinker turns over the idea in his mind leisurely and periodically. He allows it to mature. He does not hurry with it nor completely forgets about it.

3) Illumination: At this stage a clear conception of the answer to the problem that emerges from his earlier study tossing over the ideas in the mind is rewarded by a solution, which seems appropriate.

4) Verification: This is the stage where the solution to the problem, which has been found, is extended to other situations. At this stage the conclusion is attempted to be revised and reformed in the light of application.

Inspiration comes to us as we think and reflect. At one time or another each one of us must have had the experience that someone has stated a new idea or conclusion. We ourselves have enough ideas and experiences but we fail to express. Credit goes to
the person who gives expression to the idea even though it is in our mind also. Such a thing happens with many individuals who have good ideas but lack of facility of expressing them. It is the function of the school to help learners not only to gain ideas but also to express them in understanding language. Too often, crowded courses of study in our schools leave little time for creative expression.

2.6 FACTORS FACILITATING CREATIVE ABILITIES

Several personality traits have been found to be valid indicators of creative potential. Among them self-sufficiency, independence, openness, stability, tolerance to ambiguity, feminity in interests and self confidence rate first.

The life histories of highly productive, creative people have been studied intensively, and certain common family home and school conditions have been found to be related to creative output (Roe 1952).

It is rather difficult to identify precisely the conditions that contribute to the emergence of creativity. It may be partly hereditary and partly environmental. A liberal progressive outlook at home, a decent education and talent may increase the chances of one’s creative pursuits compared to non-creatives. The creatives tend to come from relatively better off, well to do families and most of their parents have artistic interests, a family environment that encourages risk-taking, and experimentation may stimulate a strong innovative effort.
I. Environmental Factors

Environmental factors also affect the creative potential. These can either enhance or hinder development of those attributes, which seem to be predictors of creative performance. These include factors involved in educational settings, working conditions, climate and training programmes. Environmental factors like relaxed and facilitating conditions, playful, game like, non competitive and process oriented than product-oriented environment.

Home environment:

This may be regarded as external influences modifying creative attributes either in positive or negative direction. Torrance is of the opinion that everyone possesses to some degree of ability to be creative, which depends on the way children are treated and provision made possible in home and school for experiences and guidance, which will free them to develop and function fully. One question arises here whether highly creative children come from a special kind of home background, which particularly facilitate the emergence of creative behaviour. Children from permissive background tend to be more independent, cooperative and creative than those with strict upbringing.

Psychological significance of Play:

Children are exploratory by nature. Children’s thinking can be developed more through play than any other medium. Most of the parents are not aware of the fact that availability of new,
enriched, planned playing material will stimulate child’s intellect, imagination, reasoning and judgement. Child's ability to manipulate objects with widely differing property, colour, shape and form with discovery, classification, analysis enhance the natural development of his concrete reasoning.

II. Parent Teachers Association

Teachers in the school can invite parents and discuss various issues including their roles and significance for the total development of the child. The timely meeting of parents and teachers and their understanding will go a long way in strengthening child’s psychological make up.

Parents can better understand how to provide opportunities for development of creative abilities. The following points are worthy for considerations:

- Making achievement activities rewarding
- Setting goals, which are challenging rather than too easy or too difficult.
- Conveying creative sense of confidence in the child’s chances of success and a high regard for his abilities.

III. Parental Care

Parental personality to some extent is significant in nurturing child’s creative ability. Creative young scientists and their equally bright counterparts describe their parents as moderately
affectionate, non-rejecting and highly encouraging of intellectual independence. Too much freedom, impede the actualising of individual’s creative potential.

Failure in case of parents to understand their creative children results in destructive, unsocial and even anti-social activities. Parents should recognize that criticism, making fun of child’s ideas, laughing at his fantasy and decision can prevent the child from giving expression to his creative ideas.

IV. Other Factors: -

Contemporary studies of creativity in different fields of human life have presented the findings that indicate the requisites for development of creativity. Alamshah (1967) specifies four minimum conditions for creativity – motivation, self-limitation or selectivity, receptivity and competence. Many other factors have their influence on the nurturance of creativity.

Such other factors are: -

1. Emotional and psychological freedom, freedom of unconscious functions i.e., without restrictions of conscious processes and without interference from unconscious process and without interferences from unconscious determinants (Kubie 1967), freedom from teacher conformity (Olten 1966).

2. Independence of thought, attitude, judgement and actions (Kneller 1965, Masao 1972).
3. Absence of repression and suppression as mechanisms for the control of impulses and images (Welsh, 1973)

4. Open mindedness in experiencing the world in a personalized, involving manner (Machead 1973, Smith 1973)

5. Need for self actualisation (Krippper et al, 1972), self-confidence and concentration (Osborn 1966), sensitivity to all external stimuli (Hallman, 1967)

6. Personality variables like emotional sensitivity (Torrance, 1965), stability and freedom (Kubie 1967)

7. Sensitivity to and tolerance for self-expression of others and awareness of attitudes and values held and expressed by others (Vick and Rhyne 1968)

8. Training and practice of activities that largely involve right hemispheric functions of the brain (Ornstein, 1972)


10. Deferred judgement – minimizing importance of error (Bruner, 1962) non-evaluative context (Parnese, 1967b) lessening of defenses, inhibitions, non-interferences, spontaneity of expression (Maslow, 1967), Suspension of judgment particularly when associated with fear of being
unconventional, a fear of thinking socially unacceptable thoughts or a fear of failure (Combs and Snygg 1959).

11. Encouragement to over-learning, extended effort, social encouragement (Hallman 1967).

All these conditions seem to be encompassed by one concept namely challenging but favorable environment for learning. It invites an individual to leave the safety of the known and to take risks to taste delights of the new and untried domains of thought and knowledge.

2.7 FACTORS DETERRING CREATIVE ABILITIES

Even though many teachers possess creative traits and potentialities, they are not reflected in their classroom teaching, may be due to lack of knowledge, understanding and skill in asking divergent questions.

Naturally, the resultant neglect of creativity is reflected in the classroom teaching practices from both the quarters, teachers and students. Students are busy in their classes in listening to what is being told by teacher, in computing pre-determined answers, in coping exercises etc and are being evaluated by the teacher passing judgements. As there is no opportunity to develop creative potential in the classroom work we have stereotyped as ‘hard work’ consisting of imitation, memorizing, doing assignments, preparing for tests and the like. The kind of hard work a creative person does which is self defined and self-imposed is not generally acceptable in the present classroom.
In addition to the blocks created by external factors, there are self-created hindrances also. William H. Alam Shah categorizes these blocks into three types.

1. Socio-economic like poverty, mistaken notions regarding choice of vocations, risk-taking and human intelligence, restrictions on social mobility etc.

2. Psychological like lack of inner quietude, feeling of inferiority, mistaken estimation of talent etc.

3. Characterological like lack of self discipline, attachment, absence of commitment etc.

Wolfgang Luthe makes a general distinction by classifying the variety of interacting attitudinal and psycho-reactive variables which may either inhibit or promote the development and utilization of creative potential into two categories viz., anti-creative, referring to those factors that inhibit or interfere with creativity, and pro-creative, referring to those factors which facilitate, support and promote creativity (Luthe 1976).

According to Luthe this pro-or anti-creative dynamics evolves from

a) the genetic constellation

b) adaptational exigencies and homeostatic priorities

c) psychodynamic, physiological or physical deviations and disorders.
d) Educational, economic and socio-cultural influences

e) Creativity-related experiences of negative or positive nature

f) Skill-related training and experience

g) Age-related developmental implications,

h) Motivation, and

i) Situational variables

2.8. PERSONALITY CHARACTERISTICS OF CREATIVE CHILDREN

Whom shall we call a creative individual? Do they possess such characteristics, which help us in their recognition? These are some questions, which are important to a teacher. If he knows the answer to these questions he may give special attention towards the education of creative children. In this way he can help in the development of the creative individual but may also serve the society and the nation because it is through the creativity of a creative individuals that the nation is enriched technologically and scientifically.

According to Taylor creative individuals have the following traits.

1) **Intellect:** For the creative individuals some cognitive abilities are essential which include memory and evaluation. Sensitivity, originality and the ability to reconstruct are also essential. He should have the ability to sense the problems and recognize the ambiguity if it is present in some situation.
2) **Motivational Interest**: The creative individual has curiosity. He has need for high achievement which keeps him continuously busy in that direction, he remains in search of challenges. Gives more importance to complex and tolerated indefiniteness. He remains completely busy in creative work.

3) **Creative Personality**: The important individual qualities in a creative individual are independent thinking, tendency to take risks, industriousness and courage. He is more extrovert as compared to the non-creative individuals.

   According to Rogers (1959) the three internal conditions of a creative individual are

1) Openness in experience, which gives no place to inflexibility.

2) Ability to evaluate in accordance with one’s needs and

3) Ability to practice, and to accept the unstable.

