A FACTOR-ANALYTIC STUDY OF INTUITION AND MENTAL ABILITIES AND ITS EDUCATIONAL IMPLICATIONS

SUMMARY

THESIS

SUBMITTED TO THE ALIGARH MUSLIM UNIVERSITY, ALIGARH FOR THE AWARD OF THE DEGREE OF

Doctor of Philosophy

IN

EDUCATION

BY

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Enrolment no. GA-2733

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ALIGARH (INDIA)

2006
SUMMARY

A great variety of meanings and interpretations have been attached to the term intuition from being considered as merely an unreliable common sense source of knowledge, to an interpretation suggesting that intuition is the Primary source of all true knowledge (e.g. Descarte, Spinoza and Bergson).

Intuition has a long tradition of use in philosophy, mathematics, business, psychology, engineering, linguistics, music, literature, religion and science – Particularly with reference to the creative process. Some of the many definition and understandings of intuition are mutually inconsistent. Still the basic definition is simple. According to the Random House dictionary of the English language (second edition): intuition is “direct perception of truth, fact, etc. independent of any reasoning process, immediate apprehension.” Another definition from the same dictionary refers to intuition as “a keen and quick insight” other definitions stress that the intuitive process is itself unconscious. Intuition, then is “knowing without knowing how you know”.

Naturally, attempts have been made to reduce process to something less mysterious. Norman Simon, the Nobel laureate
economist and cognitive scientist, had suggested that intuition is nothing more than the brain’s capacity for subliminal computation.

Intuition is a knowledge that comes to a person without any conscious remembering or formal reasoning. Some people incorrectly call intuition the sixth sense; critics of this idea suggest that intuition is rapid inference (reasoning from known facts) investigation usually shows that intuitions are based on experience, particularly, the experience of individuals with great sensitivity. A person’s experience is a storehouse of memories and impressions. These bits of experience with proper stimulation shape into a thought or judgement. Then the person knows something but cannot say where the knowledge came from. People call this kind of sudden impression an intuition or hunch.

Intuitions are sometimes followed in detective work, card games and military planning. They often occur in scientific work and in the treatment of diseases. Women are sometimes said to be more intuitive than men, but there is no scientific evidence for this claim.

**SIGNIFICANCE OF STUDY**

The empirical study of intuition is quiet recent in the field of education and psychology as intuition has been seen from
different perspectives e.g. Vaughan’s types of intuition (1979) and Goldberg’s intuition in terms of functions (1989).

To the present researcher however, the doubt arises in the mind whether intuition is a form of higher mental ability or is it a complete separate phenomena. Because if we consider intuition in terms of “insight” or functioning at the sub conscious level then it might mean that some background knowledge or some background thinking is at the base. Then in this case intuition should be related to higher mental ability. If we take intuition as something which defies cognitive processes and take it as a separate faculty e.g. (in case of mystic awareness or the knowledge of a Sufi). In order to solve this controvers the present research is a humble attempt to understand the phenomena of intuition as Einestinetein said “intuition is what is important.”

**Sample of the study**

The sample of the study has been selected from the two schools of Aligarh Muslim University. For the present purpose only XI standard students were selected for the study from different streams. Three hundred students (100 boys and 200 girls) have been selected from the following schools on random basis.
These are the only two schools one for girls and one for boys which cater the +2 education under Aligarh Muslim University.


Total students enrolled in science were 935 (317 Girls and 618 boys). In Social Science and Arts stream the test was administrated only to girls of Abdullah School. The students enrolled in Social Science and Arts are 120 girls. The present test of higher mental ability is meant only for science students. Therefore, it could not be applied on social sciences and arts students. However, only for the sake of curiosity hundred girls were taken from social science and arts stream and were given the test of intuition and creative problem solving.

The sample break is as follows:

Stream wise break up of the sample:

<table>
<thead>
<tr>
<th>Stream</th>
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<tbody>
<tr>
<td>Science</td>
<td>200 (100 boys and 100 girls)</td>
</tr>
<tr>
<td>Arts</td>
<td>50 (only girls)</td>
</tr>
<tr>
<td>Social Science</td>
<td>50 (only girls)</td>
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Sex-wise break up of the sample
<table>
<thead>
<tr>
<th>Sex</th>
<th>No.</th>
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<tbody>
<tr>
<td>Boys</td>
<td>100</td>
</tr>
<tr>
<td>Girls</td>
<td>200</td>
</tr>
</tbody>
</table>

On the whole the sample is representative of the 10+2 school population of Aligarh Muslim University.

**TOOLS OF THE STUDY**

Following tools were used for the study.

**To Measure Intuition**

The test was constructed by Psychologist and the author of “The Intuitive Edge” Dr. Philip Goldberg. This book was one of the first books to be printed for the layman on intuition.

This test contains 32 items. Each right answer was assigned one mark and each wrong answer was assigned zero mark. The test is developed for measuring intuition among students.

**To Measure Creative Problem Solving**

The present investigator employed Passi-Usha Test of Creative Problem Solving (PUTCPS). This test battery is meant to identity creative talent among the students. The (PUTCPS) is developed for the purpose of measuring creative problem solving of school children and also adult. It measures development of thinking skills-creative, critical and integrative thinking. The abilities included are originality and elaboration.
To Measure Mental Abilities

For measuring mental abilities test of higher mental ability in science (THMAS) was used. It was constructed by Dr. S.N. Sansanwal and Dr. (Mrs.) Anuradha Joshi. The scale contains of 20 items each with alternative responses. For the present test four levels of cognitive domain have been taken viz application, analysis, synthesis and evaluation. It is applied only on science students.

Statistical Techniques Employed

In order to examine and justify the objectives of the study, the statistical techniques employed, are product moment correlation and factor analysis. Product moment correlation coefficient was calculated in order to find out the relationship between different variables of the study i.e. intuition, higher mental ability (Application, analysis, synthesis, evaluation) and creative problem solving (right, wrong and original).

In order to obtain the main objective of the study factor analysis was carried out through the technique of rotated varimax. This was done to find out the factors behind intuition and higher mental ability.
Method and Procedure

In the present study, students studying in class XI in Abdullah +2 and Allama Iqbal +2 of A.M.U. Aligarh were administered Dr. Philip Golberg’s test on intuition, Dr. S.N. Sanswal and Anuradha Joshi’s test of higher mental ability and Dr. Passi Usha test of creative problem solving. A sample consisting of three hundred students was selected for both the classes i.e. boys and girls randomly.

A special case was given on administration of the test intuition, higher mental ability and creative problem solving tests and its conditions and instructions laid down in the manuals strictly observed. The students were given sufficient time to make their mind to respond to the test given to them. After collecting the test paper’s from the students, the scoring was done strictly to the manuals. The data thus collected, was given necessary statistical treatment.

The statistical techniques were employed product moment correlation and factor analysis.

OBJECTIVES OF THE STUDY

The objectives of the present study are given below:-

1. To study the relationship between intuition and higher mental ability.
2. To study the relationship between intuition and creative problem solving.

3. To study the relationship between higher mental ability and creative problem solving.

4. To search the factors involved in intuition, higher mental ability and creative problem solving.

HYPOTHESIS

To every problem, there may be more than one solution. A researcher's effort is also directed towards a solution of the selected academic problem. Most of the time it is possible to make intelligent guesses about the solution of the problem. Such an intelligent guess of a tentative solution is known as "hypothesis". As for that matter, the investigator formulated the following hypotheses.

In order to study the objectives the following hypothesis were formulated in the form of null-hypothesis.

1. There is no relationship between intuition and higher mental ability.

2. There is no relationship between intuition and creative problem solving.

3. There is no relationship between higher mental ability and creative problem solving.
For the objectives from one to three we employed product moment correlation. In order to test the first, second and third hypothesis product moment correlation was found between the three variables.

In order to study the fourth objective we used rotated varimax technique of factor analysis.

FINDINGS OF THE STUDY

Findings Based on Inter Correlations

1. Intuition is not significantly related to higher mental ability and creative problem solving in total sample (N = 200), total boys, total girls. But in the case of PCB (boys and girls) it is significantly but negatively correlated with evaluation. In the case of PCM (boys and girls) intuition is negatively but significantly correlated with application- a dimension of higher mental ability. Intuition is significantly and positively correlated with wrong and original and is negatively correlated to right responses in the group of social sciences and arts students.

2. Application- a dimension of higher mental ability is positively and significantly correlated with analysis in the group of total science. Application is positively and significantly correlated with analysis in total boys total girls
and PCB (boys and girls). Application is also positively and significantly correlated with synthesis in total boys.

3. Analysis is positively and significantly correlated with synthesis in the group of total science (N=200), total boys, and PCM (boys and girls). Analysis is also significantly but negatively correlated with right responses in total science (N=200) and in the group of PCB (boys & girls). Analysis is also significantly and positively correlated with original responses in the group of PCB (boys and girls).

4. Synthesis is significantly but negatively correlated with wrong in creative problem solving task in the group of science, total boys and PCB (boys and girls). Synthesis is significantly and positively correlated with original responses in the group of PCB (boys and girls).

5. Evaluation has a positive and significant correlation with wrong in the group of girls and is negatively but significantly correlated with original responses also in the group of girls but is negatively correlated with wrong in the group of PCB (boys and girls). Evaluation is also positively and significantly correlated with right in the group of PCM (boys and girls).
6. Wrong responses – a dimension of creative problem solving task has a significant but negative correlation with right and original in the group of total science and total boys. Wrong responses are also negatively correlated with original in the group of total girls and PCB (boys and girls).

7. Right responses has a significant but negative correlation with original responses in all the groups.

8. Original responses has a significant but negative correlation with wrong and right responses of creative problem solving task in the group of science, total boys, girls, PCB (boys and girls). It is also negatively correlated with right in the group of social sciences and PCM (boys and girls).

Findings Based on Factor Analysis

Considering all the results five factors have emerged-

1. If we look closely at the results, we find that the IV factor Rational Vs A- rational is common in all the three groups.

2. Summarizing the results further we find high and low cognitive ability as the II factor which is also common in all the three groups.

3. In total sample of girls the first factor can be termed as insight.

4. The third factor in girls can be termed as ability to synthesise or organizing ability.
In total science group the first factor has been termed as divergent thinking (vs convergent thinking). The same factor has emerged in total boys group as factor III convergent thinking (vs divergent thinking).

**Delimitations/Suggestions for Further Studies**

Though the present investigation has been carried out with due care and thought regarding various aspects of a research work, it may continue to have some shortcomings which have been realized during the conduction of the research. Being conscious of the shortcomings some suggestions are being made here for further investigations in this area.

1. Vaughan (1979) separates the extensive range of human intuitive experiences in to four discrete levels of awareness. Physical, emotional, mental and spiritual. The test used by Goldberg has items mostly covering mental and emotional aspects involved in intuition. Therefore, another test on intuition which includes other dimensions of intuition has to be developed.

2. The test of higher mental ability was meant only for science students in the present study. It could not be applied on social sciences and arts students. Therefore, a test of higher mental ability which can be given to both science
and social science group should be used in further researches.

3. None of the subjects except one, in the present sample scored “strongly intuitive” on the test of intuition. The test of intuition was scored in four categories i.e. strongly intuitive, more intuitive, erratic and low intuitive. Another study is needed to discover high scoring subjects on intuition. Only then we can reach at some definite conclusion.

**Educational Implications**

1. Intuition and “mental ability” under study are completely separate from each other. Pure intuition defies all logic whereas mental ability is based on reasoning. Intuition and creative problem solving ability have a meeting point in insight learning and problem solving. Here there is some background of logic, reasoning and experiences, but the solution is found all of a sudden and in a ‘moment’. In insight past experiences have a role to play as they are in the background and the subject captures the right responses all of a sudden based on the totality or wholeness of the situation. Intuition also comes in a particular moment and has the characteristics of suddenness. It may or may not be based on past experiences. In its purest form it
defies all logic in which the past experiences are embedded. When intuition has some background of past experiences we call it insight.

2. Application, analysis and synthesis are not separate dimensions of higher mental ability. This shows that a person who has application ability also has ability to analyse and synthesize. Evaluation however seems to be a separate factor of higher mental ability. Probably the capability for evaluation needs more training than it's being an inherent capability.

3. The study also confirms Guilford’s idea about creativity which involves divergent thinking. Emphasis upon ‘right’ responses in teaching discourages originality of children.
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TO WHOM IT MAY CONCERN

Certified that the thesis entitled "A Factor- Analytic Study of Intuition and Mental Abilities and Its Educational Implications" is an original work conducted by Sameena Kohsar under my supervision and guidance. It may be considered a contribution to knowledge in the field of education, especially of educational psychology.

Prof. (Mrs.) Roquiya Zainuddin
Supervisor
Dedicated

To My

Beloved Parents

Whose love and blessings are my strength.
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I bow in reverence to Almighty Allah, the cherisher and sustainer, whose benign benediction gave me the required zeal for the completion of this work.

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Sameena Kohsar

Sameena Kohsar
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LIST OF ABBREVIATIONS USED

INT : Intuition
SN : Sensing
SS : Subjects
MII : Miller Intuitiveness Instrument
PSI : Psychic Occurrences
ESP : Extra Sensory Perception
PK : Psycho Kinesis
Vs : Verses
SPI : Self Perception Intuitiveness
Chapter - 1

Introduction
A great variety of meanings and interpretations have been attached to the term intuition from being considered as merely an unreliable common sense source of knowledge, to an interpretation suggesting that intuition is the Primary source of all true knowledge (e.g. Descarte, Spinoza and Bergson).

Intuition has a long tradition of use in philosophy, mathematics, business, psychology, engineering, linguistics, music, literature, religion and science – Particularly with reference to the creative process. Some of the many definition and understandings of intuition are mutually inconsistent. Still the basic definition is simple. According to the Random House dictionary of the English language (second edition): intuition is “direct perception of truth, fact, etc. independent of any reasoning process, immediate apprehension.” Another definition from the same dictionary refers to intuition as “a keen and quick insight” other definitions stress that the intuitive process is itself unconscious. Intuition, then is “knowing without knowing how you know”.

INTRODUCTION
Naturally, attempts have been made to reduce process to something less mysterious. Norman Simon, the Nobel laureate economist and cognitive scientist, had suggested that intuition is nothing more than the brain’s capacity for subliminal computation.

Some Social Scientists view intuition as nothing more than learned habits and social conditioning.

According to Iqbal it is a basic psychological function which transmits perception in an unconscious way. Intuition has this peculiar quality. It is neither sensation, nor feeling, nor intellectual conclusion, although it may appear in any of these forms. Through intuition anyone content is presented as a complete whole without our being able to explain or discover in what way this content has been arrived at intuition is a kind of instinctive apprehension irrespective of the nature of its contents. Like sensation. It is an irrational perceptive function, its content like those of sensation have the character of being given, in contrast to the derived or deduced character of feeling and thinking contents.

According to Gary Klein a research psychologist intuition is an eventual, powerful and practical tool for decision making and not a special gift of perception or magic. Defining
intuition as the way we translate our experience into action, he shows how any one can build intuitive decision-making skills through a programme of mental conditioning. Klein lays out his theory that intuition is something to be valued, developed, and leveraged.

According to Albert Einestein, the intuitive mind is a sacred gift and the rational mind is a faithful servant. We have created a society that honors the servant and has forgotten the gift.

DD Runes defines intuition as, “The direct and immediate apprehension by a knowing subject of itself, of its conscious states of other minds, of an external world, of universe, of values or of rational, of values or of rational truths”. It gives an adequate knowledge of the essence of things. It enables us to know reality. Intuition is the special faculty which transcends the conditions of existence. It is not conditioned by the categories of understanding. The plane of mind immediately above that of reason is known as intuition.

Bruner has defined intuition as:

The intellectual technique of arriving at plausible but tentative formulations without going through the analytical
steps by which such formulations would be found to be valid or invalid conclusions (Bruner, 1960).

Zoa Rockenstein (1988) considers the prevalent view that either one has the intuition or does not have it, as wrong. Intuitive ability need not be viewed as something which is rare. It is found in a lesser or greater measure in all, and like creativity can be developed.