Barron and Roe (1958) consider that a creative individual’s abilities can be seen in the interaction of intellect, personality, motivation and the biography of the individual.

Creative people are more flexible and fluent and original than convergent thinkers and do not confine themselves to the information at hand. This permits a richer flow of ideas and as a result, it opens up a way towards solutions that are novel and hence creative. Creative person gives the appearance of being unconventional, rebellious, executive and non-conforming. He
disregards public opinion, ignores social pressures does the unusual, says the unexpected, is often misunderstood and viewed with suspicion. Creative people are characterized by expressions like ‘ingenious’, courageous, clear thinking, versatile individualistic, preoccupied and complicated. In addition to it independence in attitude, social behaviour, dominance, introversion, openness to stimuli, wide interests, self acceptance, intuitiveness, flexibility, social presence, social attitude, unconcern for social norms, radicalism and rejection of external constraints are the two additional traits seem to be more closely related to aesthetic than to scientific creativity.

Personality studies made use of adolescent boys and girls. Very few studies, have been made on professional and creative writers and artists. Some have employed measures of anxiety, adjustment, attitudes and values. Some have used factors such as self-concept, self-esteem, locus of control, attitudes, emotionality, achievement, motivation, cognitive style, risk taking, aspiration, anxiety, value orientation, temperament, introversion, extraversion and curiosity.

2.9 APPROACHES TO THE STUDY OF CREATIVE PERSONALITY:

Two major approaches can be recognized in the study of the creative personality. First one is holistic, which is the study of personality of the creative person in its totality or at least its major divisions. The second approach is the study of the specific ingredients of such a personality (Arieti 1976).
Neither of these approaches is completely satisfying. No specifically creative ability wholly stands up. The personality approach goes in circle, a person with a creative personality turning out to mean about the same thing as a person who behaves creatively. It makes some sense to think of creativity as a trait made up of five sorts of ingredients viz., abilities, style, values, beliefs and tactics. The results of the personality research can be re-casting in these terms and a good deal more.

Studies have hardly searched for the total system that stems from the creator's cognitive and affective life. As Gruber sees it, the student of creativity must construct the mental life of the creative individual at various points in the development of his work. The theorist of creativity has to identify certain induring motifs- for example, in the case of Darwin, themes such as organizations, variations, survival, natural selection, heredity and so on. These produce a series of 'cognitive maps' that capture the thinker's view of his project at various points. Creativity is a combination of several traits. Special family environment in some social historical situations, occurring at a given time and space that produces the synthesis we call creativity.

**Psychological Traits:**

In general, studies have been shown that there is a particular pattern of psychological traits that consistently characterizes creative individuals regardless of their age, cultural background or area of work. Creative persons appear to be distinguished more by their interests, attitudes and drives than by their intellectual abilities.
There are other cognitive variables that do seem characteristic of creative people. However, one of the most distinctive of these is a cognitive preference for complexity as opposed to simplicity.

Independence in both attitudes and behaviour is perhaps the most striking characteristic of the creative personality. Practically all studies have found out that creative individuals are not concerned with other people’s opinion about them. Another personality variable is that their patterns of interests reflect both the feminine and masculine side of their nature the androgy type (Masculine type). Creative men are able to accept the feminine aspects of their personality without experiencing any sexual conflict, thus leading to a greater openness to emotions and to a greater aesthetic sensitivity. One might expect that creative females would show an acceptance of masculine traits in their personality.

**Exceptionally creative persons:**

About the exceptionally creative persons one popular opinion is that while they are geniuses they are also completely crazy. The madness of such artists as Van Gogh or Nizinsky is often cited as a “typical example”. Creative people appear to have superior ego strength and a constructive way of handling problems. The general agreement is that in creative achievement the personality factors are very important. In India as well as in other countries it is one of the frequent concern. Reviewing American research Taylor (1975) observed ‘A great deal of research has focused on identifying the characteristics of the creative
personality, usually from a trait point of view. There seems to be historical reasons for such intense interest in the study of personality. Research workers have taken a stand, which supports a personalological approach. The roots of creativity do not seem to lie in convergent or divergent thinking, but rather, as Hudson (1966) suggested, in the personality and motivational aspects of character. Another practical reason is the possibility that a finite number of personality characteristics are significant for creativity, as distinguished from those having significance for individual diagnosis, theory or even academic performance.

On the basis of existing research a panel of ten experts was asked to evaluate the importance of the characteristics of the creative person found by various investigators. According to these experts, the most important ways in which the creative person behaves differently from the less creative person are:

1) He is courageous in his convictions.
2) He is curious
3) He is independent in his thinking and judgments
4) He becomes absorbed and preoccupied in what he is doing
5) He makes use of his intuitiveness
6) He is unwilling to accept things on mere say-so
7) He is visionary and optimistic
8) He is willing to take risks (Torrance 1965b).

Studies of single characteristics of creative persons often produced inconsistent observations.
Certain patterns of characteristics appeared quite systematically. Creative persons in a variety of fields exhibited the same pattern of values and inter-personal relations, including high theoretical and aesthetic values, high self-sufficiency, introversion, greater concern with ideas than with people and disinterestedness in social activities. They also exhibited a common pattern of perception and cognition, including preference for complexity, independent judgment, and resistance to group pressures, and willingness to take risks. Children who were judged creative were humorous in their free associations and aspired for unconventional rather than conventional careers. Although there is a long tradition that creative performance is related to neuroticism, a number of studies with a variety of children found no relation between measures of creativity and measures of emotional disorder.

2.10. FOSTERING CREATIVE TALENTS

Researches conducted during the past four decades have shown that creativity can be fostered. While the earlier approaches were focused on conceptualization, identification and assessment of creative talent, the emphasis has gradually shifted to curricular approaches. As a result there is re-orientation in the study of creative talent.

Creativity has always been built into every curriculum. It is very often conceived to be the ability to bring something new into existence. It is not a fixed and static quality but something that changes overtime.
Teaching for creativity aims towards the holistic development of children, improves teaching-learning process and a better personal and professional growth of teachers. It is possible for teachers to promote creativity while teaching different subject areas. The right kind of teacher's attitudes, behaviours and ways of interacting with children create proper conditions for creative teaching.

2.10.1 Need for the Identification of the creative

A creative individual may be identified through the measurement of creativity. Torrence considers that the measurement of creativity among children is essential because of the following reasons:

1) It enhances our understanding of human mind and personality.

2) It is helpful in individual teaching

3) It is helpful in guiding the mental growth, gives an indication of mental health and provides clues for arranging remedial programmes.

4) It helps in the evaluation of the programmes, products and processes.

5) It provides the evidence for the capability for growth and emphasizes the need for guidance in future.
2.10.2 Implications of fostering Creativity

The foremost aim of teaching is to help learners to develop abilities to communicate with the people around them and those with people away from them.

Creativity: -

**Facilitates expression:** - It is an outlet for feelings, emotions, ideas, desires, aspiration etc

**fosters intellectual growth:** - Creative ability sharpens thinking. It develops cognitive ability of individual.

**has got aesthetic value:** - Creative ability in any field allows students to get joy through their work.

**develops fine motor skills:** - It develops eye hand coordination. By drawing, painting and other creative abilities, the child develops motor skills.

**has the power of soothing the minds of people:** - It has got therapeutic value because by their Creative act they lessen their burden by expressing their feelings and emotions.

**strengthens the personality of the individual:** - The Creative ability of an individual will be depicted in his work and his personality will be strengthened.

**exposes the individual to the experiences of different senses:** - Verbal or Non verbal creative ability exposes the individual to the experiences of different senses.
has the power of entertaining: - The person who is creative enjoys himself and make other people also happy either by his writings or drawings or paintings.

lends meaning to factual information: - Whenever the creative child gets a piece of information, it will start thinking in a divergent way and hence factual information which was passive so far comes to the active mind and finds meaning.

develops fully functioning individuals: - In recent years, education is becoming child centered in the schools and opportunity is given to the children to express their creative talents. Therefore they can utilize the creative talents in different fields and can compensate the loss.

satisfies the urge for creative expression: - Normally children by nature are curious to know their environment and try to explore the events and circumstances on their own. Such inherent curiosity needs to be encouraged. If not hidden talents remain suppressed or inadequately developed.

gives the utmost experience of creation of joy: - The goal of any creation is joy. When arguably the greatest artist, Beethoven, finally translated his tonal abstractions into words, his subject was joy. That joy, which according to Kafka is food for the human, soul without it life is only a form of dying.

fosters national progress: - Creative children constitute one of the most valuable assets of our country. Lack of recognition of creativity is felt in every branch of our national life and probably
one of the bottle necks of our progress. The national interest now demands an increase emphasis on creativity in all branches of knowledge – science, literature, language and writing also.

**makes education comprehensive and complete:** - If education is to be comprehensive it should cater itself to the needs of cognitive, affective, and psychomotor domains. Unfortunately in the world of science and technology, the balance is completely tilted towards the rational and scientific abilities. Even though the transpersonal psychologists stress the need for optimal education, which cultivates all paranormal abilities in a harmonious and balanced manner. Great achievements result from the functioning of both the hemispheres of brain. So educational environment should stimulate and nurture the intuitive as well as the rational, the imaginative as well as practical, the creative as well as the receptive functions of each individual (Prabhavatamma, 1987) education at present has been concentrated on the development of rational or the left brain powers ignoring the affective or the right brain development. Creative abilities can fill this gap.

**develops the sixth dimension namely aesthetic:** - Man has the unique ability which distinguishes him from the animal. Thus creative ability empowers man to have the sixth sense namely the aesthetic, the other being physical, mental, spiritual, social and ethical.

**keeps people busy:** - Creative ability of a person keeps him busy because the talent continues through out his life making
him to do one or other work and helps him to spend his leisure time.

facilitates contributory activity: - The outstanding creative ability of a fairly small percentage of the population is mankind's ultimate capital asset (Taylor 1964). Some gifted children who has got creative ability can satisfy his need.

caters to the goal of providing equal opportunities for the creative child: - In any democratic setup, it is obligatory to see that the individual personality and ability blooms to the possible extent. Therefore school should foster the creative ability of the students to the fullest extent.

leads to self actualization: Self actualization means the fulfillment of realization of one's potentialities. It is something that one seeks to be and is as much of what he can be and wants to be as possible. It implies a satisfaction and openness to new experiences and awareness to one's deeper feelings.

has got cathartic value: - Creative ability acts as a catharsis from the psychological point of view, letting out the pent up emotions of people. Students emotions can be profitably channalized through creative abilities which otherwise would create problems.

cultivates sensitivity: - Creative ability helps an individual to be sensitive to himself and makes others sensitive because man unlike animal can be sensitive to the experiences of all senses. He
can respond to beauty, fragrance, sounds, taste and all other emotions.

2.10.3 Identifying a Creative Child:

It is not difficult for a teacher to locate creative children, if the teacher is alert. There are some broad indicators to identify creative children.

A teacher should observe the following:

- Does the child easily adopt to the situation at home, school or outside?

- Does the child think high of himself and his abilities?

- Does the child exhibit an urge to continuously excel his own performance?

- Is the child not disturbed easily while working in challenging situations?

- Does the child strive to do his best in whatever task assigned to him and will not give it up easily?

- Does the child take risks in various activities?

- Does the child act according to his own will?

- Is the child more anxious than others in solving problems faced by him?
- Does the child not get confused when situations posed appear apparently extralogical or unconnected?

- Does the child show an ability to withstand stress without affecting his behaviours?

- Is the child enthusiastic to work on the task assigned?

If the answer is ‘yes’ then he is a creative child.

Teachers can develop their own creative powers and provide an environment, which would nourish and strengthen the creativity of their students.

Every individual can raise his or her level of creative potential beyond its present level. Efforts to enhance creativity will not expand one’s inborn potentials but can ensure that these potentials are maximized. School is the place where organized efforts can be made by the teachers to develop in students the basic foundations, abilities, skills and attitudes necessary for creative achievement in life. In order to achieve the above there is a need to provide proper environment for creative expression and training for its development in school right from the early stages.

2.10.4 General methods and strategies for fostering Creativity: -

The art and science of nurturing creativity in the individual person is in its initial stages and much has not been accomplished. One can cite numerous studies in the professional literature on the effects of various training programme, which have attempted to increase productive performance under different environmental
conditions of children, adolescents and adults. These can be grouped under the following heads:

I. Earlier approaches for the conceptualization and measurement of creativity among school children.

II. Selected innovative education projects and programmes for the promotion of creative talent.

III. Methods and techniques devised through interdisciplinary research.

Devis (1973) has identified approaches which had a focus on training for creativity education. These include: Dewey’s Reflective Thinking, Inquiry learning, Brainstorming, strategies for stimulating solutions to problems and synectics. A brief treatment of these approaches along with their relevance in education is presented below.

(1) Dewey’s Reflective Thinking Approach:

Dewey (1933) conceptualized inquiry as “reflective and critical thinking” and has categorized it into five phases.

i) Mind leaping forward into a possible solution.

ii) Felt difficulty transformed into a problem, a question for which the answer must be sought.

iii) Use of one suggestion after another and as a leading hypothesis.

iv) The mental elaboration of an idea through reasoning and
v) Taking the hypothesis by imaginative action.

Dewey’s reflective thinking, carried out through phases, was followed by many researchers, each one giving one’s own elaboration to the creative process, such as thinking as a ‘purposeful and directed thought’.

(2) Inquiry learning: Suchman and Bruner (1966) have viewed creativity as a process of Inquiry and discovery learning. Suchman described Inquiry as learning that is meaningful and intrinsically rewarding to the learner. He suggested that through demonstration of an event, by showing a film or by drawing lines, curiosity in the minds of students has to be aroused. They may be asked to frame questions in such a form that these can be answered by the teacher in ‘yes’ or ‘No’ form. For example the “ring and ball” experiment can be used to illustrate the strategy. The students are allowed to ask questions and the teacher give the answer. Such exercises help the learners to think divergently and formulate questions that ultimately help problem solving.

Bruner (1966) has given the characteristics of a student who is oriented towards discovery learning. He is intellectually more effective and expects that the something to be found out. This expectation motivates the search, and the learner persists in the search for relatedness. Thinking exhibits connectedness, questions are cycled and recycled, he is governed by intrinsic motivation and is heuristically inclined. By practicing problem-solving he improves the skills of problem-solving through repeated experience with inquiry. The learner preserves information into a
personal cognitive structure, thereby maximizing its retrieval in future.

In discovery learning, the individual learner uses one’s own intellectual to gain knowledge by discovery and organizing concepts that are personally meaningful. Implication of Bruner’s work for creativity is that the children may be exposed to a large number of stimuli so that they can reorganize them cognitively and use in creative problem solving. We can give the example of Pythagorian theorem in geometry in which students find the solution of new right angles easily.

(3) Brainstorming: It was Osborn (1963) who first used Brainstorming sessions in the field of Management and Industry. It can also be used in the class to promote ‘Fluency of ideas’. He believed that it is possible to allow a free flow of the unconscious through this technique. The participants are encouraged to produce as many ideas as they can, to solve a problem. The more ideas are generated higher the probability of hitting upon some brilliant ones. Integration and combination should be encouraged. Osborn assumed that early solutions tend to be common place while unique, potentially ingenious solutions occur later in people’s “Thought-chains”.

Brainstorming is useful for problems that can have multiple solutions of which some may be better than the others such as “How are the forts and temples built on high altitudes with heavy materials? How can school be improved? Brainstorming is not very
useful unless the topic selected is specific. There are four ground rules that are followed in a brainstorming session.

- Criticism is ruled out
- Welcome the free ideas
- Quantity is wanted
- Combination and improvement is sought.

The above principles are the components of the ground principles of ‘deferred judgement’. Perhaps the most pertinent thing that can be learnt from brainstorming is the creative atmosphere of the classroom, where the teacher recognizes that the ‘wild thought’ might be tamed into a workable solution or might stimulate others to create further ideas. It is not only a technique but also a culture. It has two types of mental activities

1. Creative and 2. Judicial

1) **Creative mind:** The function of creative mind is to invent ideas, to find out new solutions to problems.

2) **Judicial mind:** the function of judicial mind is to critically examine the ideas which emerge from creative mind. There are several views given by psychologists about Brainstorming.

1. **View of page and Thomas:** “Brain storming is a technique of exploring possible solutions wherein participants are encouraged to contribute suggestions without risk of redicule.
2. **Devid's View:** “Brain-storming” is an approach to increase the learner’s creativity and openness for problem solving.

3. **Osborn’s View:** “Brain-storming” is using the brain to storm a creative problem and to do so in a commando fashion, with each stormer audaciously attacking the same objective. The crux of brain-storming technique lies in the fact that the exercise generates a wide spectrum of solutions as the participants explore along new and possible fruitful lines of thought”.

Osborn opines that brain-storming technique consists of group members which suggest ideas as rapidly as possible, prohibiting criticism, encouraging speaking out, and evaluating at a later session, holds possibilities that have not yet been thoroughly tested.

4. **View of Bruner and Suchman:** Brain-storming implies “the use of discovery and inquiry methods in teaching in order to foster creativity among children. In this way possible solutions to the problems are explored. It is group participation method of problem solving where the ideas come to the mind of the participants without fear or criticism”.

**Characteristics of Brain storming technique:**

1. The problem in Brain storming technique for developing creativity among children should be simple, specific and easy.
2. The group is encouraged to concentrate freely and friendly in a non-evaluate climate.