Intuitive Wisdom is born of experience,” says David Myer’s Ph.D, a Professor of Psychology at Hope College in Holland, Michigan, and author of intuition. Its power and Perils often represents learned expertise that’s instantly accessible. For example, a chess master can look at a board and intuitively know the right move. But most of this knowledge is not articulated or directly taught.

Of course, not all hunches can be explained by experience. The mother who senses when her child is in danger or the decision one makes to take a different route home that ends up avoiding a huge traffic jam, for instance. Some researchers slide such incidents into the category of coincidence, while others shrug them off as inexplicable.

George Santayana refers to intuition as to our awareness of the immediate data yet Hocking has spoken of self-
knowledge as the best case of intuition. Intuition and intelligence should not be confused as same because intelligence is a scientific tool to deal with the matter whereas intuition can lead one to the very inwardness of life.

According to Sodhi et al. one view is that intuition is an immediate way of knowing, it is sudden flash of light or immediate sensation whereas another type of intuition is of more generalized nature and usually thought to be mark of genius who have the knack or intuition which enables them to see the intuition in a way that is new and different types of hypothesis and theories are created. Thus at the most practical or somewhat mechanical level, intuition is often termed as a skill that one can develop much as one can develop or improve musical or artistic skills by practice under the supervision of an expert. Intuition is not only a skill rather it is a trait where nature and not the nurture plays the predominant role in the ability to exhibit the phenomenon. That way intuition is an inherent trait more available to certain types, or available under certain conditions, rather than a technique available on all, to all who practise a certain form of mental training. In fine
intuition involves a cognitive process and a possible source of knowledge like experience and reason is nor infallible.

Sri Aurobindo regards, “Intuition as an extension of that form of knowledge by identity which gives us the awareness of our own existence."

H.P. Blavatsky says everyone of us posses the faculty, the interior sense, that is known by the name of intuition, but how rare are those who know how to develop it! It is however only by the aid of this faculty that men can ever see things in their true colours. It is an instinct of the soul, which grows in us in proportion to the employment we give it and which keeps us to perceive and understand the realities of things with far more certainty then can the simple use of our senses and exercise of our reason. What are called good sense and logic enable us to see only the appearances of things, that which is evident to everyone.

Mathematicians and scientists use the term intuition, generally in two different ways:-

(a) Either as similar to the moment of illumination in a problem solving process (the first global grasp of a possible solution)
(b) When referring to a statement which may be accepted as being self evident for instance, The whole is bigger than each of its parts."

Science and journals are filled with outstanding stories of the amazing power we have to solve complex problems in our sleep. It seems that when our conscious mind or the analytical mind, gets out of the way, the subconscious mind is capable of making dramatic leaps in learning and unexplainable discoveries that depend on information that is not available to us at conscious level.

Psychology is trying to confer on the term intuition or intuitive knowledge a scientific status. For Piaget "intuition" simply means non formal thinking (C Beth and Piaget 1961 pp.223-41). However with advances in knowledge, more attention is being paid to this relatively neglected aspect of human potential. Chomsky has emphasized the role of intuition in the language development of children.

The representatives of Gestalt Psychology have used the term Einischt (insight) in a way which is very similar to that of intuition (in the sense of a sudden appearance of solution to a problem) Hartman 1966.
According to Sri Aurobindo, Intuition brings to man those brilliant messages from the unknown which are the beginning of his higher knowledge. Intuition gives us the idea of something behind and beyond all that we know and seem to be which pursues man always in contradiction of his lower reason and all his normal experience and impels him to formulate that formless perception in the more positive ideas of God, immorality, Heaven and the rest by which we strive to express it to the mind. Intuition transforms mind, heart, life, sense and even body. It brings radiant movement in to will, feelings and emotions.

Iqbal begins with intuition of the self and brings intuition nearer to the experience of all human beings. From intuition of the self, he would go further to the intuition of reality and from reality to absolute reality. Intuition of the self is open to us all. In some moments of important decision and action we have it. This intuition takes us to the very root of our existence and assures us directly of our own reality. According to Iqbal, intuition leads one to the affirmation of the reality of the self, its freedom and its immortality.
Intuition is a knowledge that comes to a person without any conscious remembering or formal reasoning. Some people incorrectly call intuition the sixth sense. Critics of this idea suggest that intuition is rapid inference (reasoning from known facts). Investigation usually shows that intuitions are based on experience, particularly, the experience of individuals with great sensitivity. A person’s experience is a storehouse of memories and impressions. These bits of experience, with proper stimulation, shape into a thought or judgement. Then the person knows something but cannot say where the knowledge came from. People call this kind of sudden impression an intuition or hunch.

Intuitions are sometimes followed in detective work, card games, and military planning. They often occur in scientific work and in the treatment of diseases. Women are sometimes said to be more intuitive than men, but there is no scientific evidence for this claim. Philosophers such as Immanuel Kant, for example, maintain that it is through intuition that we construct and maintain the basic elements of our world—our sense of space and time, our sense of identity, our sense of the truth of things, our sense of beauty and goodness. Intuition derived from the very
structure or essence of our minds, is viewed in philosophy as being prior to all perception and all reasoning. In linguistics, intuition is understood as the process by which listeners recognized the meaning of words and sentences, and speakers from words and sentences to create meaning.

Virtually every profession distinguishes between the highly intuitive sense of the virtuoso or genius as opposed to the competent, workmen like performance of other professionals. In many diverse fields of endeavour – including music, dance, drama, comedy, athletics, gambling, psychotherapy, financial management and marketing – the factor that seems to distinguish great intuitive genius is that of timing. It is as if, at this level, one’s whole being is fully engaged in the apprehension of the nuances and rhythms of the relevant activities, both internal and external. Intuition is an exquisite sensitivity within one’s deepest being, to the pulses of life’s energies.

Mathematical intuition is an interesting case. The realm of pure numbers and geometrical forms is platonic in nature – It does not exist in the natural world and cannot be directly observed. Yet, one significant aspect of mathematical intuition is the ability to apprehend, and even
visualize, this realm. Cases are on record of mathematicians who have developed the capacity to accurately visualize the details of geometrical forms in four dimensions of space. Interestingly, however, these visualizations are subject to verification not through empirical methods - but through the logic proofs of mathematics and geometry.

Among the contemporary philosophers Bergson, Whitehead, Hocking and Marcel have particularly emphasised intuition as a valid and valuable instrument of knowledge. With Bergson’s intuition is man’s aboriginal and persistent awareness of the universe, answering problems that intellect raises but cannot answer. It is the immediate experience which underlies the processes and purposes of life and cosmos, stripping off the “veils” of verbalization, conceptualisation and symbolism. With whitehead intuition is the reaction of man’s nature to the general aspect of life in the universe and is the most significant guide in ultimate matters beyond the passing flux of immediate thing. Marcel regards intuition as the sole source of explanation of mystery in the structure of the universe where the whole self - its feelings, body and will, and not the Cartesian mere thinking self, becomes the subject of its own awareness.
Intuition alone can make the mind complete and living – it is an act of participation in the other or God which he identifies with existence.

With Hocking intuition as an instrument of knowledge is not averse to conceptual interpretation. He observes “intuition” as persistent awareness of, and reaction to, the real is our most directly empirical relation to the world, the most universal, the most unrelenting.

In china intuition stands for man’s original mind through which he immediately knows that right is right and wrong is wrong. Since everyman possesses intuitive knowledge “the streets are full of sages”. Neo-Confucian philosophy seeks to extend all intuitive knowledge in to practice. Wang Shou-Jen observes, “themselves earth and all things all lie, within the function and activity of our intuitive knowledge.

A man in whom intuition is dominant easily finds his efficient, transcending whole self. His creative personality and its productive values and experiences all become oriented around intuition. Gardner Murphy aptly observes. A psychology of perception which neglects this intuitive matrix is a psychology of surfaces, not of solids, and a psychology
of personality which consider only conscious aspect of perceptual wholes is no better.

In the mind of the average psychological reader the concept of intuition is encrusted with connotations of mystery and obscurantism, and is therefore suspiciously viewed. It is, however, the only concept that contrasts properly with inference, and that can be applied to a wide variety of related theories, all of which hold knowledge to be, in one way or another, immediate and direct. Although there are several varieties of intuitions, all of them agree that knowledge of people is not derived solely from inference and analogy.

J.G. Muller (1942) tells an interesting anecdote with high-lights the advantages of intuition over analysis. A young Lawyer was advised always to make his decision in terms of his own best judgement and analytically in terms of his knowledge of principle of law. He followed this advise and became very successful as a judge, handing down decisions which were famous all over the legal world. Eventually he became so impressed with his success that he thought he ought to try to give the reasons for some of his decisions for the benefit of future generations of jurists.
However, when he did, in fact, write out the bases for his decisions, their absurdity was obvious to everyone and he only appeared ridiculous in the eyes of the whole legal profession. Similarly the theoretical psychologist, with his tools of analysis and inference, must often appear ridiculous in the eyes of really good clinical judges of personality who are not forced to give the reasons for their judgements.

Intuition began gaining legitimacy among scientist back in 1995, when DEAN Radin, Ph.D. then director of the Consciousness Research Division of the Harry Reid Centre for Environmental Studies at the University of Nevada-Las Vegas, first started studying it Radin hooked up subjects to electrodes to monitor skin resistance – one of the methods used in lie detector tests to major emotional changes. Then he left them in a room alone to watch various images – some designed to provoke forceful emotions (like a car crash or mutilated bodies) and other calm emotions (like beautiful national scenes) – Flash in random order on a computer screen, “one in 10 study subjects showed a significant increase in arousal two seconds before the disturbing images appeared”, Radin says, “and a drop in arousal before the call images”. These folks didn’t
consciously know a gruesome scene was about to pop up, but their bodies sensed it and responded sub consciously through their nervous system.

Later Radin refined the test to measure other nervous system responses, including skin temperature, respiration rate, and fingertip blood volume. His tests using these indicators have affirmed his earlier results.

Intuition seems to turn up out of nowhere, but that doesn’t mean it’s magically plucked from the sky. In fact, most experts agree that it is a product of life lessons, and that much of it is tucked beyond our consciousness.

**Classification of Intuitions**

The domain of intuitions is so vast and so apparently heterogeneous, that no serious analysis of its implications is possible without a preliminary classification. A first dichotomy distinguishes problem solving intuitions and affirmatory intuitions.

**Problem Solving Intuitions**

There are two main types of problem solving intuitions (a) Anticipatory intuition represent the preliminary global views, which precede the analytical fully developed solution of a problem.
After an intense effort for solving a problem, it is possible to get suddenly the feeling that the solution has been reached, though not yet in all of its details. This anticipators solutions inspite of the fact that it has not yet been expletively proven my appear as complete and certain.

According to Bruner the intuitive thinking of pupils (Plausible, intelligent guesses) has to be encouraged in an instructional process (Bruner 1965) and not banished as is frequently the case.

**Affirmatory Intuition**

Affirmatory intuitions are cognitions (representatives, interpretation, relations), which are directly accepted as certain and self evident by the knowing person.

They always contain as element of belief, which generally transcends the effective data at hand. Some of their cognitive beliefs may be considered as being correct by the scientific community during a certain period. Some of them may be qualified as false and consequently they have to be rejected or connected via instruction.

Affirmatory intuitions (cognitive beliefs) represents them very active intellectual factors of which people are not
very often aware. The instructional process must not ignore them. They may block or facilitate the comprehension of concepts and statements. What characterises then is their apparent obviousness, the feeling of immanent necessity, their extrapolativeness, and their resistance to instructional influences. They may be enriched refined corrected and became conceptually controlled only as the effect of personal involvement of the learner in a long lasting activity an activity which requires and consequently shapes, such new intuitive views.

Another important series of tests was carried out by J.G. Vanbusschbach in Holland and later in the United States (1953). In these experiments the subjects were fifth and sixth grade school children, their teachers serving as agents or experimenters. Results under these conditions were highly significant classroom experiments of this order were repeated by Margaret Anderson and Rheawhite (1956) working under clairvoyant conditions, they found that scores obtained by pupils “liking” their respective teachers were significantly higher than those obtained from pupils expressing negative attitudes towards them. In turn, the teachers positive attitude towards his pupil had a favourable
effect upon ESP scores. Yet replication of results by other working was only partly successful.

Intuition is just one attribute of the creative mind. Our thinking and decision making are also initiated and sustained by education, experience, imagination, innate wisdom ethical-percepts, motivation, self actualisation, values, courage etc.

Myers and Brigg’s discussing the 16 Personality types based on Jung’s introvert and extrovert typology differentiates between sensation and intuition e.g. in terms of information processing. If it is in the form of facts or familiar types it is called sensing, if it is in the form of possibilities or new potential it is called intuition. In other words when information is taking in primarily by way of the senses it is termed as sensing. When information is perceived primarily in an intuitive fashion the term intuition is used.

Sensing tends to be interested in tangible reality, focussing on the present, and seeing what is, rather than what might be. At an extreme, sensing can have its fact so well and truly on the ground that it misses out on possibilities for the future.
The preferences for intuition gives a greater emphasis on insight and the future, focussing on what might be, rather than what is. At an extreme, intuition can focus so much on possibilities that it loses touch with current realities. Sensing tends to communicate in direct ways, whilst intuition prefers to communicate in creative ways.

Intuition is defined by Jung as “the immediate awareness of relationship” and regarded by him as a basic psychological function along with three others viz sensation, thinking and feeling. Thinking and feeling are rational, sensation and intuition are non-rational. Intuition is a non rational psychological function opening the door to an aspect of human experience which eludes consciousness. It largely depends upon complex, unconscious operations says Jung. There are the implications and overtunes of experience which cannot be known in any other way. Intuition in Jung’s writings presents us with complete and finished contents though it is not clear as how these came in to being.

In addition to the conscious-unconscious polarity and the extraversion-introversion polarity, Jung postulate four functions of the psyche thinking, feeling, sensation and
intuition. For Jung thinking and feeling are polar, or opposite to each other and so are sensation and intuition.

Intuition provides us with startling inspirations, revelations and insights regarding what is not readily observable but is nevertheless true. It is the intuitive function which enables us to make the mental jump from the known, present facts to the unknown still unseen possibilities of what can happen if intuition accounts for our prophetic abilities our hunches and those accurate first impressions we sometimes get about things and people as contrasted with the practical, sensing personality who is able to read the data of the external world the intuitive personality gets its information primarily from his inner unconscious responses.

A person who is highly intuitive may be the true visionary, but if he is greatly under developed in the function of sensing he may not know what to do with his intuitional understandings. If he lacks sensitivity in the realm of practical affairs, his intuitive knowledge will not help him pragmatically to get to where he wants to go and do what he wants to do. Such persons are other characterized as dreams or impractical visionaries.
The illogical and non-rational mental functions are intuition and sensation. The logical and rational functions are feeling and thinking. All four are necessary for man’s mind to perform if he is to know and live in this world.

When a student makes a decision and is unable to give reasons for it, he is often said to have acted intuitively. Intuition goes beyond the senses of sight, hearing and so on, to lower levels of consciousness thinking is not a part of intuition. We come upon our decision with out any conscious activity of which we are aware obviously, subliminal clues are used, but because they are subliminal we cannot reconstruct our thought processes.

Jung felt that intuition is as important to man’s mental life as is any of the other three functions. Only by intuition man is able to solve some of his problems sensing, feeling and thinking may bring him no nearer to a solution, because the facts do not lead themselves to the five senses, to a personal commitment of emotion or to the orderly argument of facts. He then may be able to drive profitably at some sort of conclusion by, intuition, which employs none of these mental functions. But intuition, like sensation, knows no rules of logic. The answers came from the inner recesses
of the unconscious through patterns and processes that cannot be traced.

According to Jung, the conscious aspects of men are usually thinking and sensation where as feeling and intuition are repressed. In women, feeling and intuition are dominant, with thinking and sensation repressed.

EXTRA-SENSORY POWER OR PRECOGNITION

Common to every one are dreams, among our most convincing experiences. Because the nature of dreams is still surprisingly ill understood, Cultphud literature is filled with accounts of what claim to be precognition, seeing the future.