3. For the solution of specific problem there should be spontaneity and rapid production of ideas in the group.

4. Combination of modification of ideas is preferred.

5. Chain thinking facilitates the brain storming group in expression.

6. There is an element of competition within the group, each member tries to produce as many good ideas as possible.

7. There should not be any criticism and discouragement as they hamper imagination and creativity.

8. The quantity of ideas and the speed demanded in brain storming does not leave any time for evaluation. Absence of external standards of evaluation as well as absence of internal evaluation reduce the feeling of restrictiveness. The storms does not bother whether.........The ideas can actually be put to practice (action) or not.

Principles of brain storming:

1. **Statement of the problem:** The problem is stated to the group before the start of the brain-storming session.

2. **Appreciation:** All ideas are encouraged and appreciated, they are encouraged for modification, combination and improvement of ideas for their own as well as of others.
3. **Central Point:** Only one central point of a problem is to be taken up for one session of brainstorming. The dull idea is to be made interesting and exciting.

4. **Chairman and recorder:** A chairman, a recorder and a process observer may be selected or appointed before the start of brain-storming session. A fast writer should be selected for getting down all new ideas immediately. A tape recorder may be used and instead of selecting a process observer.

5. **Discussion:** After informing about the responsibilities of the group, all the ideas review should be discussed in a free, frank and congenial environment and suitable ideas should be accepted for the solution of the problem in hand.

**Uses of brainstorming**

1. It arouses attention of students

2. It stimulates and develops interest of the students

3. It arouses active participation and development of imagination

4. It helps in the development of new ideas, new prediction, new inferences and creative-thinking

5. It is helpful in finding out new solutions to problems
It is a source of joy and satisfaction

(4) **Stimulating creative solutions:**

It involves two techniques

a) Attribute listing

b) Idea check list

In the year 1954 Robert Crawford developed a useful technique for designing a specific product or activity called Attribute Listing. According to him, magic inspiration is not the only major source of creativity, much creativity arises from changing the attribute of an object or activity. We can give an example of traveling bags used to be made of metal to assure durability. Nowadays durability is secured by using much lighter plastic substitutes, in attribute listing, the first attempt is made to list the basic but “modifiable” attributes or properties or specifications of a particular object or activity. Then an attempt is made to generate alternatives to the current attribute or specification.

Crawford has summarised the principles of attribute listing as follows:

1) Creation is not inspiration alone. It is largely adaptation and experimentation.
2) Creation is not mechanically combining different products or ideas. It is useful modification of an attribute or assimilation of the attributes of other things.

3) In trying to modify the current attributes of an object, it is desirable to search for concrete alternatives.

4) Creation is not just stealing of ideas: It is a continuous stream of modification.

Idea check list: Idea check list amounts to examine some kind of “task” that could suggest solutions for a given problem. Questions are creative acts of intelligence. They often energise divergent thinking. A creative idea is the one that can result in some new essentially stimulates non-obvious and non-conventional idea combinations. Davis and Houtman (1968), in their creative problem-solving programme, taught the sixth to eight grade students some effective strategies for designing, inventing and improving physical products. They gave seven possible hints and suggestions. These were change colour, make new size, change shape, introduce new material, add or subtract something, rearrange and introduce new design, students were encouraged to make objective evaluation of their own thinking. It is observed that the students who make evaluation of their own thinking are less likely to be inhibited in future functioning.

(5) Synectics:

Gordon (1961) is the originator of ‘synectics’ movement. It was first developed in consumer industry. In synectics, we use the
technique of “making the strange familiar”. It requires generation of ideas by connecting a familiar content to a new or looking at a familiar content from a new perspective. There are four types of analogies by Gordon for fostering creativity among the learners.

**Direct analogy**: It involves seeking a direct comparison of the phenomenon with some other phenomenon that is similar enough. We can give an example like aerodynamics of a plane is under discussion, the group may explore how birds manage to fly and thereby seek insights into a plane’s aerodynamics.

**Fantasy Analogy**: It is based upon Freudian concept of wish fulfillment. There the group members are urged to imagine a constraint free solution in much the same way of our wish fulfilling day dreams. Group members are urged to fantasise some perfect solution even if it flies in the face of known scientific principles.

**Personal analogy**: It is a peculiar kind of empathising, the person is asked to retain his individual human sensibility but is simultaneously asked to transpose himself into a situation and report what he feels, hears, thinks etc.

**Symbolic analogy**: In this leader may take a key word or even some discussion and ask group member to come up with a short, provocative phrase that captures the essence of the word under discussion but in such a way that it is aesthetically satisfying or paradoxical.

George Prince of Synectic Inc. has described the structure of synectic process. The steps are
1) The problem is explained to the group by an expert.

2) The group attempts to solve the problem in the usual way for a while. This phase is called “Purge”

3) If the problem remains unsolved the leader asks the members to state the problem as they understand it.

4) Next the leader may ask an “evocative question”.

5) A number of responses may be made to an evocative question.

6) At appropriate places, the leader may request a personal analogy.

7) The leader may also ask them to fantasise without restrictions.

8) The leader may ask for a Book Title or Symbolic Analogy – say two or three word title, poetic and compelling, example: “warm-hate” – “Indifferent-destruction” – “Compulsive indifference”

9) The leader may pick a particularly intriguing book title such as “compulsive indifference” and ask for direct analogies, examples ‘Queen bee’ ‘cat’ etc.

10) At some point, when the leader senses that a potentially useful approach to the original problem is at hand, he may ask for a “force fit” i.e. he may ask the participants to try to think how a present or analogy or
situation could suggest a solution to the original problem. If the "force-fit" does not yield satisfactory results, another cycle of analogies may be started.

Synetics does not necessarily aim at finding full-fledged solutions to problem. It aims at identifying promising approaches or viewpoints that would possibly lead to novel solutions to vexing problems.

Selected innovative educational projects and programmes

There are several content areas in psychology, education and psychometry that have a direct bearing on the teacher training programmes from the viewpoint of creativity. The following programmes need to be induced in the pre-service and in-service education and training of teachers.


2. Roe’s (1951) study of Eminent Scientists.

3. Bloom’s (1956) Taxonomy of Educational objectives and subsequent work on this model, especially for analysis and synthesis objectives.

4. Guilford's (1967) structure of Intellect Model and other studies, especially on divergent productions.
5. Studies by Torrance (1962) on the measurement of Creative Thinking.


7. Specific Programme conducted by Education Departments, in Canada, Alberta’s Education services developed a programme 1966 for the use by the teachers in the education of gifted and talented children. Many more such methods, materials and techniques have been developed on creativity among different target groups, especially for the schools.

Methods and Techniques devised through Inter-disciplinary Research

Several other methods and techniques, developed in other disciplines, have implications for teaching.

1. Problem – Solving Method

Problem solving is an important technique of developing creativity among students. The success, happiness and efficiency in life to a great extent depend upon problem solving and creativity.

There are different views about problem solving. According to skinner “Problem solving is the frame work or pattern within which creative thinking and reasoning take place”.

In the words of Gates “Problem solving is a form of learning in which the appropriate response must be discovered.”
Problem solving can be defined as a process of removing obstacles that appear to interfere with the attainment of goals. It is a make adjustment to a new situation. It requires prediction, analysis of facts and principles to develop cause and affect relationship. It also involves the application of principles and facts for explaining and solving new phenomenon or predicts consequences.

Characteristics of a good problem

1. *It should be real and goal-directed:* Goal is to remove the obstacle.

2. *Selective and educationally significant:* Selective research are recalled for finding the successful solution. It should be educationally significant also.

3. *Insightful, interesting and practical:* Problem should be insightful, relevant, interesting and practical.

4. *Creative, Clear and Definite:* Problem should be creative in the sense that it results in an essentially new construct and reorganization of ideas. It should be free from language errors and ambiguities.

5. *Pupil-centered:* Problem should be according to the age, abilities, needs, interests and developmental level of the students.

6. *Thought provoking:* It should be thought provoking. It should demand reflective thinking on the part of the
students. In short, a good problem is clear, definite, interesting, thought-provoking, suitable and of practical utility.

**Merits of problem solving technique:**

1. *Self-expression*: It provides training in self-expression through discussion during the solution of the problem.

2. *Self-discipline and self-dependence*: It develops self-discipline and self-dependence, as they are to tackle the problems themselves.

3. *Thinking and reasoning*: It stimulates thinking and reasoning power of students and also develops the power of critical judgment in students.

4. *New idea and knowledge*: It develops desirable study habits and the students learn to create new ideas and discover new knowledge.

5. *Interest and enthusiasm*: It provides opportunity to satisfy their curiosity and develops interest in the problem. Students develop enthusiasm to solve new problems.

**Role of teacher in problem solving technique:**

The teacher has to play an important role in problem solving method. His role can be highlighted as under:
**Creating Problem Situation:** The teacher has to create a problem situation in which the learner accepts the challenge and feels the need of doing something.

**Sensing the problem:** The teacher should see that the problem is not difficult for the class. To make the problem solving interesting and life like, the teacher himself must possess the ability to sense the problem clearly, supply the necessary challenge for his pupils and make good the deficiency of the text books.

**Problem to the whole class:** The teacher should present the problem to the whole class in which the learner accepts the challenge.

**Providing motivation and assistance:** The teacher should provide necessary motivation. In case of difficulty he should provide assistance to the students in defining, delimiting and solving the problem.

**Encourage divergent thinking:** The teacher has to encourage divergent thinking and develop the art of reasoning and scientific attitude in the students.

**Conclusion**

Problem solving is an important method of developing creativity among students. It develops in the students the ability to think, reason, imagine, judge, criticize and discuss. It helps in developing constructive and open-minded attitude among the students. The students develop independent habits of study, new
ideas, new thoughts and also share the problematic situation with his classmates.

2. Group Discussion

Creativity can be developed among students with the help of group discussion. Convergent as well as divergent thinking is involved in-group discussion. Discussion implies thoughtful consideration of the relationships involved in the problem or topic under study. The relationships are analyzed, compared and evaluated and conclusions may be drawn.

There are various types of group discussions

i. Informal group Discussion

ii. Formalized group discussion

iii. Panel or Round Table Discussion

iv. The symposium Discussion

v. The Seminar Discussion

vi. Workshop Discussion

In the above discussions, criticism should not be allowed. The temperature to point out a faulty answer is very strong and needs to be strongly and quickly checked. Evaluation comes later at the termination of the session and not during the session.
Advantages of Group Discussion

Oral expression: It provides training in development of oral expression and improves linguistic ability of the students.

Logical and Original thinking: It is helpful in clear, logical and original thinking. It provides training in argumentation. It is the best means and for self-expression.

Self-confidence: It helps in maintaining self-confidence, resisting against stage fear, shyness and nervousness and maintaining presence of mind.

Organization of Ideas: It trains the pupils in the art of selecting material and organization of ideas, speaking effectively and convincing with advance arguments.

Co-operative work and Social adaptability: Group discussion develops a spirit of co-operative work among group members. It develops social adaptability among students.

Role of the Teacher in Group Discussion

1. Proper planning: Group discussion must be planned properly

   1. Selection of the topic: The teacher should make a judicious selection of interesting and useful topics.

   2. Notify the time and place: The teacher should notify the date, time and place and group discussion.
3. **Announcement of topic:** The topic must be announced well in advance.

4. **Number of the speakers:** The number of speakers and the time given to each speaker may be specified.

5. **Technical points:** The technical points such as how to open the discussion, how to conclude and how to judge should be well attended to.

**2. Preparations and Guidance:**

All discussions must be guided by the teacher. In the beginning goal should be established. Maximum number of students should be selected. Students should be stimulated through good questions. Emphasize reasoning and judgment. Develop initiative and responsibility of students. Furnish training in thinking, planning and organizing. Do not allow emotional tension in the class.

To conclude, if discussions are properly used they are valuable in stimulating mental activity, fluency in expression. Clarity with thinking and training in preparation.

**3. Play-way method:**

Play-way method is another important method for developing creativity among students. It stimulates thinking, reasoning, imagination and problem solving.
Percy Nunn’s View: “Play is profound manifestation of creative activities”

View of Ross: “Play is joyful, spontaneous and creative activity in which man finds fullest self-expression”

Play is an innate and creative tendency, which is related to a number of instincts and emotions. It is cathartic in action. The child expresses his feelings, instincts and emotions and finds his fullest self-expression, freedom, joy and recreation.

Like water for fish, play-way is inevitable for the child. By play-way we mean all those methods and devices which convert the school work into play. It emphasizes the spirit of freedom, enjoyment and spontaneity in all schoolwork, it means ‘learning without drudgery and tears’

Forms of play-way

The following forms of play-way methods are helpful in developing creativity among students.

Kindergarten method: Froebel, the famous German educationist, was the father of this method. He evolved the technique of educating children of pre-primary stage through play-material called gifts, and Chorus singing.

Montessori method: Montessori system is based on play-way in education, Maria Montessori is of the opinion that play is essential for the proper development of the child.
**Dalton Plan:** The main principles underlying Dalton plan are freedom and co-operation. The students enjoy the task because they are free to do at their own way.

**Basic System of Education:** Instead of bookish knowledge our basic system of education emphasizes play-way in school education, i.e., craft has been recognized. All the subjects are correlated with craft. Students develop interest in craft because it gives them pleasure and joy.

**Project method:** In this method, the students are free to select their projects. After discussion they select one project. The atmosphere is that of joy and freedom. The project method provides opportunities to the child to choose problems and solves them in natural manner.

**Heuristic Method:** This method puts the child in the position of discoverer. He experiments with different type of instruments and find out the principle for himself. The curiosity of the child is aroused and the child learns new things in spirit of play.

**Story telling method:** Story telling method is based on play-way spirit. It should be applied in teaching of history, geography, literature and elementary science.

**Self-Government:** Self-government in the schools provides opportunities for the expression of instincts like self-assertion, self-abasement and combat. This leads to the goal of self-discipline in a play-way spirit.
**Dramatization and chorus singing:** These have great emotional and therapeutic values, as these are cathartic in action. Dramas having historical, cultural and religious importance should be played.

**Intellectual games:** Intellectual games like word building; mechano, braino and trade are also based upon play.

**Hobbies:** Hobbies like collection of stamps, leaves, flowers, seeds and weeds, sample of stones, drawing, painting and scientific hobbies are a source of profit and enjoyment.

**Co-curricular activities:** Co-curricular activities in the form of debates, declamation, contests, discussions, and symposium should be organized in the school, which is a form of play.

**Audio-visual aids:** Audio-visual aids like radio, television, cinema, slides, charts, models, maps are now a days utilized for educational purposes because they give pleasure and enjoyment to students.

**Uses of Play-way:**

In intellectual field, play has the following advantages.

i. It helps in the development of new ideas, concepts and thoughts.

ii. Mental horizon is broadened.

iii. Imagination is sharpened.

iv. Power of judgment is widened.

v. Learning by doing is based on play and children learn effectively when they perform various activities.
Emotional Uses: Play overcomes shyness, nervousness aggressiveness, over-sensitiveness and withdrawing attitude. It helps the child to have control over his emotions.

Social Uses: Play-way method helps in developing social qualities like spirit of cooperation, fellow feeling, self-confidence, obedience and socialization.

Physical Uses: Play provides opportunities for the growth of physical development because all the muscles, and parts of the body are developed and exercised in play.

Personality Development: Play has got great importance in the development of personality. All the elements of personality like physical, intellectual, emotional and social are integrated into one. Qualities like self-control, self-confidence, honesty, obedience, truthfulness; cooperation, industriousness, integrity, objective attitude and character are developed.

Therapeutic Importance: Play-way is one of the important projective techniques with the help of which children can express and release their feelings, emotions, thoughts, hopes, hidden wishes and desires.

4. Quiz:

Quiz is a unique method of developing creativity among students. It entails asking questions to a group regarding various issues or on a particular theme. Promptness in answering a question or finding out a solution is based on rational and sometimes
original thinking. The person responsible for asking questions to the participants in a quiz should be mature and experienced person. He should be embodiment of knowledge.

**Advantages of Quiz:**

1. *Mental horizon:* quiz competition broadens the mental horizon of the students. The students learn more and more about the country and the world as a whole. They keep themselves abreast with current affairs of the country and of the world as whole.

2. *Reading habits:* quiz competition develops reading habits among students. They read newspapers, good magazines, and other reading materials and make use of library. They get training in self-learning.

3. *Self-confidence and boldness:* it helps in developing boldness, clear thinking, self-confidence and self-reliance among the students. It makes them independent, gives them training in planning, organizing and collecting data.

4. *Instinctive value:* Various instincts like curiosity, self-assertion and gregariousness find healthy outlet of expression and are sublimated through quiz competition.

5. *Emotional value:* Quiz plays a significant role in the training of emotions. It has a cathartic effect on the emotions of students as they purge out the pent up emotional energy.
Role of the teacher:

Proper planning: The quiz must be properly planned. The teacher should make a judicious selection of interesting and useful questions and notify the date, time and place of the quiz. The field or the area of the quiz must be announced well in advance. Definite objective of the quiz should be fixed up and efforts should be made in the right direction for the achievement of these objectives. The active participants of the quiz should be specified.

Preparation and guidance: The teacher should encourage maximum number of students to take part in the quiz. The true spirit of quiz should be developed among the students. They should come well prepared for the quiz. The quiz is a joint responsibility of all the students. The teacher should give proper guidance for the quiz.

5. Self-Designed Instructional Materials:


Dodd-Anne-Wescott (1992) presented a guide, which instructs parents on how to maximize their children's educational opportunities at home and in school. Real learning is discovering how to think how to express creativity and developing the skills needed for cooperation.