A mother dreams her three-year-old son has drowned in the swimming pool, she finds him floating face down. She wakes up but forgets, the dream. While washing dishes at the sink, she suddenly remembers, it rushes out, finds her youngster face down in the pool, but saves him.

The subject matter of parapsychology stems from frequently reported experiences which seem to defy an easy explanation. A man may dream of an impending catastrophe before it happens. A woman may experience anxiety about
her husband at the moment his car is involved in a collision. A psychic healer may be involved in the remarkable recovery of a person from fatal disease.

All parapsychological phenomenon are referred to as psychic occurrences or Psi. Psi has both perceptual cognitive and motor kinetic aspects. The perceptual cognitive aspect of Psi is designated as extra sensory perception or ESP and includes precognition (the ability to foretell future events), Telepathy (mind to mind communication), and clairvoyance (the knowledge of distant happenings). The motor kinetic aspect of psi is designated as psycho kinesis or PK, the ability to influence the movements of objects. Without the intermediation of any known energy. (e.g. Psychic healing, thought photography, control of dice from a dice, influence over the growth of plants by paranormal methods).

Most of the experimental data in parapsychological literature have proceeded in direction unlike there advocated by humanistic psychologists e.g. the pioneering work of J.B. Rhine (1935) involved the development of materials and methods that would permit easy handling and precise measurement. He used a specifically designed pack of cards containing five cards on which there was a cross,
five on which there was a circle, five which contained a square, five which contained a star, and five on which there were wavy lines. A series of 25 trials with the Esp cards was called as run, a successful trial was called a hit. Five hits per run is the expected average.

Later, Rhine (Pratt, Rhine, Smith and Stunt 1940) conducted similar card tests demonstrating to his satisfaction, the independent existence of various types of Esp. clairvoyance, telepathy and precognition. He then attempted an investigation of PK though various tests with dice.

The attitude of Rhine’s professional colleagues, and of intelligent persons generally in the middle decades of the 20th century, was one of disinterest or actual disbelief in psychic manifestations. Authentic instances of clairvoyance, mental telepathy, provision or precognition, retro cognition, and related psychic phenomena, had nevertheless accumulated.

A mid western banker had read Death comes to the Archbishop. The image of his dying father, 5000 miles away, crossed his mind and two days later word arrived that his
father had died within fifteen minutes of the time, of his vision.

A college professor’s wife was engrossed in a bridge game. Something inspired her suddenly to call her baby-sitter on the telephone. The baby-sitter reported the baby safe but discovered later that even as she was speaking the child was hanging head downwards from her carriage.

Two schoolmates dreamed of each other on the same night after having been out of touch with each other for forty years.

During sleep a woman received the image of her brother committing suicide. She roused her husband and they drove nine miles in a borrowed buggy to the brother’s house. The brother had committed suicide. With photographic exactness the dream had duplicated every detail of the actual incident.

A woman awakened her husband one night and told him of a horrifying dream. She reported seeing a large ornamental chandelier which hangs over her baby’s bed. The chandelier fell and crushed the baby to death. The hands on the clock in the baby’s room pointed to 4:35. Her husband laughed at the story and criticised her for putting
the baby in her own bed. He did not laugh two hours later when a crushing noise summoned then to the baby's bed chamber. The chandelier has fallen on the baby's empty crib, the clock on the dresser showed the time to be 4:35. In this instance, human violation may have effective in altering the shape of forth coming events.

In one case a person had an intuition that a friend was dead. This turned out to be true. The person concerned thought his intuition was due to telepathic communication. It was, however found that an obituary notice had appeared in the news paper in a column adjacent to a news item which this person had been reading. It is mere reasonable to assume that he perceived and read the obituary notice unconsciously than that he had received a spirit communication.

Yugma Malik a sixth class student from the school of father Angel School Sector -62, Noida.

One night she had a terrifying dream. She dreamt that she lived on a hill station, where many other people also lived. They all were living in harmony, when one-day a flood came washed away all the houses and trees. The water was very cold. Children and people drowned. There was a
sudden panic on the hill, which was a haven for the people living in that hill station. She was crying for help but nobody came. This part of the dream was so shocking that she just got up for the bed sweating and crying. She just ran to her mother and told about the nightmare. But exactly after three days when she got up in the morning and switched on the T.V. it looked like every channel was transmitting her nightmare. Tsunami had recollect her dream she think was it some kind of warning of God or just a co-incidence. (The Hindu) (Young World, Friday, 8 April, 2005).

**SIGNIFICANCE OF STUDY**

The empirical study of intuition is quiet recent in the field of education and psychology as intuition has been seen from different perspectives e.g. Vaughan’s types of intuition (1979) and Goldberg’s intuition in terms of functions (1989).

To the present researcher however, the doubt arises in the mind whether intuition is a form of higher mental ability or is it a complete separate phenomena. Because if we consider intuition in terms of “insight” or functioning at the sub conscious level then it might mean that some background knowledge or some background thinking is at
the base. Then in this case intuition should be related to higher mental ability. If we take intuition as something which defies cognitive processes and take it as a separate faculty e.g. (in case of mystic awareness or the knowledge of a Sufi). In order to solve this controvers the present research is a humble attempt to understand the phenomena of intuition as Einestineit said “intuition is what is important.”

OBJECTIVES OF THE STUDY

The objectives of the present study are given below:-

1. To study the relationship between intuition and higher mental ability.
2. To study the relationship between intuition and creative problem solving.
3. To study the relationship between higher mental ability and creative problem solving.
4. To search the factors involved in intuition, higher mental ability and creative problem solving.

HYPOTHESIS

To every problem, there may be more than one solution. A researcher’s effort is also directed towards a
solution of the selected academic problem. Most of the time it is possible to make intelligent guesses about the solution of the problem. Such an intelligent guess of a tentative solution is known as “hypothesis”. As for that matter, the investigator formulated the following hypotheses.

In order to study the objectives the following hypothesis were formulated in the form of null-hypothesis.

1. There is no relationship between intuition and higher mental ability.

2. There is no relationship between intuition and creative problem solving.

3. There is no relationship between higher mental ability and creative problem solving.

For the objectives from one to three we employed product moment correlation. In order to test the first, second and third hypothesis product moment correlation was found between the three variables.

In order to study the fourth objective we used rotated varimax technique of factor analysis.
Chapter - 2

Review of Related Studies
REVIEW OF RELATED STUDIES

Significance of the Related Literature

Research takes the advantage of the knowledge which has accumulated in the past as a result of constant human endeavour. It can never be undertaken in isolation of the work that has already been done on the problems which are directly or indirectly related to study proposed by researcher.

A careful review of the research journals, books, dissertations, thesis and other sources of information on the problem to be investigated is one of the important steps in the planning of any research study. Review of the related literature, serves the following specific purposes.

(i) A careful review helps the researcher in selecting the variables lying within the scope of his interest, in defining and operationlizing variables and in identifying variables, which are conceptually and practically important.

(ii) It helps the researcher in avoiding any duplication of work done earlier, specially when the stability and validity of its results have been clearly established.
(iii) It also gives the researcher an understanding of the research methodology which refers to the way, the study is to be conducted.

(iv) The review of the related literature helps the researcher to know about the tools and instruments which proves to be useful and promising in the previous studies.

(v) The advantage of the related literature is also to provide insight into statistical methods through which the validity of research is to be established.

(vi) The final and important specific reason for reviewing the related literature is to know about the recommendations of previous researchers for further research which they have listed in their studies.

**STUDIES RELATED TO INTUITION**

Shimojo and Ichikawa (1989) examined a version of the Bayesian probability problem, the problem of three prisoners by D.V. Lindly (1971) and F. Mosteller (1965). The problem illustrates the discrepancy between intuitive reasoning and mathematical formal reasoning about probability. The new version was also designed so that
different inferential schemes would lead to separate estimates of posterior probability.

Data obtained from 161 undergraduates in three experiments and theoretical analysis of the original and modified problem suggests that (i) The psychological processes of intuitive reasoning were qualitatively different from mathematical reasoning. (ii) Intuitive judgements can be categorized by distinctive propositional beliefs from which the judgements were apparently believed.

Gott (1989) presents an explication of expertise in two types of system diagnosis (SD) tasks:

(i) Human SD, as practiced by medical problem solvers and
(ii) Non human SD, as practiced by electronics trouble shooters.

Studies in both domains have revealed that it is particularised knowledge that plays a vital role for experts not in explicable powers of intuition. The present article describes advanced knowledge engineering methods that have been developed and applied in a number of Airforce technical domains so that experts, mental databases, and procedural libraries can be made explicit enough to serve as targets of instruction. Instructional principles have been
derived from this knowledge engineering work and are
guiding the development of a new generation of technical
training systems.

Markley (1989) described four methods by which to awaken,
facilitate and apply intuitive capacities for problem solving
and innovation. Method I, focussing, uses insights that
occur solely at the level of thought, experienced as a shift
in mind and body. Method II, is a procedure whose purpose
is to use depth sources of intuition to heal projections,
especially those dealing with people not liked. Method III, is
a type of fast free forward overview useful for exploring
situations in which likely future conditions differ from those
encountered before.

In Method IV, the transcendental dimension of intuition is
explored more deeply.

Kolanczyk (1989) discussed a model of creative intuition,
synthesizing psychological research from different
paradigms (e.g. "insight" brain literalization, neurolinguistic
programming and mediation). A system of hypothesis is
constructed that covers the characteristics of motivation,
evaluation, emotion, attention in the process of creative
intuition. The proposed model distinguishes creative intuition
from related processes, such as analytical problem solving, defense mechanisms, projection and feminine intuition.

Bowers and Parker (1990) investigated intuition as informed judgement in the context of discovery using two word tasks and a perceptual (gestalt closure) task. Two of there tasks demonstrated that Ss could respond discriminatively to coherence that they could not identify, and a 3rd demonstrated that this tacit perception of coherence guided Ss gradually to an explicit representation of it in the form of a hunch or hypothesis. Clues to coherence may automatically activate the problem solvers relevant mneemonic and semantic networks and eventually the level of patterned activation is sufficient to cross a threshold of consciousness at that point, it is represented as a hunch or hypothesis.

Levin and Druyan (1990) examined whether children and adults possess a single object, single motion intuition.

In experiment I, data from 180 3rd, 6th and 9th graders and 60 undergraduate show that Ss respond in accord with this intuition. On problem in which the intuition lead to errors, a large majority of subjects of all ages answered in correctly on problems in which it led to successful
performance. Ss answered more accurately than on problems in which the intuition was not applicable. Experiment two demonstrated that making 72 6th graders aware of the intuition and providing them kinaesthetic experiences that contradicted it produced significant improvements in their understanding.

Agor, W.H. (1991) described a brain skill management programme that can be used to find and exploit intuitive talent within organizations. Typically high intuitive managers work in environments that hinder the use of their brain skills. To counter this, executives should be assigned to tasks according to their brain skills rather than titles or seniority diagnostic testing (e.g. Myers – Briggs type indicators) can be used to locate highly intuitive executives. Such people can then be grouped together, in isolation. From those with thinking brain skills, and assigned the task of developing new ideas or solutions to problems executives with thinking skills can then evaluate this work. Both groups can be brought together for final work.

Ross (1992) examined Jung’s conception of the process of intuition and its effect on religious orientation. The intuitive person has the capacity to
(1) Abstract patterns of relationships among phenomena.

(2) Construct new possibilities not dependent on the originating sensory phenomena.

(3) Scan the phenomenal world for similar patterns and possibilities. The intuitive person’s openness to change, doubt and complexity with respect to religious belief and practical, contrast with stereotypes of the religious devotee. Appreciating the contrasting orientation that the intuitive and sensing functions bring to religious practice can help foster a climate of tolerance and acceptance both between and within religious communities and between therapist and client.

Eichler and Halseth (1992) discussed how group leaders can recognise and use their own intuition and enhance it among group members. The process of accessing intuition is based on trusting oneself. The intuitive leader is able to see the gestalt of group process. To sense the patterns that are emerging, and to know what strategies to employ and when to be quiet. The leader’s intuition is enhanced by knowledge about the intuitive process, stages of intuition, and
practices that foster intuition. By providing a conducive atmosphere, allowing reflective time, and seeing participants as collaboratives, the group leader assists participants in accessing their intuition.

Wonder and Blake (1992) argued that the difference between eastern and western approaches to creativity is the difference between intuition and logic, respectively. The two approaches are best viewed as being different in degree. The creative thought process cannot take place without use of both logic and intuition. It is proposed that both approaches fit in to the same epistemological model, with the east emphasizing the mind’s ability to grasp. Patterns intuitively and the west stressing the mind’s ability to understand by organizing information.

Manokhou and Cheremushkin (1992) investigated via brain mapping the neurological electrical activity underlying mechanism of extralogical thinking (e.g. recognition of a visual image and decisions taken through insight) 16 Ss (aged 18-25 years) were asked to identify a complex. Double image of pictures presented on a projected screen. The procedure involved perceiving the visual image. Taking a decision, and signaling that a decision had been taken by
pressing a button. The same had to be done with a second image. Identification took place gradually by Neuro physiological processes and then reached a peak. Results indicate that a subconscious process is reflected in electrical activity regardless of the laws governing it and that subconscious and conscious thought processes have a similar electrographic expression.

Holder (1992) organisations are experiencing a change in the nature of their environment from a study to a chaotic state. This new environment requires organisations to focus on human beings and their mental, physical, feeling and spiritual faculties and thus to recognize that intuition is a key ability to be possessed by organisation members. Four forms of intuition are identified. Mental, physical, feeling and spiritual. Ways of enhancing these forms of intuition are described and the importance of recognising that these strategies are not mutually exclusive is noted.

Davis, J.H. (1992) intuitions about aggregate behaviour can be very compelling, and sometimes even persist in the face of contrary evidence. An example of apparent intuition-based assumptions about group decision making behaviour from each of the past four decades to discussed in detail.
(1) Group superiority relative to individual performance (the fifties), (2) exaggerated group risk-taking relative to individuals (the sixties), (3) Group size and performance level (the seventies), and (4) decision making performance of free discussion groups and (implicit) procedural constraints (the eighties).

Au and Rollins (1993) conducted four studies and examined whether 3-7 years old appreciate that a substance can continue to exist and maintain its inherent properties (e.g. taste, having weight) even after it has become invisible upon dissolution. These studies also examined whether young children have the concept of tiny invisible particles" and if so, whether they can use it to reason about material kinds. These studies revealed that, by age 3 some children could appreciate both conservation of matter despite visual disappearance and the existence of tiny, invisible particles. Moreover, they could make use of the particle concept to come up with a plausible mechanism for how a substance can continue to exist and maintain its inherent properties despite visual disappearance upon dissolution. The proportion of children who could do so increase with age. Such abilities can play an important role in the development
of an intuitive theory of material kinds and in the acquisition of scientific concepts and theories.

Choi (1993) investigated developmental changes in the intuitive thinking of 144 children in each of 4 grade levels (kindergarten, 2nd grade, 4th grade and 6th grade): mean ages for each grade were 5.67 years, 7.75 years, 9.58 years and 11.58 years respectively. Ss completed a perceptual inference task. Two response measures, the mean point of correct response and the mean RT were applied. Results of the mean point of correct response and the mean RT were applied results of the mean point of correct response show rapid improvement from kindergarten to 2nd grade and less rapid development change thereafter, but a U-shaped developmental change was not found. However, RT results do show a U-shaped developmental change.

Johnson and Daumer (1993) defined intuition and discusses the different functions of the left and right brain hemispheres. They also suggest techniques to be used to make intuition work in the communication process, and indicates how these techniques enhance communication. It is postulated that in order to develop the brain skill of intuition, it is sometimes necessary to shutdown cognitive
(left brain) analysis and pay special attention to intuitive (right brain) ways of knowing. Educators are encouraged to have students use the right as well as the left sides of their brains. The traditional work ethic that guides education should be reconsidered in light of evidence concerning the value of incubation (during which non conscious synthesis occurs) and the deleterious impact of stress.