Fogarty-Robin, Ballanca, James (1993) wrote a guide to teach both cognitive skills and cognitive strategies necessary for
productive solving, mindful decision making and creative ideation by all students in kindergarten through grade twelve sittings.

Baloche-Lynda (1994) described an instructional strategy combining cooperative learning in small groups with questioning, teaching design to encourage creative and critical thinking.

In conclusion, it may be stated that with the availability of media and a large number of teaching-learning materials, it should be possible for the teachers to use the best ideas for the promotion of creative talent of learners.

2.10. Fostering creativity among Primary Children:

1) A primary school teacher must possess various useful traits like open heartedness, endurance, tolerance, love and affection, develop friendly relationship with students inside and outside the classroom.

2) Educate them through playway and nature school without walls.

3) Child’s participation and entertaining the ideas and expression must be taken into consideration.

4) Beautification of school campus should be encouraged.

5) Examples, story telling, pictorial autobiographies, video cassettes can be used to inculcate various interests among children.
6) Frequent local excursions must be organized to develop love for arts, culture and creativity.

7) Maximum thrust on behavioural aspects like oral/drill/practical exercises.

8) A democratic classroom climate must be fostered.

9) In order to inculcate creative tendency a collection room consisting of pictures/photographs should be provided.

10) The design of the text books should be based on psychological and scientific notions so that some original and creative norms can be developed.

2.10.6 Educational Provisions for helping and fostering Creative Talents:

1) Creativity is fostered by intellectual curiosity, freedom to work, play and study. Encourage the students to ask more relevant questions in the class.

2) Develop confidence among students.

3) Encourage students energetic attitudes.

4) Make them to show positive attitude towards work. Impress upon them that every work is equal that respect should be shown to all types of job. A creative student has to do every type of work. He or she should know that no work is big or small.
5) Sense of humour provides strength to get over the discouragement and disappointment.

6) Developing a sustained interest, a tenacity is another important measure which helps in fostering creativity.

7) Motivation is necessary for oppression of creativity and therefore the teacher should motivate his students according to their interests, hobbies and abilities.

2.10.7 Organizational Principles for fostering Creativity:

There are two approaches for organizing programmes for fostering creativity. “The first approach is individual or working with small group. The second approach is working with the entire class or group.

1) Classroom atmosphere should be free to develop new ideas.

2) Independent thinking should be encouraged.

3) Creativity is nurtured by experiences and therefore provides enriched experiences in the same direction.

4) The teacher should try to widen the mental horizons of the creative students.

5) The teacher should encourage the imaginative flight because imagination leads to creativity.

6) Initiate “self initiated learning”
7) Teacher should respect unusual questions, unusual and divergent production.

8) The teacher should keep in mind that “preparation is the basis to creativity and therefore students should be encouraged to read, study and experiment intensively.

Gallagher (1964) listed the following suggestions for the development of creativity in students.

1) Organize the curriculum primarily on the basis of concepts rather than facts.

2) Allow more individual assignments under competent supervision.

3) Bring the students into contact with the best talent and knowledge available from the specialists in the field.

4) Follow the general philosophy that truth is something to be sought rather than something to be revealed.

5) Provide in teacher education for more competence in both subject mastery and methods of teaching.

Torrance (1965) has enumerated the following principles for teacher for encouraging creativity.

1) Be respectful of unusual questions.

2) Be respectful for imaginative, unusual ideas.

3) Show your pupils that their ideas have values.
4) Encourage the pupils to do something for practice

5) Tie in evaluation with causes and consequences

If teachers are to develop creativity, they must place a high value on creative thinking, encourage and reward creative students and develop stimulating relationships with their pupils.

Klausmeur and Ripple (1971) in their book mention the following three principles for encouraging creativity.

1) Expressing oneself by figural, verbal or physical means is essential for the production of novel forms or ideas.

2) Experiencing in successive creative efforts is associated with a high level of creative expression.

3) Thinking and behaving in divergent ways, in addition to accepting and confirming to some existing standards.

On the basis of the above three principles they offer three instructional guides.

2.10.8 Ways to Encourage Creative Abilities:

1) Encourage divergent production in many Media

   The child should be given opportunities for original expression in many media- written language, oral language, rhythms, music and art. According to Guilford fluency, originality and flexibility are the three main divergent production abilities. In young children they are manifested in the form of free expression
in spontaneous play, singing, finger painting and other activities. In the initial manifestations, the quality of the output and the level of technical skill shown are unimportant. Later, in dance, speech or painting produced by elementary and high school students, quality and technical skill are more important. In creative work like writing a novel or conceptualizing a new design for housing or a new theory of human behavior the highest quality and skill capable of mankind of a given generation are required. Such creative expressions are accomplished by only a few adults in a large population.

Keeping the above in mind we can say that teacher cannot order creativity. He cannot order the students to write a poem at once. Therefore it is essential that the teaching for creativity must follow a continuing programme.

2) Reward creative efforts: The teacher should reward the creativity in students, which are original in nature. Exhibitions of creative products can be arranged. Both verbal and material rewards can be given to creative students.

3) Foster a Creative Personality: A creative individual is found to be impulsive, sensitive, self-confident, independent and unconventional. Therefore several times he will not be liked by parents and teachers. This fact impedes creativity. Therefore the environment of the school almost is an open one where a child is able to think otherwise than simply conforming to the norms of the society. He feels free to express himself and is not simply governed by what pleases other persons.
4) Raise the level of our expectations for creative individual. It has been recently studied that the teacher’s expectations do influence the learning of the students. This phenomenon is described as ‘self fulfilling prophecy’. The teachers who expect good work from creative individual may be able to get better results.

2.10.9 Guidelines for Personnel to Foster Creative Efforts of their Pupils

1. Teachers can create favourable environment in the class or school.

2. Pose open-ended, divergent questions in the classroom.

3. Allow children to challenge the assumptions.

4. Present some analogies/similarities, which are meaningless.

5. Develop sensitiveness in children. Assign them some projects or activities.

6. Avoid over emphasizing the textual information depending upon their special areas of interest. Provide supplementary materials, books and other experiences.

7. Encourage children to pursue their hobbies and provide opportunities for expression of ideas.

8. Provide stimulation through teaching aids to promote creative learning. It involves skills of inquiry, research and problem solving. The learner raises questions, makes guesses, tests and corrects errors and arrives at conclusion.
9. Appreciate openly the creative behavior like asking unusual questions, ideas and self-initiated actions.

10. Evaluate the goodness of the idea. Always do not insist on correct answers.

11. Do not make sarcastic and insulting remarks on children. Allow the child to rethink or explore.

12. Encourage children to do their best without giving hints for the solution.

13. Do not encourage rote learning or memorization.

14. Associate yourself with District and National level organizations.

   a. Try new ways of teaching.

   b. Give various types of challenging assignments.

   c. Suggest and involve yourself in school improvement programmes.

   d. Try evaluating various ways of tapping community resources.

2.10.10 Strategies for developing creativity

   Creativity needs to be identified, energized and guided almost from birth. Research findings suggest that the development of creativity cannot be left to chance. Creativity is likely to flourish in an environment which values independent and free thinking.
Creative children are constantly probing, discovering, imagining fantasying, asking questions, guessing and wondering. Therefore they should be encouraged to ask unusual questions to explore new ways of thinking, to try novel approaches to problem solving, to play with ideas and material and use divergent ways of dealing with traditional topics.

Providing Appropriate Learning Environment

1) Inspiring the student to learn to disagree or emulate.

2) Providing for exciting experiences in the curriculum.

3) Providing a warm, safe and permissive atmosphere.

4) Providing effective direction.

5) Developing students’ ideas through constructive criticism and through referral to competent authorities.

6) Providing satisfactory and necessary guidance and counseling for developing motivation and over coming emotional fears.

Promotion of Creativity at Home:

The home environment greatly influences the Creative talents. Too much love and too much fear will not promote creativity. Students should be permitted to ask questions freely. They should be provided with stimulating learning material. Appropriate type of toys and reading material may be made available to children.
Residential education programmes facilitate promotion of creativity

- Stimulating school environment, proper physical facilities, and free atmosphere.
- Regular practice in meditation facilities creativity.
- Creative teachers promote creativity among students.
- Group contributions to individual creativity must be encouraged.
- Recognition of the role of self discovery.
- Recognition of readiness for creativity.
- Teacher must see, perceive potentialities and strive continuously to develop creative climate to his pupils.

2.10.1 Nurturing creativity-Indian Context:

Little research has been done in India on nurturing creativity through various procedures. This is because promoting students creative thinking and problem-solving abilities has not been considered a viable educational goal. To encourage research opportunities a model of creative learning will be helpful.