Miller (1993) determined the reliability and validity of the miller intuitiveness instrument (MII), an instrument designed to measure the self-perception of intuitiveness (SPI) of practicing nurses. Ample evidence of reliability and validity was found. (MII) provides a way to quantity the (SPI) of practicing nurses.

Leoni and Mullet (1993) investigated levels of intuitive mastery of the relationships between the concepts of mass, volume and density in 5th to 9th grade school students, total no. was 138) and 48 college students in France. The methodological framework of information integration theory (N.H. Anderson, 1991) was used. When asked to infer mass from information on volume and density, the rule applied most frequently was an additive rule (density plus volume). An alternative rule used by the majority of younger children
was unifactorial, involving only density. When asked to infer density the rule used most frequently was a unifactorial involving volume. Only science students primarily used the subtraction rule (means minus value) when asked to infer volume, the most frequent case was the absence of a coherent rule. University students tend to use the subtraction rule.

Wippich (1994) combined the processing view of implicit-memory interpretations with the model of intuition as proposed by Bowes et al. In their gestalt-closure task, Ss were shown slides of paired drawings. One of the drawings represented a fragmented picture of a common object, whereas the other was constructed by rotation of the elements of the coherent gestalt. When Ss were unable to name the object, they were asked to make a forced-choice decision regarding which of the 2-drawings represented a real object. Results show that the proportion of pictures not correctly identified that were nevertheless correctly selected as coherent was significantly higher than chance. The current experiment replicated there findings with 64 undergraduates. It was also shown that a study phase with either coherent or incoherent picture primes can bias
intuitive judgements in the test phase in accordance with a processing view.

Clement (1994) discussed evidence from thinking aloud case studies that indicates that part of the knowledge used by expert problem solvers consists of concrete physical intuitions rather than abstract verbal principles or equations. The case study examples focus on a number of observable behaviours in transcripts, including imagery reports, depictive hand motions and references to using intuition. [Ss] were advanced doctoral students or Professors in technical fields by expert problem solver” means a person who is an experienced problem solver in a technical field.

[Propose] hypothesized cognitive structures and processes that can account for these behaviour patterns hypothesize the use of dynamic imagery in conjunction with perceptual motor schemas in order to account for cases where the S appears to be “running and imagistic simulation” of an event on the basis of a physical intuition. [Presents evidence] indicating that imagistic simulation can be used to make knowledge that is implicit in a physical intuition more explicit attempts to online an initial framework that describe
basic relationships between physical intuitions, imagery imagined actions, implicit knowledge and mental simulation. McKenzie (1994) through Monte Carlo simulation, the accuracy of several intuitive strategies for co-variation assessment and Bayesian inference under general conditions was investigated. Conditions under which most of the intuitive strategies well or badly were characterized. Results indicate that under some general conditions, all the intuitive strategies perform much better than chance and may perform surprisingly well. Some simple environmental variables have large effects on most of the intuitive strategies, accuracy, not just in terms of the number of errors, but also in terms of the kinds of errors (e.g. incorrectly accepting vs incorrectly rejecting a hypothesis). Furthermore, common to many of the intuitive strategies is a disregard for the strength of the alternative hypothesis. Thus, a key to better performance in both tasks lies in considering alternative hypothesis.

Redford and Gaa (1995) investigated the relation between the sensing (S) – intuition (N) dimension of the Myers Briggs type indicator (MBTI) and moral development using 2 samples of 74 Ss each who were administered the MBTI and
the defining issues test (DIT) – correlation coefficients were computed for the perceiving scores of the DIT and for the continuous scores of each of the 4-preference scales of the MBTI. The coefficients of the two samples were statistically pooled and results supported the hypothesis that, of the 4 personality dimensions of the MBTI, the S-N dimension would be the only one to have a positive relation with Ss level of moral reasoning.

Miller (1995) described the process used to verify characteristics of intuitive nurses that supplied the framework for construction of Miller intuitiveness instrument (MII).

Evidence for validity of the MII was provided by examining factor analysis and correlations with the intuitive component of the Myers Briggs type indicator (MBTI) with 228 nurses. The following characteristics were subsequently verified: intuitive nurses are willing to act on their intuitions, are skilled clinicians, incorporate a spiritual component in their practices, express an interest in the abstract nature of things, and are risk takers. Intuitive nurses prefer intuition to sensing (as reflected by the MBTI) as a way of take in information. They are extroverted and express confidence in
their intuitions, nurses who delay making decisions until all the information is in and more intuitive than those who make decisions abruptly.

Shirley and Langan (1996) reviews the available literature on intuition and related concepts, including tacit knowledge, insight and creativity. Definitions of intuition are discussed, and attempts have made to distinguish among intuition, insight and creativity. Relationships between intuition and tacit knowledge and intuition and creativity are explored.

Types of intuition are proposed by F.E. Vaughan (1979) and P. Goldberg (1989) are described, as are hypothesis about how intuition works. Available empirical research is presented along with a number of possible avenues for other research.

Vanrooij (1996) explored the relationship between the Jungian psychological functions of sensing (SN) and intuition (INT) and preference for art among 179 Dutch university and high school students. Preference for SN or INT was accessed with the Myers – Briggs type indicator. Form G (MBII) SS rated how much they liked 20 realistic paintings over abstract one’s. INT SS did not show a
pronounced preference for any specific style, but were more apt to like abstract paintings than were SN Ss.

Gills and Deschutter (1996) examined intuitive – syllabifications of disyllabic words with a single intervocalic consonant in 55 and 56 years olds and 58 year olds. The children syllabified Dutch disyllabic words with a single intervocalic consonant that were presented orally to them. The aim was to find out if these syllabifications adhered to the universal principles of syllable structure and if the children’s syllabifications witnessed or overruling of the universal phonological constraint by language specific one’s. Results indicate that universal principles are sufficient to explain syllabifications. Except for obligatory onset formation, other principles act as soft constraints that are influenced by factors such as stress and vowel and consonant quality. A language specific constraint proposed in the phonological literature, namely bimosaic minimality, is hypothesized to be result of children’s familiarization with the spelling corrections.

Taggart and Lowe (1997) examined differences in responses to the 6 rational intuitive scales of the personal style inventory in relation to gender, age, ethnic group, birth
country, occupation and industry. Data were collected from 495 participants in training programmes in Australia, England, New Zealand and the US. Multivariate analysis of variance indicated no differences among groups on the 6 scales when they are not sensitive to the characteristics so separate norming scores are not indicated. Lack of differences between sexes contrasts with the finding that women score more intuitive than men on other style assessment tools findings are not, however, consistent, since characteristics other than gender may show similar disparate results, further study of rational – intuitive commensurability is needed.

Norenzayan and Nisbett (2002) examined cultural preferences for formal vs intuitive reasoning among 273 east Asian (Chinese and Korean), 187 Asian American, and 292 European American university students. The author’s investigation categorization (studies 1 and 2) conceptual structure (study 3) and deductive reasoning (studies 3 and 4). In each study a cognitive conflict was activated between formal and intuitive. Strategies of reasoning. European Americans, more than Chinese and Koreans, set aside intuition in favour of formal reasoning. Conversely, Chinese
and Koreans relied on intuitive strategies more than European Americans. Asian Americans, reasoning with either identical to that of European Americans, or intermediate. Differences emerged against a background of similar reasoning tendencies across cultures in the absence of conflict between formal and intuitive strategies.

Drewes, A.A. (2002) notes that among DR L.E. Rhine’s collection of over 30,000 letters of spontaneous adult Psi experiences were separate files containing 216 acceptable cases received between 1961 and 1977 from school age children (aged 10-18 years) 148 of the letters specially recounted 157 spontaneous Psi experiences. These cases were compared with S.A. Schouten’s (1982) analysis of 1,620 randomly selected adult – only Psi experiences letters for the Rhine collection. The children’s experiences were analysed. According to Schouten’s categorises, resulting in precognitive dreams (PDS: 52.2%) and intuitive experiences (IES: 25.1%) chi-square analysis yielded a significant difference between the two samples for PDS, IES and waking secondary experiences. Two thirds of the children’s letters were from females, the highest connection for the percipient with acquaintances, and very low reporting of
experiences with parents. Same sex target person prevailed in PDS and IES for male and female percipients 14.8% of the reported PDS were about. The children themselves and 8.9% about their pets. The highest percentage of precognitive content was around trivial events (54.1%) compared with death (18.5%) or serious injury (19.3%) also in contrast to Schouten’s data. Several case examples are provided.

Bamberger (2003) tracing the compositional process of two musically untrained college students, this close case study demonstrates their ability try to produce archetypal tonal melodies, even when working initially within the constraints of tonally and metrically ambiguous melodic materials. The two students were representative of a sample of about 75 who participated in a new approach to music fundamentals supported by novel, interactive computer music environment. Student’s, logs including their compositional sketches, decision-making, analysis of progressive modifications and completed compositions, served as evidence and data for analysis. It is argued that, when students work at their own pace, with immediate sound feedback, can modify given materials and trace access to
multiple representatives at differing levels of detail they are able to make explicit their intuitive criteria for compositional decision – making, as well as proposing an intuitive model of a sensible tune.

Frantz (2003) H. Simon made overlapping substantive contributions to the fields of economics, psychology, cognitive sciences, artificial intelligence, decision theory, and organization theory. Simon’s work was motivated by the belief that neither the human mind, human thinking and decision making, nor human creativity need be mysterious. It was after he helped create “thinking” machines that Simon come to understand human intuition as subconscious pattern recognition.

In doing so he showed that intuition need not be associated with magic and mysticism, and that it is complementary with analytical thinking. This paper will show how it overlaps in his work and especially his work on (artificial intelligence) affected his view towards intuition.

Betsch and Plessner (2003) conducted a laboratory experiment, the author’s compared the relative impact of two possible determinants of intuitive evaluative judgements. Case of recognition and total value of prior
encounters with a target, normal participants encoded daily return values of shares on the stock market while watching. Videotaped ads on the computer screen. This dual task procedure ensures that participants subsequently lack relevant event memories and thus have to rely on their intuition when evaluating the targets. In the presentation, the share appearing least frequently-pro frequently produced the lowest sum of returns. Evaluative judgements reveal a preference for the share with the highest sum of returns, although evident from recognition latencies, it was the one that was more difficult to recognize. The results provide evidence for the value–account model of implicit attitude formation, which predicts that intuitive evaluative judgements reflect the total value of prior encounters.

STUDIES RELATED TO MENTAL ABILITIES AND CREATIVITY

The present researcher could not find any study directly related to the topic of the present research. However, few studies deals with general mental ability and creativity are cited below.

Kulshreshtha (1956) conducted a study on a representative sample of 1520 students studying in literary, scientific and commerce stream of X and XI classes of the Board of High
School and Intermediate education, Uttar Pradesh. Non-verbal test of intelligence (group test 70/23) from relation test (both prepared by National Institute of Industrial Psychology, London) and Jalota’s group test of general mental ability were employed as measure of intellectual ability and examination marks served as the measures of attainment. The coefficient of correlation between the three measures of intelligence and academic achievement obtained in the study, were not high, yet they clearly indicated that students belonging to scientific stream both at the high school and intermediate level possessed a higher level, of intelligence than those belonging to literary and commercial groups.

Mishra, S.L. (1967) made an attempt to study the variations of intelligence with occupational training course, age, sex and locality. The findings showed that fifteen year old boys received higher score and lowest score and the medium score was received by sixteen, seventeen and eighteen year old boys. Boys did significantly better than the girls and high scores of physical science group showed significantly higher total in two tests but there was no significant difference in the total with high score of engineering group.
Olton (1967) investigated the extent to which thinking and problem solving ability of fifth grade students could be improved by the use of self-instructional programme lesson (The productive thinking) it showed statistically significant increments in thinking and problem solving performance on a wide variety of productive thinking measures. These instructional benefits occurred for virtually all types of students, regardless of sex or general IQ level and were specially marked for the students in classroom having in environment which were judged to provide relatively and little support and encouragement for the development of productive thinking.

Pandey, R.N. (1970) study was concerned with the testing of general mental ability among five well-defined social classes. The sample of 800 students studying in classes from standard VIII to the undergraduate stage in Gorakhpur district. The tools used were the social class evaluation scale, specially prepared by the investigator and Jalota’s group test of general mental ability. The major findings were:

(i) Each social group differed from the rest, significantly, on mental ability scores.
(ii) Students belonging to the upper end of the continuum of social class scored better on the various elements of the mental ability test.

(iii) Differences among students in general mental ability became smaller with the advancement of age and education.

(iv) Mental ability was found to be susceptible to differences in social levels.

Berglund, Gosta W. (1970) 418 Swedish children (11 years old) were divided randomly into four experimental groups. Three mental ability tests of the factor type were administered to the groups by means of four different sets of instructions. In the first group the test were presented as intelligence tests and the second group as achievement tests. The third group received the original instructions of the tests and the fourth group received routine instructions. It is concluded: - (a) That the four instructions do not differentiate the groups in power tests, and (b) that the routine does not affect the Ss' working speed to the same degree as the other instructions.

Passi, B.K. (1972) conducted a study to explore the relationship between creativity and intelligence on the
students of higher secondary schools of Punjab. The test employed for this purpose were Passi’s test of creativity, Jalota’s group test of mental ability and Raven’s standard progressive matrices. The coefficient of correlation obtained between creativity and intelligence was 0.26 and 0.33 respectively. He obtained curvilinear relationship between creativity and intelligence which suggests the possibility of a threshold point beyond which the two scores did not correlate.

Khetena (1973) conducted a study to find out the effect of creative thinking strategies with children between the ages of five and eleven to think creativity. Teachers were trained for there patterns of teaching. The result showed that the training to think creativity with pictures influences the creativity of children in terms of figural flexibility, originality and evaluation, specially at the kindergarten and grade one levels.

Collahan (1973) attempted to find the effects of a programme called mark I creative programme on creative thinking of sixth grade students. The results indicated that those was a trained towards high mean scores for the experimental group.
Rai (1974) attempted to investigate the relationship between intelligence and achievement. The sample consisted of 1000 students of science (Biology) matched on the basis of socio-economic status. Jalota's group test of general mental ability served as a measure of intelligence. The investigation revealed that intelligence was significant for better achievement.

Nair, P.M. (1975) conducted a study of personality characteristics of creative high school pupils. The objective of the study was to solve the problem of identification of the creative pupils in the classroom by simple observation of the adjusting nature of their personality. The findings of the study revealed that creative pupils were found to differ from non-creative pupils in respect of the adjustment variable (2) the creative pupils were better adjusted than the non-creative pupils, personally as well as socially (3) the non-creative pupils exhibited the highest degree of anxiety whereas, the creative pupils exhibited the least degree of anxiety.

Kumari K. (1975) conducted a study of relationship among creativity, intelligence, and adjustment and value patterns in adolescence age ranged from 13 to 19 years. Sample of
the study comprises one thousand subjects including 500 girls and 500 boys. Intelligence, adjustment, creativity tests were the tools used for the study. Important hypothesis were (i) There is a positive and significant relationship between creativity and intelligence, creativity and adjustment,. Creativity and value pattern (ii) the level of adjustment is not dependent on the amount of intelligence – following were the important findings (a) there was no significant relationship between intelligence and creativity, creativity and adjustment (iii) level of adjustment was significantly related to the amount of intelligence. (iv) Intelligence had no place in patterning of the value system among adolescents and so no specific value was related to intelligence.

Dharmangadan, M.A. (1976) carried out an analytical study of creativity in the school children. The study was intended to determine the relationship between creativity and intelligence, temperament, motivation and certain selected environmental factors. Product moment coefficient of correlation, partial correlation of three analysis of variance and covariance were the statistical techniques. Findings of the study revealed that intelligence (both verbal and non-
verbal) was found to correlate highly with creativity. (2) The relationship between the different components of SES index and creativity indicate a differential pattern. (3) The family size showed only a weak relationship with creativity (4) Extracurricular activities showed no relationship to creativity.

Gupta (1977) studied the relationship of creativity with self-concept on a sample of 1000 boys and girls of 12\textsuperscript{th} in Jammu city. A verbal and nonverbal battery of MIER, and the Deo’s personality word list were used as the measure of creativity and self-concept respectively. This study confirmed the theories of Allport, Rogers and Maslow. The result highlighted the healthier self concept and higher self acceptance as important personality characteristics conducive to higher creativity. Highly creative individuals were found to possess higher self concepts and higher acceptance both of which were conducive to better adjustment, yet the presence of a common factor between the two variables was not borne out by the results.

Ameerjan, Girja and Bhadra (1978) attempted to investigate the relationship between general mental ability and academic achievement. The sample consisted of 224 fresh
men of veterinary and agricultural sciences. Ravon’s progressive matrices was employed as measuring tools of mental ability. The study revealed that academic achievement was significantly related to general mental ability.

Asha, C.B. (1978) Carried out an empirical study of the adjustment patterns of creative children in secondary schools. The study attempted to find out another highly creative children different from their less creative peers indifferent areas of adjustment such as home, health, social and school adjustments and whether better adjusted children differed from their maladjusted peers in creative performance. A test of creative thinking abilities, an adjustment inventory, a school adjustment inventory and personal adjustment inventory were the tools. The sample comprised 1,100 students of standard X drawn from twenty four high school in Trivandrum district in Kerala. The study revealed that none of the group classified on the basis of creativity showed significant difference in health, social and school adjustment areas, for the boys and girls. (ii) the three creative groups among boys showed significant difference in emotional adjustment (iii) only two sub groups
Singh, R.P. (1979) conducted a study of creativity in relation to adjustment, frustration and level of aspiration. The study was aimed at (i) to find out the nature and extent of the relationship between creativity and adjustment, creativity and frustration reaction and creativity and level of aspiration (ii) To study the predictors of creativity. Six hundred (600) male students of class IX and X were randomly selected as the sample of the study, creative thinking by Mehdi, adjustment inventory by Sinha and Singh, frustration test by Chauhan and level of aspiration test by Shah and Bhargawa were the test employed for the investigation. Statistical techniques used included t-test, product moment correlation and multiple regression analysis. The major findings were (i) creativity was found to be positively and significantly related to total, social and educational adjustment at 0.05 level, but creativity was not found to be significantly related to emotional adjustment. (2) The value of multiple regression coefficient between creativity and adjustment, aggression and level of
aspiration was found to be significant at 0.05 level, while others were insignificant.

Qureshi, A.N. (1980) conducted a study of creativity in relation to intelligence, manifest anxiety and level of aspiration of high school girls. The study was undertaken to know (i) how and at what level intelligence, anxiety and level of aspiration are related to creativity (ii) how much and in that way intelligence, anxiety and level of aspiration influenced creativity (iii) The dynamics of aspiration. Statistical technique involving analysis of variance and coefficient of correlation were used. The sample was drawn from Firozabad town and three hundred girls of high school and intermediate classes were selected creativity test of Mehdi, group test of mental ability (Jalota), STAT by Sharma and Singh and level of aspiration inventory (Patel). Findings of the study revealed that intelligence was significantly and positively related to intelligence (ii) Anxiety appeared to be a positive correlated of creativity (iii) intelligence, anxiety and aspiration promoted creativity and its components (iv) aspiration were related to creativity and its components.
Maddu, V. (1980) carried out an investigation of some personality correlates of intelligence and creative abilities among high school students in Andhra Pradesh. Major objectives of the study were to investigate the relationship of certain variables to creativity. The sample consisted of 474 boys drawn from various high schools, in the two cities of Hyderabad and Secunderabad cluster and multistage sampling technique was adopted in the selection of sample. Passi’s test of creativity, a group test of general mental ability, and high school personality questionnaire. Major findings were (i) the high creative group was found to be negatively correlated (r = -0.096) with intelligence (ii) Personality characteristics of the high creative groups (iii) The high as well as low creative groups did not show any significant correlation with intelligence.

Pandey R.C. (1981) conducted a study of creativity as related to rural urban background, sex, socio-economic status and formal education with special reference to the high school students of Kumaun division. The main objectives of the study were to find out the relationship between creative factors and SES of students and to study the incidence of creativity and compare its pattern among
males and females as well as rural and urban students. The sample was selected on the basis of stratified random sampling techniques, comprising 400 students of class VIII. Findings of the study revealed a positive trend in case of the upper SES group with creativity while a negative trend appeared in group with the lower SES (ii) No significant difference between mean creativity scores of boys and girls. (iii) There was evidence of significant difference between the mean creativity scores of the samples of rural and urban students.

Jarial (1981) conducted a relational study between creativity and intelligence with reference to sex. Torrance test of creative thinking and Jalota’s General Mental ability tests were employed on 200 male and female students of class IX. He obtained a positively significant relationship between the verbal and non-verbal creativity and intelligence.

Singh, K. (1982) made an extensive study of creative thinking in relation to some cognitive and non-cognitive variables. The sample consisted of 370 students from grade VIII, IX and X. Jalota’s general mental ability test, personality inventory, McClelland’s test of achievement
motivation were employed on the sample. The important results obtained from the above study were:-

(i) Boys achieved significantly higher mean scores than the girls on the measures of creative thinking.

(ii) Creativity was found to related positively and significantly with intelligence among boys and girls.

(iii) Creativity had positive and significant relationship with the academic achievement of boys and girls.

(iv) The introversion, extroversion and neuroticism, emotional stability scale had negative relationship with creativity.

(v) Achievement motivation had positive and significant relationship with creativity.

Singh, O.P. (1982) conducted a study of creativity in high school students in relation to intelligence and socio-economic status. The sample of the study consisted of 400 rural and 400 urban high school students. Joshi’s test of mental ability was used, for the assessment of intelligence, Baqer Mehdi’s test was used for the measurement of creativity and information about socio-economic status of the family was collected with the help of questionnaire. The
main findings of the study were (i) The mean intelligence
test score of the science students was significantly higher
than that of the arts students (ii) In general the SES of the
urban students was higher from rural areas. (iii) The mean
creativity score of the urban students was higher than that
of the students from rural areas (iv) the main creativity
score of science students was higher than that of arts
students.

Mehrotra, S. (1986) studied the relationship between
intelligence, socio economic status, anxiety, personality,
adjustment and academic achievements of 535 class
student. The tool used was Jalota’s group general mental
ability test. The finding suggested that there is a positive
relationship between intelligence and academic
achievement.

Myrs S. (1986) made a study to find out the relationship
between problem solving abilities and synthesis, the sample
of the study includes fourth, fifth and sixth grade gifted
students. The instrument used was the Weschler
intelligences scale for the children revised (Wisc-R) and the
Ross test of higher cognitive abilities. The findings of the
studies indicate that
(i) There was a significant relationship between grade level and problem solving abilities.

(ii) No significant relationship was found between problem solving skill and grade level of general intelligence on all the subjects of the Ross and the Wisc-R except for Ross sub test VIII. The sub-test had a positive relationship with the Wisc-R verbal and scale sector.

Desai, N.N. (1987) carried out an investigation into the creative thinking abilities of students of higher secondary of Gujrat State in the contest of some psycho-socio-factors. Main objectives of the study were (i) to study the trend of creative thinking ability of pupils of higher secondary schools. (ii) To study the creative thinking ability in relation to different socio-economic levels and (iii) To study creative thinking ability in relation to scholastic achievement, anxiety and reasoning. Sample of the study was 608 students from rural and urban area both girls and boys SES scale by B.V. Patel and Arora. The anxiety scale by Nighawan, the percentage marks obtained by the students at SSC examination were the tool of the study. ANOVA was the statistical technique. The investigation revealed that (i)
there exists no difference in creative thinking ability of urban and rural higher secondary students. (iii) There was no significant difference between the means of high SES students (iii) there was no difference between the means of science and common stream students.

Sudhir, and Muraleedharan, (1987) investigated in to science achievement in relation to intelligence and SES. The sample comprised of 146 male and 165 female secondary school students. They were administered a science achievement test, a group test of intelligence and SES scale. Findings, revealed that SES and intelligence are positively related with science achievement, i.e. high socio-economic status and high intelligence subjects and higher science achievement scores than low SES and low intelligence group.

Mc Duffie Harriet, E. (1988) attempted to study the effect of intelligence, creativity and cognitive style on success in composition. The main aim was to study the effect of intelligent, creativity and cognitive styles on success in composition. The sample of the study consists of 109 college freshmen at a small Southern Public University. The findings of the study demonstrate that students with high
performance scores in writing are more affected by intelligence and cognitive styles than by creativity. In fact creativity score on originality had no co-relational significance with success in academic writing performance.
Chapter - 3

Method

&

Procedure
METHOD AND PROCEDURE

Research Design

The research design is the detailed plan of the investigation. In fact, it is the “blue print” of the detailed procedure of testing the hypothesis and analyzing the obtained data. The research design there may be defined as the sequence of those steps taken ahead of time to ensure that the relevant data will be collected in a way that permits objective analysis of the different hypotheses formulated with respect to the research problems. Thus, the research design helps the researcher in testing the hypothesis by reaching valid and objective conclusions regarding the relationship between independent and dependent variables.

In this chapter a description of the sample, its size, research tools, administration and collection of data and statistical techniques used by the investigator for analyzing data, has been presented.

Sample of the study

The sample of the study has been selected from the two schools of Aligarh Muslim University. For the present purpose only XI standard students were selected for the
study from different streams. Three hundred students (100 boys and 200 girls) have been selected from the following schools on random basis.

These are the only two schools one for girls and one for boys which cater the +2 education under Aligarh Muslim University.


Total students enrolled in science were 935 (317 Girls and 618 boys). In Social Science and Arts stream the test was administrated only to girls of Abdullah School. The students enrolled in Social Science and Arts are 120 girls. The present test of higher mental ability is meant only for science students. Therefore, it could not be applied on social sciences and arts students. However, only for the sake of curiosity hundred girls were taken from social science and arts stream and were given the test of intuition and creative problem solving.

The sample break is as follows:

Stream wise break up of the sample:
<table>
<thead>
<tr>
<th>Stream</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>200 (100 boys and 100 girls)</td>
</tr>
<tr>
<td>Arts</td>
<td>50 (only girls)</td>
</tr>
<tr>
<td>Social Science</td>
<td>50 (only girls)</td>
</tr>
</tbody>
</table>

Sex-wise break up of the sample

<table>
<thead>
<tr>
<th>Sex</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>100</td>
</tr>
<tr>
<td>Girls</td>
<td>200</td>
</tr>
</tbody>
</table>

On the whole the sample is representative of the 10+2 school population of Aligarh Muslim University.

**Tools of the study**

In order to collect the data for the present investigation the following tools have been used.

- Test on intuition by Dr. Philip Goldberg
- Test on Higher Mental Ability (THMAS) by Dr. D.N. Sansanwal and Dr. (Mrs.) Anuradha Joshi.
- Passi Usha Test of creative problem solving (PUTCPS) by B.K. Passi and Usha Kumar.

**Test on Intuition**

The test was constructed by Psychologist and the author of "The Intuitive Edge" Dr. Philip Goldberg. This book was one of the first books to be printed for the layman on intuition.
This test contains 32 items. Each right answer was assigned one mark and each wrong answer was assigned zero mark. The test is developed for measuring intuition among students.

The reliability and validity of the test was determined for the present study on a sample of 300 students.

**Validity**

The discriminatory value of items was found out for the test of intuition. On the basis of high and low scoring in the test, the students on and above 75\(^{th}\) percentile position are regarded as high scorers and students scoring on the 25\(^{th}\) percentile or below are classified as low scorers. Those items are being accepted whose discriminatory value is 0.55 or above and those items were rejected whose discriminatory value is below 0.55. Total number of items in the test by Goldberg are 32 out of which 23 items were accepted and 9 items were rejected on the basis of discriminatory value of items.

**Reliability**

The reliability of twenty-three items was determined by split half method. The results are as follows.
\( r = 0.57 \)

\( r = 0.726 \) (after applying the formula \( 2r/1+r \) for correction)

**Split Half Method**

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>Reliable Half Test</td>
<td>0.570</td>
</tr>
<tr>
<td>Reliable Full Test</td>
<td>0.726</td>
</tr>
</tbody>
</table>

**Test on Creative Problem Solving**

The present investigator employed Passi-Usha Test of Creative Problem Solving (PUTCPS). This test battery is meant to identify creative talent among the students. The (PUTCPS) is developed for the purpose of measuring creative problem solving of school children and also adult. It measures development of thinking skills-creative, critical and integrative thinking. The abilities included are originality and elaboration.

**Reliability of the Test**

Reliability of the PUTCPS was established through test-retest method.

**Test-retest Reliability co-efficient of PUTCPS**

<table>
<thead>
<tr>
<th></th>
<th>Elaboration</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Originality</td>
<td>0.74</td>
<td>0.85</td>
</tr>
<tr>
<td>Elaboration</td>
<td>0.86</td>
<td></td>
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</tbody>
</table>

Significant at 0.01 level
The test-retest reliability of the PUTCPS and its components are found to be high. The PUTCPS was found reliable for practical purposes of conducting academic studies and research investigations.

**Validity of the Test**

Concurrent validity method was employed to validate the PUTCPS. Concurrent validity was established by working out the relationship between the PUTCPS scores with that of Passi-Tests of Creativity (PTC) and also Torrance Tests of Creative Thinking (TTCT).

**Concurrent Validity of the PUTCPS**

<table>
<thead>
<tr>
<th>Passi Test of Creativity</th>
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<tbody>
<tr>
<td>No. of students for PUTCPS and PTC</td>
<td>N = 61</td>
</tr>
<tr>
<td>Correlation Coefficient for Criterion Measure PTC</td>
<td>r = 0.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Torrance Test of Creativity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students present for PUTCPS and TTCT</td>
<td>N = 53</td>
</tr>
<tr>
<td>Correlation Coefficient for Criterion Measure TTCT</td>
<td>r = 0.56</td>
</tr>
</tbody>
</table>

Significant at 0.01 level

75
Scoring

The responses were non-verbal or in drawings form. These responses were scored for originality and elaboration on the lines of TTCT and PTC scoring system. The scores on the dimensions of originality and elaboration were added so as to represent a measure of creative problem solving ability.

Originality was assessed on the basis of commonness of responses for which a three-point scale from zero to two was developed. Wrong responses were scored zero, the right and more common responses were scored one, and exceptionally good and original responses were scored two. Level of commonness is decided by the frequency of occurrence of a particular response in a particular group. Greater the frequency of occurrence in the relevant groups, more is the commonness and lower is the score on originality, and vice-versa. Elaboration is the ability to give minute details and work out plans and refinements, implements and sell solutions. In the PUTCPS scoring, Elaboration is assessed by given credit to each pertinent detail (idea) added to the original stimulus figure.
Test on Higher Mental Ability

For measuring mental abilities test of higher mental ability in science (THMAS) was used. It was constructed by Dr. D.N. Sansanwal and Dr. (Mrs.) Anuradha Joshi. The scale consists of 20 items each with alternative responses. The respondents are required to place a tick mark against the best answer of their choice within the parentheses provided for the purpose. For the present test the four levels of cognitive domain have been taken viz application, analysis, synthesis and evaluation. It is applied only on science students.

Details of Items

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Class</th>
<th>No. of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Application</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>Analysis</td>
<td>6</td>
</tr>
<tr>
<td>3.</td>
<td>Synthesis</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>Evaluation</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>20</td>
</tr>
</tbody>
</table>

Reliability of the Test

Reliability of the test was established by test-retest method. The test was administered to 110 students of class IX. The correlation coefficient was found to be 0.504. The
test-retest correlation co-efficient is high. The test-retest reliability co-efficient at the gap of 20 days was found out to 0.816 on 111 class IX students. So it reflects that the developed test of (THMAS) could be taken to be reliable.

Validity of the Test

The concurrent validity was established against the performance of students in science and total academic achievement.