Researchers have studied the effect of teaching strategies, instructional materials, creative training programs and stimulating environment on the development of creativity. Most of them studied middle and high school children. There are many issues
within this area, which remain unexplored. Many studies provide hardly any firm basis for determining the effectiveness of procedures. There is no single direct approach and one method or technique may profit one person but not another. We need to know what kind of problems.

Those who have used techniques to stimulate creativity have reinforced the use of concepts of divergent thinking and convergent thinking and push them to forefront of visibility and popularity. Creative thinking does not depend only on divergent thinking.

While nurturing creativity it is important to realize that there is a wide range of socio-psychological and educational variable that might influence creativity.

In the context of Indian situation Gandhi (1985) said, “How to locate dynamic, open-ended and flexible political structures and models and evolve new administrative and management tools, which will facilitate the emergence of an evolutionary and transformational image of man and society. How to recast priorities in the educational system with a focus on vocationalisation and value oriented education. These and many inter-related questions need to be answered”. In this issue we shall notice creative functioning, flourishing in our students and other sections of our society.

2.10.12 Suggestions for Improving Creativity:

In 1962, Torrance advanced the following suggestions for improving creativity.
1. Value creative thinking.

2. Help children become more sensible to environmental stimuli.

3. Encourage manipulation of objectives and ideas.

4. Teach how to test each idea systemically and develop tolerance of new ideas.

5. Beware of forcing a set pattern.

6. Develop a creative classroom atmosphere by avoiding copying.

7. Encourage and evaluate self initiated learning.

8. Be adventurous and encourage the habit of working.

9. Encourage acquisition of knowledge and creative thought processes.


11. Provide opportunities for students to manipulate materials ideas, concepts, tools and structures.

**Principles needed for improving creative skills**

1. Recognizing and acknowledging potentialities.

2. Respectful questions and ideas.

3. Asking provocative questions.
4. Unevaluated practice and experimentation.

5. Developing creative readers.

6. Predicting Behaviour.

7. Guided planned experiences.

8. Searching for the truth with methods of research.

9. Creative problem solving skills.

**Helping students with Intellectual Ability**

- Re-examine your teaching methods and select techniques.

- Discuss the plan with the individual student.

- Plan with the gifted students as a group.

- Use large, flexible teaching units.

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**Helping students with Scientific Ability**

- Encourage experimentation and research.

- Make a study of various branches of science.

- Acquaint the student with opportunities outside the school.

- Contact the students family.
Helping students with Leadership Ability

Leaders can be trained both individually and in group which require different techniques. Teachers should avoid some common mistakes such as negligence about leadership. Too much advise, hindrance to leadership, lack of encouragement etc.

Helping students with Creative Ability

• Establish a classroom atmosphere conducive to creativity

• Independent thought needs to be encouraged

• Encourage the imaginative flights of youngsters which is matured by experience

• Motivation is important in stimulating creativity

Helping students with Artistic Talent

• Helping students in written assignments

• Helping students in dramatic assignments

• Open clubs and hold group discussion to develop their mechanical ability

Helping students with Physical Skills

To develop personality, good health, socialization of the youngsters and motivation to learn, arrange summer camps, open a wonderful avenue to youngsters for developing physical skills.
Research on the nature and nurture of creativity has pointed out that creative thinking ability is not fixed and pre-determined and it can be developed to a marked degree through proper environmental stimulation. The environmental conditions are those, which encourage and facilitate openness in thought and action and provide for discovery of new ideas. Social interaction is an important condition for the development of creativity.

To develop a wider variety of creative thinking the school must emphasize "openness in all its activities and programs. Non-authoritarian ways of learning have to be encouraged.

Torrance concluded that the most successful approaches seem to be these that involve both cognitive and emotional functioning, provide adequate structure and motivation and give opportunities for involvement, practice and interaction with teacher and students. Motivating and facilitating conditions make a difference in creative functioning.

2.11. MEASUREMENT OF CREATIVITY

One of the major reasons for slow progress in the field of educational research has been the lack of valid and reliable tools to measure different attributes. Especially in India there has been a dearth of good and valid measuring instruments. A survey of research literature in the area of creativity makes it clear that although sporadic reports can be found on the topic as early as in the year 1898, yet sustained efforts by numerous research workers are of quite recent origin (Torrance 1962). Creativity became an
object of scientific study primarily because of the general interest in individual differences. In the era of disenchantment with IQ tests, measures of creativity have quickly become fashionable substitutes.

2.11.1 Difficulties in measurement of Creativity

Measurement of creativity poses problems of establishing the practical criterion. Frequent fluctuations in creative performance, types of items and their contents and complexity and subjectivity involved in scoring. In spite of various complications involved in the measurement of creativity, various efforts have been made to measure it by employing different types of tools and methods of investigation depending upon specific situations. No one criterion has been used by all investigators. These included no one.

1) Statistical definitions involving deviations on psychological tests.

2) Number of citations or number of lines devoted to a person in general case histories or biographies of famous people.

3) Judgments of professionally qualified people.

4) Generally acknowledged eminence as in the case of Leonardo da Vinci and Shakespeare.

5) Number of products defined as creative.
6) Pursuit of an activity like painting or music assumed to require creative behaviour.

Because of the complexities and confusion that may arise from variations in the criterion, some researchers have investigated the factors that make up a criterion others have sought ultimate criteria of creativity. Several tests, biographical inventories and other devices to identify creative individuals have appeared during the past three decades. These tests are designed to identify individual differences in originality and ingenuity. The work of Herman Rorschach on psycho-diagnostic testing is based on the theories of perception and imagination.

Taylor and Holland (1962) submitted the classification of prevalent measures as:

1) Traditional measures such as school grades, accumulation of knowledge and intelligence tests.

2) Multivariate approach covering the cognitive factors recognized through factor analytic studies of Thurstone (1952), Guilford (1951, 1952). It also involves nonintelligence measures such as motivational, biographical, sociometric, and other personality characteristics.

3) Single test approach, i.e., A variety of tools such as check list, the Word Association Test, interest and temperamental inventories, personality inventories, self ratings supervisor's ratings, peer nominations and problem solving tests have largely been used to measure creativity. The creative behaviour has also
been predicted and assessed by taking into account the factors of home and school environment. Creativity has been studied in the arts and in the sciences and a variety of personality characteristics and factors motivating creative individuals in the fields have also been pointed out.

Most notable work in the field of creative tests has been done by two groups of researchers- the first under the direction of Torrance and second under the guidance of Guilford. It was Guilford, who made the claim that divergent thinking abilities can be distinguished factorially from the convergent thinking abilities, on which traditional tests of intelligence and achievement are based. In Guilford's Model of Structure of Intellect, divergent thinking abilities are considered to be responsible for creative production and some of the factors under convergent thinking, cognition and evaluation abilities particularly of transformation, implications and systems were also responsible for creative production. Guilford's battery of about sixty tests involves several media of expression and is very comprehensive in its range. These tests are open-ended having no prefixed answers. All psychologists who attempted to measure creativity owe a debt principally to the work of Guilford.

These important tests of creativity show that there are broadly two categories of tests. One having Guilford's S.I model as the base, such as tests developed by Guilford, Getgels and Jackson, Barron and Torrance, and the second category is of those tests having associative approach of Mednick as the base, which
visualizes creativity as an independent ability having almost no relation with intelligence. We can give the examples like Remote Association Tests of Mednick and Wallach and Kogan's Test of creativity.

2.11.2 Creativity Tests in different fields: -

The term creativity refers to a fairly specific type of cognitive ability reflected in performance on a series of paper and pencil tests. Unlike the popular definition, this type of intellectual ability is characteristic only of persons judged to be creative in the artistic and scientific sense. These creative thinking abilities are found to some extent in all persons - children and adults, sculptors and astronomers, architects and artisans. The abilities seen to be logically related to the more common definition of creativity and ultimately may perhaps be empirically related to it.

In general, the tests of creativity, involves the ability to deal inventively with verbal and numerical symbol systems and with object-space relations. Most of these tests had is common was that the score depended not on a single predetermined correct response as is most often in the case with the common intelligence test, but on the number, novelty and variety of adaptive responses to a given stimulus task.

There have recently developed several tests to measure creativity. Important tests constructed and standardized abroad are by Barron (1955), Ghislen (1956), Human (1957), Flanagan (1957), Taylor (1958), Getzels and Jackson (1962), Torrance (1962), Clive,
Richards and Needham (1963), Flascher (1963), Wallach and Kogan (1965) and many others.

**Description of some tests constructed and standardized abroad**

i. *Torrance Minnisota Test of Creative Thinking.*

Torrance tests battery on creativity measures, may be classified into three major categories, non-verbal tasks, verbal tasks using non-verbal stimuli, and verbal tasks using verbal stimuli.

**Non-verbal tasks**

It consists of i) Incomplete figures ii) Picture construction iii) Circles and squares iv) Creative design.

Responses are scored for originality, elaboration and flexibility.

**Verbal tasks using non-verbal stimuli**

1. The ask and guess test
2. Product improvement tasks
3. Unusual uses (Toy Dog/ Monkey)

Responses are scored for fluency, flexibility and originality.

1. **Verbal tasks using verbal stimuli**

These test consists of

1. Unusual uses (tin cans, books)
2. Impossibilities task
3. Just suppose

4. Common problems

Responses are scored for fluency, flexibility and originality

2. Guilford and Merrifield Tests of Creativity

This test battery measures six important factors

1. Fluency
2. Flexibility
3. Originality
4. Sensitivity to problems
5. Semantic elaboration and
6. Redefinition

3. Getgels and Jackson

They have used five different measures of creativity in their research.

1. Word-association tests: - Students are required to give as many definitions and number of different categories into which they could be placed.

2. Uses of things tests: A student is asked to give as many uses as he can for a common object.
3. **Hidden shapes tests**: Students are required to find more complex form of figure shown on card in a simple form.

4. **Three different endings**: Students are required to suggest three different endings to incomplete short tables.

5. **Make – up problems**: Students are required to make up as many mathematical problems as he can on the basis of information given in a complete paragraph.

4. **Tests by Wallach and Kogan**:

They designed a battery of tests which measure divergent thinking developed on Guilford pattern. This instrument have in all five techniques of which three are Verbal and the other two are visual ones.

The verbal techniques consists of

a) Items intended to elicit possible instances of class concepts, i.e., instances.

b) Items intended to elicit possible uses of specified objects, i.e., alternate uses and

c) Items intended to elicit possible similarities between two verbally specified objects, i.e., similarities. The visual techniques comprised of two sets

d) Visual designs i.e., pattern meanings, and line drawings.
These visual stimuli would facilitate the generation of possible meaning or interpretation.

The wallach-Kogan instruments have been found to be applicable to all age levels.

5. Creativity Test by Flanagan

He developed a test, which consisted of a series of problems, situations for which an ingenious solution can be found.

Indian Tests of Creativity

1. Passi’s Battery of Creativity Tests (Verbal and Non-verbal)

The Passi’s Tests of Creativity (both English and Hindi) are developed for the purpose of measuring creativity in school children. In all, six tests namely

I) The seeing problems test II) The unusual uses test III) The consequences test IV) The test of inquisitiveness V) The square puzzle test and VI) The blocks tests of Creativity are included in the test battery.

These tests are classified on the lines of Torrance (1962) as follows

a) Tests consisting of verbal tasks, namely, the seeing problems test, the unusual uses test and the consequences test.

b) Test with verbal response tasks using mostly non-verbal stimuli namely, the test of inquisitiveness.
b) Test with verbal response tasks using mostly non-verbal stimuli namely, the test of inquisitiveness.

c) Tests consisting of non-verbal tasks comprising the Square Puzzle Test and the blocks test of creativity.

The first three tests are verbal in nature. The last three tests can be classified as partially nonverbal for the simple reason that the test material of these three tests presents the nonverbal type of stimuli. The first four tests can be administered individually as well as in convenient groups of nearly thirty subjects at a time. The fifth test of Square Puzzle can either be administered individually or in groups not exceeding six students per administration. The sixth test, namely, the Blocks Test of Creativity can be administered individually.

It gives fifteen different scores on various areas such as fluency, flexibility, originality persistency etc.

2. Baqer Mehdi’s Verbal and Nonverbal Tests of Creativity

These tests developed by Dr Baqer Mehdi, consists of four verbal and three non-verbal sub-tests.

(i) Consequence test (time allowed 12 minutes) think for the following situations as many consequences as possible:

1. What would happen if man could fly like birds?

2. What would happen if our schools had wheels?

3. What would happen if man did not have any need for food?
(ii) **Unusual uses test** (Time allowed 15 minutes) Write as many novel, interesting and unusual uses for the objects, as you can think of viz., a piece of stone, a wooden stick, water.

(iii) **New relationship test** (Time allowed 15 minutes) Think of as many relationships between the following pairs of words, as possible

1. Tree and house
2. Chair and ladder
3. Air and water

(iv) **Product improvement test** (Time allowed 6 minutes) Suppose you start with a toy horse. Think of as many new things or features to make it more useful and interesting.

**The non-verbal sub tests:**

i. **Picture construction test** (time allowed 20 minutes)

   Two simple geometrical figures, viz., a semicircle and a rhombus is given. Students are asked to construct and elaborate pictures as an integral part for each picture, a separate title should be given.

ii. **Line figures completion test** (time allowed 15 minutes)

   Ten complete line drawings are shown. Students are required to draw meaningful and interesting pictures using each of them and also give appropriate titles.
**iii. Picture construction test** (time allowed 10 minute)

Seven triangles and seven ellipses are shown. Students are required to construct different meaningful and interesting pictures by using these figures in multiple associations.

**3. Ramachandrachar's creative response matrices**

This test consists of visual, figural stimuli of varying ambiguity, letter duplets and sets of five single digit numbers.

**4. ISPTC Creative Performance Scale:**

This scale is meant from class VI onwards consists of three parts i) verbal ii) non-verbal iii) performance. The scale uses fluency, originality, elaboration and redefinition of traits or tasks. Time needed is three hours. Scale can be administered in three installments.

Verbal test includes 4 sub tests viz.,

i) Unusual uses ii) Consequences questions iii) Product improvement test iv) Imaginal production

Non-verbal part of the scale includes four sub tests a) picture construction b) picture completion c) angle and rectangular activity and d) pattern meanings

The performance part of this scale includes six sub tests namely, i) Turney Designs ii) Drawing Designs iii) Boat Improvement iv) Missing Part Activity v) Discovery of Picture Material vi) Construction Ability
2.11.3 Non-testing techniques

The creative aspect in the child can be assessed through non-testing techniques like i) Observation ii) Situational Techniques iii) Rating Scales iv) Check List v) Aptitude Test vi) Attitude Scales vii) Interest Inventories viii) Personality Inventories ix) Value Schedules x) Interview xi) Projective Techniques. These techniques are useful in understanding and identifying behavioral and personality characteristics of creative children.

According to Freeman (1976), it is necessary to differentiate between creative abilities in several fields, each of which has some element common with the others. Guilford and Hoefner (1971) point out that specialization in art, music, shopwork or commercial subjects calls for quite different combinations of S.I abilities and aptitude score summations of different compositions are called for. Many other psychologists have pointed out the need to study creativity in different fields. It has been pointed out that creative achievement in different fields requires a complex pattern of aptitudes and personality traits appropriate to that particular field.

In India, most of the tests developed measure general creativity. Tests to measure creativity in music, art, commercial and other subjects are still need to be developed.

Creativity tests for different Target Groups and Age groups

Psychologists have been now postulating the existence within each individual of an essentially biologically based inner nature propelling him towards growth of all abilities including
creativity which they possess to different degrees. Most of the tests
developed in India measure creativity of secondary school students.
So there is a need to develop tests to measure creativity of other
target groups such as socially disadvantaged persons, tribal people,
adult learners, primary school children and students of different age
groups and professional groups.

2.11.4 Validity of Creative Tests:

Due to lack of well-defined criteria, determining the validity
of creativity tests has been very difficult. Yamamoto (1964) in his
review of some of the validation studies in the area of creativity has
found that:

a) Investigators have not come to an agreement as to the most
meaningful, practical and immediate criteria of creative
thinking.

b) Every one of the easily obtained measures like school grade,
supervisor and teacher rating, peer nominations, production
records and psychiatric diagnosis have serious shortcomings
as suitable criteria.

c) More validation studies are urgently needed to establish both
empirical and conceptual validities of the current
instruments.

According to Torrance also “Perhaps one of the major
reasons, why research related to the measurement and development
of creative thinking did not catch the imagination of the educators
in the past years lies in the failure of researchers to deal adequately
with the difficult problem of criteria and validity” (Torrance).

2.11.5 Time and Administration of Creativity Tests:

In a test of divergent thinking where the questions are open-ended time is one of the important factors to be considered. The associative model on which Wallach and Kogan test is based assumes a hierarchy of potential associates to any stimulus, with stereo typed responses likely early in the sequence of responses and unique responses later. Deutler and Mackler indicate in a study that children administered the creativity test under relaxed conditions produced significantly higher scores than children administered the same test under test like conditions. Crockenberg (1972) argued that the creativity test by Torrance or any other creativity test, encourages if not actually coerces a child to stay with the task, he might otherwise leave. According to Guilford and Hoepfner a strict time limit is necessary for testing fluency abilities. A test without time limit would probably be a waste of time but would lower factor loadings in the fluency factors, perhaps to zero.

Wallach and Kogan (1965) are of the view that creativity test should be given individually and not in groups as it may create test-like situations. In fact tests administered in a group may bring out more unique and novel responses due to competitive psychology of human nature.