Concurrent Validity Coefficient of the Test

<table>
<thead>
<tr>
<th>Correlation Between</th>
<th>N</th>
<th>Correlation Coefficient</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement on Test of THMAS and Achievement in Science</td>
<td>104</td>
<td>0.24</td>
<td>Significant at 0.05 level</td>
</tr>
<tr>
<td>Achievement on test of THMAS and total academic achievement</td>
<td>102</td>
<td>0.26</td>
<td>Significant at 0.01 level</td>
</tr>
</tbody>
</table>

It can be seen that the concurrent validity coefficients are 0.24 and 0.26 which are significant at 0.05 level and 0.01 level with df. equal to 102 and 100 respectively.
Although the correlation coefficients are significant yet they are low.

**Scoring**

The scoring was done according to the instructions provided in the respective manual.

**Administration of the Test**

From the two schools of AMU, Aligarh, three hundred students were taken. In the process of data collection, the investigator first sought the permission from the Principal of respective schools. To get the correct information from the respondents, the following aspects were taken into consideration.

The purpose of collection of data was highlighted

(1) Respondents were assumed that the information provided by them would be kept confidential.

(2) Respondents were assured that the information would only be used for research purposes and has nothing to do with their school achievement. Students were provided general orientation for the type of item given in the tool and the way to respond it.
(3) They were requested to answer the items carefully and correctly.

(4) The tools were then distributed and respondents were asked to read the instructions provided on the first page and to fill up the entries.

(5) The investigator was vigilant enough to see that each and every columns/items of the tools are filled up by the respondents.

(6) After the completion of the questionnaire according to the time limit, which was different for different section of the test, it was collected from the respondents.

**Statistical Techniques Employed**

In order to examine and justify the objectives of the study, the statistical techniques employed, are product moment correlation and factor analysis. Product moment correlation coefficient was calculated in order to find out the relationship between different variables of the study i.e. intuition, higher mental ability (Application, analysis, synthesis, evaluation) and creative problem solving (right, wrong and original).
In order to obtain the main objective of the study factor analysis was carried out through the technique of rotated varimax. This was done to find out the factors behind intuition and higher mental ability.
Chapter - 4

Analysis, Interpretation & Discussion
ANALYSIS, INTERPRETATION
AND DISCUSSION

Analysis is really a highly complicated job and it requires scientific mind and expertness. In the present investigation, the investigator in order to analyse the data of the study employed the suitable statistical technique. The statistical techniques employed in the present investigation are product moment correlation and factor analysis. The investigator tried the level best to arrive at meaningful generalization by comparing differences among male and female students of various variables, viz-a-viz intuition, higher mental ability (application, analysis, synthesis, evaluation) and creative problem solving (wrong responses, right responses, original responses. The relationships have been ascertained by computing inter-correlations among the above mentioned variables.
**TABLE-I**

Correlation Matrix of total science (boys & girls) N=200

<table>
<thead>
<tr>
<th></th>
<th>Intuition</th>
<th>Application</th>
<th>Analysis</th>
<th>Synthesis</th>
<th>Evaluation</th>
<th>Wrong</th>
<th>Right</th>
<th>Original</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>-</td>
<td>-0.075</td>
<td>-0.081</td>
<td>-0.070</td>
<td>-0.103</td>
<td>0.068</td>
<td>0.104</td>
<td>-0.100</td>
</tr>
<tr>
<td>Application</td>
<td>-</td>
<td>-</td>
<td>0.279**</td>
<td>0.067</td>
<td>-0.053</td>
<td>0.036</td>
<td>0.058</td>
<td>-0.105</td>
</tr>
<tr>
<td>Analysis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.0168*</td>
<td>0.023</td>
<td>0.051</td>
<td>-0.138*</td>
<td>0.093</td>
</tr>
<tr>
<td>Synthesis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.003</td>
<td>-0.167*</td>
<td>0.089</td>
<td>0.073</td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.028</td>
<td>0.063</td>
<td>0.067</td>
<td></td>
</tr>
<tr>
<td>Wrong</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.180*</td>
<td>-0.450**</td>
</tr>
<tr>
<td>Right</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.731**</td>
</tr>
<tr>
<td>Original</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

** Significant at 0.01 level
* Significant at 0.05 level

Intuition is not significantly related to higher mental ability and creative problem solving in total sample (N=200). Application is positively correlated with Analysis (r = 0.279 > 0.01 level). Analysis yields a positive correlation (r = 0.168 at 0.05 level) with synthesis. Analysis is significantly but negatively correlated with right responses in the creative problem solving task (r = -0.138 at 0.05 level). Synthesis is significantly but negatively correlated with wrong responses (r = 0.167 at 0.05 levels). In creative problem solving wrong responses are negatively correlated with right responses (r = -0.180 > 0.05 < 0.01 level). Wrong is also negatively correlated with original responses.
Right responses are negatively correlated with original responses ($r = -0.731 > 0.01$ level).

**TABLE-II**

**Correlation Matrix of Social Sciences and Arts Girls N=100**

<table>
<thead>
<tr>
<th></th>
<th>Intuition</th>
<th>Wrong</th>
<th>Right</th>
<th>Original</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>-</td>
<td>0.706**</td>
<td>-0.225*</td>
<td>0.225*</td>
</tr>
<tr>
<td>Wrong</td>
<td>-</td>
<td>-</td>
<td>-0.189</td>
<td>0.189</td>
</tr>
<tr>
<td>Right</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-1.000**</td>
</tr>
<tr>
<td>Original</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

** Significant at 0.01 level  
* Significant at 0.05 level

Intuition yields a positive correlation with wrong responses ($r = 0.706 > 0.01$ level). Intuition is significant but negatively correlated with right responses in the creative problem solving task ($r = -0.225$ at 0.05 level). Intuition yields a positive correlation with original responses ($r = 0.225$ at 0.05 level). Right responses have perfect negative relationship with original responses ($r = -1.000 > 0.01$ level).
### TABLE-III

Correlation Matrix of Total Science Boys (PCB and PCM) N=100

<table>
<thead>
<tr>
<th></th>
<th>Intuition</th>
<th>Application</th>
<th>Analysis</th>
<th>Synthesis</th>
<th>Evaluation</th>
<th>Wrong</th>
<th>Right</th>
<th>Original</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>-</td>
<td>-0.056</td>
<td>0.000</td>
<td>-0.130</td>
<td>-0.036</td>
<td>0.030</td>
<td>-0.002</td>
<td>-0.028</td>
</tr>
<tr>
<td>Application</td>
<td>-</td>
<td>-</td>
<td>0.220*</td>
<td>0.237*</td>
<td>-0.030</td>
<td>-0.106</td>
<td>0.099</td>
<td>-0.055</td>
</tr>
<tr>
<td>Analysis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.229*</td>
<td>-0.070</td>
<td>-0.047</td>
<td>-0.127</td>
<td>0.117</td>
</tr>
<tr>
<td>Synthesis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.098</td>
<td>-0.197*</td>
<td>0.060</td>
<td>0.039</td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.025</td>
<td>-0.024</td>
<td>0.066</td>
<td></td>
</tr>
<tr>
<td>Wrong</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-244*</td>
<td>-0.501</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.672</td>
<td></td>
</tr>
<tr>
<td>Original</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level

Intuition is not significantly related to higher mental ability and creative problem solving. Application yields a positive correlation with analysis (r = 0.220 at 0.05 level). Application also yields a positive correlation with synthesis (r = 0.237 at 0.05 level). Analysis is positively correlated with synthesis (r = 0.229 at 0.05 level) synthesis is negatively correlated with wrong responses (r = - 0.197 at 0.05 level). Wrong responses are negatively correlated with right responses in the creative problem-solving task (r = -0.244 at 0.05 level). Wrong responses are also negatively correlated with original responses. (r = - 0.501 > 0.01 level). Right responses are negatively correlated with original responses (r = - 0.672 > 0.01 level).
### TABLE-IV

**Correlation Matrix of Science Girls (PCB & PCM) N=100**

<table>
<thead>
<tr>
<th></th>
<th>Intuition</th>
<th>Application</th>
<th>Analysis</th>
<th>Synthesis</th>
<th>Evaluation</th>
<th>Wrong</th>
<th>Right</th>
<th>Original</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>-</td>
<td>-0.124</td>
<td>-0.165</td>
<td>-0.005</td>
<td>-0.130</td>
<td>0.062</td>
<td>0.181</td>
<td>-0.128</td>
</tr>
<tr>
<td>Application</td>
<td>-</td>
<td>-</td>
<td>0.325**</td>
<td>-0.022</td>
<td>-0.032</td>
<td>0.155</td>
<td>0.024</td>
<td>-0.111</td>
</tr>
<tr>
<td>Analysis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.143</td>
<td>0.134</td>
<td>0.156</td>
<td>-0.150</td>
<td>0.093</td>
</tr>
<tr>
<td>Synthesis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.027</td>
<td>-0.092</td>
<td>0.110</td>
<td>0.061</td>
</tr>
<tr>
<td>Evaluation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.208*</td>
<td>0.138</td>
<td>-0.245*</td>
</tr>
<tr>
<td>Wrong</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.139</td>
<td>-0.360**</td>
</tr>
<tr>
<td>Right</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.792**</td>
</tr>
<tr>
<td>Original</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

** Significant at 0.01 level
* Significant at 0.05 level

Intuition is not significantly related to higher mental ability and creative problem solving. Application is positively correlated with Analysis (r = 0.325 > 0.01 level). Evaluation yields a positive correlation with wrong responses (r = 0.208 at 0.05 level). Evaluation is negatively correlated with original responses (r = -0.245 at 0.05 level). Wrong is also negatively correlated with original responses (r = -0.360 > 0.01 level). Right responses are negatively correlated with original responses (r = -0.792 > 0.01 level).
TABLE-V
Correlation Matrix of PCB Boys and Girls N=100

<table>
<thead>
<tr>
<th></th>
<th>Intuition</th>
<th>Application</th>
<th>Analysis</th>
<th>Synthesis</th>
<th>Evaluation</th>
<th>Wrong</th>
<th>Right</th>
<th>Original</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>-</td>
<td></td>
<td>0.022</td>
<td>-0.123</td>
<td>-0.232*</td>
<td>0.115</td>
<td>0.181</td>
<td>-0.189</td>
</tr>
<tr>
<td>Application</td>
<td>-</td>
<td></td>
<td></td>
<td>0.388**</td>
<td>0.057</td>
<td>-0.079</td>
<td>0.089</td>
<td>-0.011</td>
</tr>
<tr>
<td>Analysis</td>
<td>-</td>
<td>-</td>
<td>0.004</td>
<td>-0.107</td>
<td>-0.003</td>
<td>-0.261**</td>
<td>0.234*</td>
<td></td>
</tr>
<tr>
<td>Synthesis</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-0.131</td>
<td>-0.224*</td>
<td>0.021</td>
<td>0.232*</td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.196*</td>
<td>-0.133</td>
<td>-0.097</td>
<td></td>
</tr>
<tr>
<td>Wrong</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.175</td>
<td>-0.495**</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.175</td>
<td>-0.719**</td>
</tr>
<tr>
<td>Original</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level

Intuition is negatively correlated with evaluation (r = -0.232 at 0.05 level). Application yields a positive correlation with Analysis (r = 0.388 > 0.01 level). Analysis is negatively correlated with right responses (r = -0.261 > 0.01 level). Analysis is positively correlated with original responses (r = 0.234 at 0.05 level). Synthesis is negatively correlated with wrong responses (r = -0.224 at 0.05 level) but synthesis is positively correlated with original responses (r = 0.232 at 0.05 level). Evaluation yields a positive correlation with wrong responses (r = 0.196 at 0.05 level). In creative problem solving task wrong responses are negatively
correlated with original responses \( (r = -0.495 > 0.01 \text{ level}) \). Right responses are also negatively correlated with original responses \( (r = -0.719 > 0.01 \text{ level}) \).

**TABLE VI**

Correlation Matrix of PCM Boys and Girls \( N=100 \)

<table>
<thead>
<tr>
<th></th>
<th>Intuition</th>
<th>Application</th>
<th>Analysis</th>
<th>Synthesis</th>
<th>Evaluation</th>
<th>Wrong</th>
<th>Right</th>
<th>Original</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>-</td>
<td>-0.231*</td>
<td>-0.061</td>
<td>-0.103</td>
<td>0.010</td>
<td>0.017</td>
<td>0.029</td>
<td>-0.001</td>
</tr>
<tr>
<td>Application</td>
<td>-</td>
<td>-</td>
<td>0.107</td>
<td>-0.021</td>
<td>-0.039</td>
<td>-0.014</td>
<td>0.109</td>
<td>-0.134</td>
</tr>
<tr>
<td>Analysis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.226*</td>
<td>0.106</td>
<td>0.134</td>
<td>-0.099</td>
<td>0.005</td>
</tr>
<tr>
<td>Synthesis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.102</td>
<td>-0.075</td>
<td>0.110</td>
<td>-0.068</td>
</tr>
<tr>
<td>Evaluation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.126</td>
<td>0.210*</td>
<td>-0.039</td>
<td></td>
</tr>
<tr>
<td>Wrong</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.177</td>
<td>-0.142</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.743**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level

Intuition yields a negative correlation with application \( (r = -0.231 \text{ at } 0.05 \text{ level}) \). Analysis is positively correlated with synthesis \( (r = 0.226 \text{ at } 0.05 \text{ level}) \). Evaluation is positively correlated with Right Responses \( (r = 0.210 \text{ at } 0.05 \text{ level}) \). In creative problem solving task right responses are negatively correlated with original responses \( (r = -0.743 > 0.01 \text{ level}) \).
FACTOR ANALYSIS

Factor analysis was done by the principal factor method followed by varimax rotation. It is generally very difficult to interpret the nature of factors through an unrotated factor matrix because the nature of factor patterns is very complex. For sound statistical reasons it is advisable to rotate the factors before interpretation (Harman, 1976). In the present study, the method suggested by Kaiser (1958) was utilized. This method maximises the sum of variances of squared loadings in the column's of the factor matrix. In each column of the matrix this tends to produce some high loadings and some loadings near zero, which is one aspect of simple structure. The varimax method is applied to the squared loadings rather than to the loadings themselves. This makes all entries because of the possible presence of some large, negative loadings. This approach of rotation is considered to be the best because of certain statistical and theoretical advantages over other approaches. For instance, this approach is best approximates Thurston's idea of 'simple structure' Thurston, (1947). The un-rotated and rotated
factor matrix using varimax criterion is shown in the following table.

**TABLE-VII**

Unrotated factor matrix of total science N=200

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor I</th>
<th>Factor II</th>
<th>Factor III</th>
<th>Factor IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>-0.25286</td>
<td>-0.31837</td>
<td>0.03017</td>
<td>-0.57606</td>
</tr>
<tr>
<td>Application</td>
<td>-0.07280</td>
<td>0.69905</td>
<td>0.20793</td>
<td>-0.22492</td>
</tr>
<tr>
<td>Analysis</td>
<td>0.23401</td>
<td>0.69749</td>
<td>0.28637</td>
<td>-0.06977</td>
</tr>
<tr>
<td>Synthesis</td>
<td>0.13167</td>
<td>0.50817</td>
<td>-0.45582</td>
<td>-0.07527</td>
</tr>
<tr>
<td>Evaluation</td>
<td>-0.10487</td>
<td>0.07409</td>
<td>-0.03092</td>
<td>0.82955</td>
</tr>
<tr>
<td>Wrong</td>
<td>-0.37212</td>
<td>-0.03460</td>
<td>0.82425</td>
<td>0.7340</td>
</tr>
<tr>
<td>Right</td>
<td>-0.80478</td>
<td>0.16821</td>
<td>-0.51090</td>
<td>-0.02171</td>
</tr>
<tr>
<td>Original</td>
<td>0.96062</td>
<td>-0.13478</td>
<td>-0.09569</td>
<td>-0.04056</td>
</tr>
</tbody>
</table>
### TABLE–VIII

**Rotated factor matrix of total science N=200**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor I</th>
<th>Factor II</th>
<th>Factor III</th>
<th>Factor IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>-0.16036</td>
<td>-0.17427</td>
<td>0.12666</td>
<td>-0.65263</td>
</tr>
<tr>
<td>Application</td>
<td>-0.13608</td>
<td>0.75175</td>
<td>-0.00699</td>
<td>-0.06400</td>
</tr>
<tr>
<td>Analysis</td>
<td>0.17227</td>
<td>0.76611</td>
<td>-0.01482</td>
<td>0.10631</td>
</tr>
<tr>
<td>Synthesis</td>
<td>-0.09500</td>
<td>0.33941</td>
<td>-0.5992</td>
<td>0.06982</td>
</tr>
<tr>
<td>Evaluation</td>
<td>-0.13655</td>
<td>-0.13235</td>
<td>0.08233</td>
<td>0.81404</td>
</tr>
<tr>
<td>Wrong</td>
<td>-0.11701</td>
<td>0.19789</td>
<td>0.87832</td>
<td>0.01199</td>
</tr>
<tr>
<td>Right</td>
<td>-0.93104</td>
<td>-0.07360</td>
<td>-0.25402</td>
<td>-0.02617</td>
</tr>
<tr>
<td>Original</td>
<td>0.90458</td>
<td>-0.07205</td>
<td>-0.35816</td>
<td>0.00253</td>
</tr>
</tbody>
</table>

**Eigen Value**

|     | 1.86126 | 1.38790 | 1.28444 | 1.08863 |

**Cumulative Percentage of Eigen Values**

|     | 0.23266 | 0.40614 | 0.56670 | 0.70278 |
TOTAL SCIENCE (BOYS & GIRLS)

Four factors have been discussed.

**Factor I—Divergent Thinking (as opposed to convergent thinking)**

Right responses have negative loading (-0.93) and original responses have high positive loading (0.90) on this factor. This we can term as Guilford’s divergent thinking as opposed to convergent thinking. In divergent thinking the subject is free to choose responses where as in convergent thinking there is a fixed ‘right’ response. Guilford says that our educational system mostly emphases right responses and suppresses creativity. Original responses in the creative problem task obviously involve divergent thinking. Right and original responses are also negatively correlated (-0.73).

**Factor II—High Cognitive Ability or Higher Mental Ability**

Factor II has positive loading on application (0.75), analysis (0.76), and synthesis (0.33). The loading on synthesis is low though positive. This factor is termed as cognitive ability or higher mental ability. This shows that the same cognitive and mental ability is running in application, analysis and synthesis. This also shows that
these are not independent dimensions of higher mental ability.

**Factor III—Low Cognitive Ability**

Factor III has high positive loading on wrong responses (0.87) and negative loading on synthesis (-0.59) and original (-0.35). It probably shows lack of mental ability as well as creativity. So this term can be termed as low cognitive ability.

**Factor IV: Rational Vs A Rational**

This factor is positively loaded to evaluation (0.81) and negatively loaded to intuition (-0.65). This factor can be termed as Rational as opposed to irrational or A-rational. Jung (1974) has used the term irrational for describing intuition as opposed to rational.
**TABLE-IX**

Unrotated factor matrix of Total Science Boys $N=100$

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor I</th>
<th>Factor II</th>
<th>Factor III</th>
<th>Factor IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>-0.10263</td>
<td>0.20523</td>
<td>-0.07575</td>
<td>0.82248</td>
</tr>
<tr>
<td>Application</td>
<td>0.10451</td>
<td>-0.63224</td>
<td>-0.20282</td>
<td>-0.08460</td>
</tr>
<tr>
<td>Analysis</td>
<td>0.37281</td>
<td>-0.38921</td>
<td>-0.51533</td>
<td>0.05892</td>
</tr>
<tr>
<td>Synthesis</td>
<td>0.26560</td>
<td>-0.66239</td>
<td>-0.11455</td>
<td>-0.08766</td>
</tr>
<tr>
<td>Evaluation</td>
<td>0.04794</td>
<td>0.21174</td>
<td>0.38604</td>
<td>-0.49181</td>
</tr>
<tr>
<td>Wrong</td>
<td>-0.49090</td>
<td>0.39014</td>
<td>-0.70592</td>
<td>-0.26639</td>
</tr>
<tr>
<td>Right</td>
<td>-0.66699</td>
<td>-0.54331</td>
<td>0.43700</td>
<td>0.12426</td>
</tr>
<tr>
<td>Original</td>
<td>0.93761</td>
<td>0.24227</td>
<td>0.17320</td>
<td>0.07493</td>
</tr>
<tr>
<td>Variable</td>
<td>Factor I</td>
<td>Factor II</td>
<td>Factor III</td>
<td>Factor IV</td>
</tr>
<tr>
<td>--------------</td>
<td>----------</td>
<td>-----------</td>
<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Intuition</td>
<td>0.08550</td>
<td>0.25965</td>
<td>0.00180</td>
<td>0.81249</td>
</tr>
<tr>
<td>Application</td>
<td>0.04283</td>
<td>-0.65943</td>
<td>0.14533</td>
<td>-0.03374</td>
</tr>
<tr>
<td>Analysis</td>
<td>-0.09479</td>
<td>-0.66098</td>
<td>-0.28235</td>
<td>0.18412</td>
</tr>
<tr>
<td>Synthesis</td>
<td>0.19582</td>
<td>-0.69474</td>
<td>0.05546</td>
<td>-0.07764</td>
</tr>
<tr>
<td>Evaluation</td>
<td>0.11358</td>
<td>0.27963</td>
<td>-0.04016</td>
<td>-0.58765</td>
</tr>
<tr>
<td>Wrong</td>
<td>-0.97176</td>
<td>0.13231</td>
<td>-0.01944</td>
<td>0.01673</td>
</tr>
<tr>
<td>Right</td>
<td>0.20819</td>
<td>-0.04328</td>
<td>0.94909</td>
<td>0.02188</td>
</tr>
<tr>
<td>Original</td>
<td>0.53867</td>
<td>0.00248</td>
<td>-0.82487</td>
<td>-0.05318</td>
</tr>
</tbody>
</table>

Eigen Value

1.79826  1.58302  1.19388  1.02869

Cumulative Percentage of Eigen Values

0.22478  0.42266  0.57189  0.70048
TOTAL BOYS

Four factors have been discussed

Factor-I Creativity

Factor I has a positive loading on original responses in creative problem solving task (0.53) and negative loading on wrong responses of the same test (-0.97). The correlation coefficient between wrong and original is (-0.50) which is highly significant. This factor can be termed simply as creativity which involves original thinking. It shows a creative imagination as opposite to mere fantasy.

Factor-II (Low Cognitive Ability)

It has an high negative loading on application (-0.65), analysis (-0.66), synthesis (-0.69). The correlation coefficient between application and analysis is positive and highly significant (0.22) > 0.1 level. Correlation between application and synthesis is again positive and highly significant (0.23). The correlation between analysis and synthesis is (0.22) which is again positive and highly significant. This factor may be termed as low mental ability.
**Factor-III Convergent thinking vs divergent thinking**

Factor-III has a high positive loading on right responses (0.94) and high negative loading on original responses (-0.82) in the creative problem solving task. This factor can be termed as convergent thinking. Emphasis on right responses suppresses convergent thinking as observed by Guilford.

**Factor-IV A – Rational Vs. Rational**

The fourth factor has a high positive loading on intuition (0.81) and a negative loading (-0.58) on evaluation. This factor is termed as A-rational as opposed to rational. This is the only factor which is positively loaded to intuition. Intuition and evaluation are not significantly correlated. Correlation coefficient being (-0.03). Evaluation is based on concrete material and concrete experiences. Intuition does not require concrete experience. Pure intuition is beyond rationalism. In its purest form it can be completely detached to reality or past experience. The reason for calling it A-rational is that intuition does not know anything about rationality. It is neither rational nor anti-rational.
TABLE-XI

Unrotated factor matrix of Science Girls N=100

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor I</th>
<th>Factor II</th>
<th>Factor III</th>
<th>Factor IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>0.26535</td>
<td>-0.42479</td>
<td>-0.22274</td>
<td>-0.38390</td>
</tr>
<tr>
<td>Application</td>
<td>0.08819</td>
<td>0.61123</td>
<td>0.07058</td>
<td>-0.59978</td>
</tr>
<tr>
<td>Analysis</td>
<td>-0.13673</td>
<td>0.74085</td>
<td>0.25907</td>
<td>-0.14763</td>
</tr>
<tr>
<td>Synthesis</td>
<td>-0.00660</td>
<td>0.04450</td>
<td>0.78412</td>
<td>0.03063</td>
</tr>
<tr>
<td>Evaluation</td>
<td>0.37015</td>
<td>0.38284</td>
<td>0.03545</td>
<td>0.70634</td>
</tr>
<tr>
<td>Wrong</td>
<td>0.31845</td>
<td>0.52901</td>
<td>-0.55148</td>
<td>0.03488</td>
</tr>
<tr>
<td>Right</td>
<td>0.85259</td>
<td>-0.24136</td>
<td>0.34776</td>
<td>-0.10597</td>
</tr>
<tr>
<td>Original</td>
<td>-0.95729</td>
<td>-0.05852</td>
<td>-0.04234</td>
<td>0.04954</td>
</tr>
</tbody>
</table>
### TABLE-XII

Rotated factor matrix of Science Girls $N=100$

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor I</th>
<th>Factor II</th>
<th>Factor III</th>
<th>Factor IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuition</td>
<td>0.31103</td>
<td>-0.18075</td>
<td>-0.1564</td>
<td>-0.54213</td>
</tr>
<tr>
<td>Application</td>
<td>0.09762</td>
<td>0.83856</td>
<td>-0.09490</td>
<td>-0.15611</td>
</tr>
<tr>
<td>Analysis</td>
<td>-0.15528</td>
<td>0.73528</td>
<td>0.09295</td>
<td>0.28824</td>
</tr>
<tr>
<td>Synthesis</td>
<td>0.11062</td>
<td>0.17858</td>
<td>0.73744</td>
<td>0.17281</td>
</tr>
<tr>
<td>Evaluation</td>
<td>0.24778</td>
<td>-0.07189</td>
<td>-0.12907</td>
<td>0.83697</td>
</tr>
<tr>
<td>Wrong</td>
<td>0.16183</td>
<td>0.29608</td>
<td>-0.71197</td>
<td>0.25661</td>
</tr>
<tr>
<td>Right</td>
<td>0.92449</td>
<td>-0.07198</td>
<td>0.23408</td>
<td>-0.05182</td>
</tr>
<tr>
<td>Original</td>
<td>-0.92589</td>
<td>-0.06046</td>
<td>0.22958</td>
<td>-0.10220</td>
</tr>
</tbody>
</table>

**Eigen Value**

1.97866  1.59293  1.16467  1.04367

**Cumulative Percentage of Eigen Values**

0.24733  0.44646  0.59204  0.72250
TOTAL GIRLS

Four factors have been discussed.

Factor-I Insight

Factor I has a positive loading on intuition (0.31), high positive loading on right responses (0.92), and a high negative loading on original responses (-0.92) in the creative problem solving task. There is a significant negative correlation between right and original responses (-0.79). This negative correlation coefficient explains Guilford’s Divergent Thinking which is found in original responses but not in right responses. In creative problem solving task the right responses are those which are given frequently by other people. Since it is a creative problem solving task the right responses are not fixed. They require interpretation on the part of the subject. They require subjective responses. There seems to be some scope for flexibility in the response but not originality.

In insight past experiences have a role to play, and are in the background. The subject gets an insight for right responses based on the totality or wholeness of the situation. Intuition also comes in a particular moment and has the characteristics of suddenness. It may or may not be
based on past experiences. In its purest form it defies all logic in which the past experiences are embedded when intuition has some background of past experiences we call it insight. Probably insight is the meeting point of creative problem solving or creativity in general and intuition. Probably it is insight that business executives like. Gary Klein have used in successful decision making and called it intuition.

For Jung intuition stands in a compensatory relationship to sensation and, like it, is the matrix out of which thinking and feeling develop as rational functions. Although intuition is an irrational function, many intuition can afterwards be broken down into their component elements and their origin thus brought in to harmony with the laws of reason. This is probably true of insight.

**Factor-II High Cognitive Ability**

Factor II has got high positive loading on application (0.83) and analysis (0.73). It can be termed as higher cognitive ability or higher mental ability. Application analysis are not separate factors of higher mental ability. Synthesis though showing a positive loading on this factor (0.178) but fail to reach the level of significance.
Factor-III Ability to Synthesise or Organizing Ability

Factor III has a high positive loading on synthesis (0.73) and high negative loading on wrong responses (-0.71) in the creative problem solving task. Synthesis and wrong do not yield significant correlation coefficient (-0.09). This factor have been termed as the ability to synthesise or organising ability. Synthesis in this test has been defined as the process of putting together the elements and parts so as to form a whole. Synthesis therefore be as a part of organizing capability. This organizing capability has a negative loading on wrong responses in a creative problem-solving task. Thus, ability to synthesise or ability to organize and to be wrong are opposite poles.

Factor-IV Rational Vs A – Rational

Factor IV has a positive loading on evaluation (0.83) and negative loading on intuition (-0.54). Intuition and evaluation are not significantly correlated to each other. This result is just the opposite of what we found in the result of boys where intuition as a high positive loading and evaluation has a high negative loading. Intuition and evaluation exist in opposition to each other. We can presume that intuition operates in an abstract way where as
evaluation in a concrete way. A concrete concept is not differentiated concept but is still embedded in the material transmitted by sense perception. Jung also mentions about concretism as being present in thinking, feeling, sensing and intuiting. Jung gives an example that for primitive man the tree is the abode of the god or even the god himself. This is concretistic thinking. Concretistic thinking consists in the inability to conceive of anything except immediately obvious facts transmitted by the senses. [In Hull and Bayne’s 1974].

The IV factor on total boys sample has a high positive loading on intuition (0.81) and negative loading on evaluation (-0.58).

The IV factor on girls has a positive loading on evaluation (0.83) and negative loading on intuition (-0.54).

In total sample again the IV factor is positively loaded to evaluation (0.81) and negatively loaded to intuition (-0.65).

This shows that intuition and evaluation are two opposite poles of the same factor. This factor can be termed as rational Vs A-rational than irrational. Evaluation or judgement is always based on reasoning whereas intuition defies logic and reasoning.
Chapter - 5

Summary, Conclusion, Suggestions & Educational Implications
SUMMARY, CONCLUSIONS, SUGGESTIONS AND EDUCATIONAL IMPLICATIONS

The empirical study of intuition is quiet recent in the field of education and psychology as intuition has been seen from different perspectives e.g. Vaughan's types of intuition (1979) and Goldberg's intuition in terms of functions (1989).

To the present researcher however, the doubt arises in the mind whether intuition is a form of higher mental ability or is it a complete separate phenomena. Because if we consider intuition in terms of "insight" or functioning at the sub conscious level then it might mean that some background knowledge or some background thinking is at the base. Then in this case intuition should be related to higher mental ability. If we take intuition as something which defies cognitive processes and take it as a separate faculty e.g. (in case of mystic awareness or the knowledge of a Sufi). In order to solve this controvers the present research is a humble attempt to understand the phenomena of intuition as Einestinetein said "intuition is what is important."
OBJECTIVES OF THE STUDY

The objectives of the present study are given below:-

1. To study the relationship between intuition and higher mental ability.
2. To study the relationship between intuition and creative problem solving.
3. To study the relationship between higher mental ability and creative problem solving.
4. To search the factors involved in intuition, higher mental ability and creative problem solving.

HYPOTHESIS

To every problem, there may be more than one solution. A researcher’s effort is also directed towards a solution of the selected academic problem. Most of the time it is possible to make intelligent guesses about the solution of the problem. Such an intelligent guess of a tentative solution is known as “hypothesis”. As for that matter, the investigator formulated the following hypotheses.

In order to study the objectives the following hypothesis were formulated in the form of null-hypothesis.
1. There is no relationship between intuition and higher mental ability.

2. There is no relationship between intuition and creative problem solving.

3. There is no relationship between higher mental ability and creative problem solving.

For the objectives from one to three we employed product moment correlation. In order to test the first, second and third hypothesis product moment correlation was found between the three variables.

In order to study the fourth objective we used rotated varimax technique of factor analysis.

**Findings Based on Inter Correlation**

In order to study the three objectives namely

(i) Relationship between intuition and higher mental ability.

(ii) Relationship between intuition and creative problem solving.

(iii) Relationship between higher mental ability and creative problem solving. The productive moment correlation coefficient yielded the following results.
Only the important and significant results have been discussed in the following summary.

1. Intuition is not significantly related to higher mental ability and creative problem solving in total sample (N = 200), total boys, total girls. But in the case of PCB (boys and girls) it is significantly but negatively correlated with evaluation. In the case of PCM (boys and girls) intuition is negatively but significantly correlated with application—a dimension of higher mental ability. Intuition is significantly and positively correlated with wrong and original and is negatively correlated to right responses in the group of social sciences and arts students.

2. Application—a dimension of higher mental ability is positively and significantly correlated with analysis in the group of total science. Application is positively and significantly correlated with analysis in total boys total girls and PCB (boys and girls). Application is also positively and significantly correlated with synthesis in total boys.

3. Analysis is positively and significantly correlated with synthesis in the group of total science (N=200), total
boys, and PCM (boys and girls). Analysis is also significantly but negatively correlated with right responses in total science (N=200) and in the group of PCB (boys & girls). Analysis is also significantly and positively correlated with original responses in the group of PCB (boys and girls).

4. Synthesis is significantly but negatively correlated with wrong in creative problem solving task in the group of science, total boys and PCB (boys and girls). Synthesis is significantly and positively correlated with original responses in the group of PCB (boys and girls).

5. Evaluation has a positive and significant correlation with wrong in the group of girls and is negatively but significantly correlated with original responses also in the group of girls but is negatively correlated with wrong in the group of PCB (boys and girls). Evaluation is also positively and significantly correlated with right in the group of PCM (boys and girls).

6. Wrong responses – a dimension of creative problem solving task has a significant but negative correlation with right and original in the group of total science
and total boys. Wrong responses are also negatively correlated with original in the group of total girls and PCB (boys and girls).

7. Right responses has a significant but negative correlation with original responses in all the groups.

8. Original responses has a significant but negative correlation with wrong and right responses of creative problem solving task in the group of science, total boys, girls, PCB (boys and girls). It is also negatively correlated with right in the group of social sciences and PCM (boys and girls).

**FINDINGS BASED ON FACTOR ANALYSIS**

In order to study the fourth objective namely the factors involved in intuition, higher mental ability and creative problem solving varimax technique of factor analysis has been used. The major findings obtained are summarized as follows.

Considering all the results five factors have emerged-

1. If we look closely at the results, we find that the IV factor Rational Vs A- rational is common in all the three groups.
2. Summarizing the results further we find high and low cognitive ability as the II factor which is also common in all the three groups.

3. In total sample of girls the first factor can be termed as insight.

4. The third factor in girls can be termed as ability to synthesise or organizing ability.

5. In total science group the first factor has been termed as divergent thinking (vs convergent thinking). The same factor has emerged in total boys group as factor III convergent thinking (vs divergent thinking).

**Educational Implications**

1. Intuition and “mental ability” under study are completely separate from each other. Pure intuition defies all logic whereas mental ability is based on reasoning. Intuition and creative problem solving ability have a meeting point in insight learning and problem solving. Here there is some background of logic, reasoning and experiences, but the solution is found all of a sudden and in a ‘moment’. In insight past experiences have a role to play as they are in the
background and the subject captures the right responses all of a sudden based on the totality or wholeness of the situation. Intuition also comes in a particular moment and has the characteristics of suddenness. It may or may not be based on past experiences. In its purest form it defies all logic in which the past experiences are embedded. When intuition has some background of past experiences we call it insight.

2. Application, analysis and synthesis are not separate dimensions of higher mental ability. This shows that a person who has application ability also has ability to analyse and synthesize. Evaluation however seems to be a separate factor of higher mental ability. Probably the capability for evaluation needs more training than it's being an inherent capability.

3. The study also confirms Guilford’s idea about creativity which involves divergent thinking. Emphasis upon ‘right’ responses in teaching discourages originality of children.
Delimitations/suggestions for further researches

Though the present investigation has been carried out with due care and thought regarding various aspects of a research work, it may continue to have some shortcomings which have been realized during the conduction of the research. Being conscious of the shortcomings some suggestions are being made here for further investigations in this area.

1. Vaughan (1979) separates the extensive range of human intuitive experiences into four discrete levels of awareness. Physical, emotional, mental and spiritual. The test used by Goldberg has items mostly covering mental and emotional aspects involved in intuition. Therefore, another test on intuition which includes other dimensions of intuition has to be developed.

2. The test of higher mental ability was meant only for science students in the present study. It could not be applied on social sciences and arts students. Therefore, a test of higher mental ability which can be given to both science and social science group should be used in further researches.
3. None of the subjects except one, in the present sample scored "strongly intuitive" on the test of intuition. The test of intuition was scored in four categories i.e. strongly intuitive, more intuitive, erratic and low intuitive. Another study is needed to discover high scoring subjects on intuition. Only then we can reach at some definite conclusion.
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Appendices

Appendix – A

Measure of Intuition
PLEASE FILL IN THE FOLLOWING INFORMATION

Name: ____________________________
Age: ____________________________
Class: ____________________________
Sex: ____________________________
Name of School: ____________________________

The following test was created by psychologist and author of “the intuitive edge” Dr. Philip Goldberg. For each item, choose the alternative, A or B, that best applies to you.

Website: www.psychicvista.com/articles/intuitquizhtm.17k
1. When I don't have a ready answer, I trend to be:
   A. Patient   (  )
   B. Uneasy    (  )

2. When face with uncertainly, I usually:
   A. Become disoriented  (  )
   B. Remain comfortable (  )

3. In challenging situations, I am highly motivated and deeply committed:
   A. Most of the time     (  )
   B. Infrequently        (  )

4. When my intuition differs from the facts, I usually:
   A. Trust my feelings.  (  )
   B. Follow the logical course (  )

5. When working on a difficult problem I tend to:
   A. Concentrate on finding the solution (  )
   B. Play around with possibilities   (  )

6. When I disagree with others, I tend to:
   A. Let them know about it       (  )
   B. Keep the disagreement to myself (  )

7. Generally speaking I:
   A. Prefer the safe way.   (  )
   B. Enjoy taking risk     

8. When working on a problem I change strategies:
   A. Seldom.        (  )
   B. Often.         (  )

9. I prefer to be told:
   A. Exactly how to do things (  )
   B. Only what needs to be done (  )

10. When things get very complicated, I:
    A. Become exhilarated. (  )
    B. Become insecure   (  )

11. When faced with a problem, I usually:
    A. Create a plan or outline before getting started. (  )
    B. Plunge right in.    (  )
12. In most cases:
   A. Change makes me nervous
   B. I welcome unexpected changes.

13. My reading consists of:
   A. A variety of subjects, including fiction.
   B. Factual material mainly related to my work.

14. When my opinion differs from the experts, I usually:
   A. Stick to my beliefs
   B. Defer to authority

15. When faced with a number of tasks:
   A. Tackle them simultaneously
   B. Finish one before going on to another

16. When learning something new, I:
   A. Master the rules and procedures first.
   B. Get started and learn the rules as I go along.

17. At work I prefer to:
   A. Follow a prearranged schedule.
   B. Make my own schedule.

18. At school I was (am) better at:
   A. Essay questions.
   B. Short-answer questions.

19. Basically, I am
   A. An idealist
   B. A realist.

20. When I make a mistake, I tend to:
   A. Second-guess myself.
   B. Forget it and go on.

21. The following statement best applies to me:
   A. I can usually explain exactly why I know something
   B. Often I can’t describe why I know something

22. When offering a description of explanation, I am more likely to rely on
   A. Analogy anecdote
   B. Facts and figures.
23. I can usually be convinced by:
   A. An appeal to reason
   B. An appeal to my emotions.

24. When I am wrong, I:
   A. Readily admit it
   B. Defend myself

25. I wound rather be called:
   A. Imaginative
   B. Practical

26. When faced with a difficult problem, I am likely to:
   A. Ask for advice.
   B. Tackle it myself

27. Unpredictable people are:
   A. Annoying
   B. Interesting

28. When setting an appointment for the following week, I am likely to say:
   A. "Let's set an exact time now"
   B. "Call me the day before.

29. When something spoils my plans, it
   A. Get upset.
   B. Calmly make a new plan.

30. When I have a hunch, I usually react with:
   A. Enthusiasm
   B. Mistrust

31. Most of my friends and colleagues:
   A. Believe in the value of intuition
   B. Are skeptical about intuition

32. I am best known as:
   A. An idea person
   B. A detail person
Appendix – B

Measure of Higher Mental Abilities
INSTRUCTIONS

The main purpose of the test is to measure the Higher Mental Abilities in Science. Higher Mental Abilities like, Application, Analysis, Synthesis and Evaluation can be measured by this test. You are requested to read the instructions given in each question carefully. These instructions will help you in solving the questions. You have to solve all the questions. Keep in mind that none of the questions should remain unanswered. Your answers will be kept confidential.

Thank you very much for the co-operation.
Q. 1. You saw a fish at the beach struggling for life. What will you do for the fish?

Direction: Choose an inference from the following and put a tick mark (√) on it.

Inference:
1. You will give O₂ to the fish. □
2. You will take it to the doctor. □
3. You will immediately put the fish in water. □
4. You will keep it on bed. □

Direction: There will be some reason for your answer. Select the reason from the following reasons that most nearly expresses the logic of the inference you have drawn and put a tick mark (√).

Reason:
1. Fish respires in water with the help of gills. □
2. Fish needs moisture. □
3. Fish gets food in water. □
4. Atmosphere of water is appropriate for fish. □

Q. 2. You have read about ‘Matter’ in previous classes. Write down any THREE facts about the structure of matter.

1. ........................................................................................................................................
2. ........................................................................................................................................
3. ........................................................................................................................................

Q. 3. Measures of the four arms of a quadrilateral are as follows. Make a quadrilateral.
AB - 4 Cm.       Diagram:
CD - 2.5 Cm
BC - 3 Cm.
AD - 2.0 Cm.
Q. 4. You are watching a cinema in a theatre. Suddenly the fire burst-out. What will you do?

**Direction**: Choose a correct answer from the following and put a tick mark (✓) on it.

**Answer**
1. You will run outside. □
2. You will hide yourself in a tank. □
3. You will cry and make a crowd. □
4. You will use fire extinguisher. □

**Direction**: Choose from the following reasons the most appropriate reason for your answer and put a tick mark (✓) on it.

**Reason**
1. Because you know people will be safe if they run outside the theatre. □
2. Because you know water doesn't catch fire. □
3. Because you know that people will help in extinguishing fire. □
4. Because you know that carbon dioxide of the fire extinguisher helps to extinguish the fire. □

Q. 5. When a glass rod is rubbed with silk, positive charge is produced on the rod. In the same way when abonite rod is rubbed with fur, negative charge is produced on the rod. If a ball is touched to the positively charged glass rod, by induction, positive charge is also induced on the ball. In this case if a negatively charged abonite rod is kept near the ball, the ball is attracted towards abonite rod.

**Direction**: In the above passage some information about charge is given. Choose the statement from the following which represents the information and put a tick mark (✓) on it.

1. All-over the glass rod gravitational force is the same.
2. Opposite charges attract each other. □
3. There is only one charge on a body. □
4. None of the above.
Q. 6. By doing an experiment electrolysis of water was done by Halfman's voltameter. On passing electric current Oxygen and Hydrogen gas was liberated at the anode and cathode respectively. After some time it has been seen that when 24 CC of Hydrogen was liberated at cathode only 12 CC of Oxygen was liberated at anode.

Question: What is the volumetric ratio of Hydrogen and Oxygen in water?

Direction: Choose the correct answer and put a tick mark (✓) from the following, which shows the correct ratio of Hydrogen and Oxygen in water.

1. The ratio of Hydrogen and Oxygen is 1:2. □
2. The ratio of Hydrogen and Oxygen is 1:8. □
3. The ratio of Hydrogen and Oxygen is 2:8. □
4. The ratio of Hydrogen and Oxygen is 1:4. □

Q. 7. If we make curd from milk at 50° C. What will happen?

Direction: Select the most appropriate conclusion from the following and put a tick mark (✓) on it.

Conclusion: 1. The composition of milk will be disturbed. □
2. The curd will not set properly. □
3. Milk will be turned into water. □
4. Milk becomes thick. □

Direction: Choose the most appropriate reason for your conclusion from the following and put a tick mark (✓).

Reason: 1. This is not the proper situation to make curd. □
2. More bacteria are produced. □
3. The bacteria which make curd remain active only upto the temperature of 34° C. □
4. There is less reproduction in bacteria. □
Q. 8. Following table represents the use of fertilizer and production of wheat.

<table>
<thead>
<tr>
<th>Quantity of fertilizer</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 Kg.</td>
<td>4 tons</td>
</tr>
<tr>
<td>400 Kg.</td>
<td>6 tons</td>
</tr>
<tr>
<td>800 Kg.</td>
<td>12 tons</td>
</tr>
<tr>
<td>1 ton</td>
<td>20 tons</td>
</tr>
</tbody>
</table>

Conclusion: If the quantity of fertilizer is increased, the production of wheat is also increased.

Direction: Which one of the following assumption would be necessary to justify this conclusion. Put a tick mark (√) on the most appropriate assumption.

1. Plants only depend upon fertilizer. □
2. Soil needs fertilizer. □
3. Fertilizer has a quality to increase the production. √
4. Soil gets essential nutrients from fertilizers which are absorbed by the plants and so they grow. □

Q. 9. Gallileo investigated the problem of the acceleration of falling bodies by rolling balls down on very smooth planes inclined at increasing angles; since he had no means of determining very short intervals of time. From the data obtained he extrapolated for the case of free fall, which of the following is an assumption implicit in the extrapolation?

Direction: Put a tick mark (√) on the correct answer from the following:

1. Air resistance is negligible in free fall. 
2. Objects fall with constant acceleration. 
3. The acceleration observed with the inclined plane is the same as that involved in free fall. 
4. The planes are frictionless.
Q.10. A man wants to take a sun bath. At what time should he take bath so that he can get maximum heat? Perhaps at the mid day (from 12.0 a.m. to 2.0 p.m.) he can get maximum heat, because:

Direction : Put a tick mark (✓) on the correct answer from the following :-

1. In the morning we are nearer to the sun than at evening.
2. Mid day sun gives more intense light than noon and evening sun.
3. At mid day sun-rays fall straight on the earth and give more energy, while the sun-rays at the morning and evening fall slanting and give less energy.
4. The air at the mid day is hotter than the air at evening and morning.
5. Ultraviolet rays of sun are responsible for more energy.

Q.11. Some points are given below. Join these points in such a way that you can get a figure of cock.
Q.12. When a burning magnesium wire is brought in a gas jar filled with oxygen, it burns intensively. When the burning wire is brought in a gas jar filled with carbon dioxide it remains burnt and carbon is deposited. The same wire is put off in hydrogen gas jar but a sound is heard and the gas itself burns. If the burning wire is brought in chlorine gas jar, gas itself burns.

Question : There is a gas jar. The burning magnesium wire is put in this jar. Consequently magnesium wire stops burning and the gas itself burns with a pop sound. Identify and name the gas.

Q.13. You have seen that if anything is thrown upward, after some time it falls on the ground. Fruits from the tree also fall downward. What is the reason behind this phenomenon?

Q.14. When a spoonful of sugar is mixed with water and stirred, it disappears, obtained liquid is sweet in taste. The liquid, which is obtained on mixing sugar and water, is called solution. The solid which is dissolved in the solution is called solute and the liquid in which the solid is dissolved is called solvent.

Conclusion : In a solution two things are necessary - a solute and a solvent. Sugar and water make a solution because:

Direction : Choose a correct reason and put a tick mark (✓) from the following conclusions.
Q.15. An electric iron (110 Volts, 1000 Watts) has been used for some time and plug contacts have burnt, thus introducing additional resistance. How will this affect the amount of heat which the iron produces?

Direction: Choose the conclusion which you believe is most consistent with the facts given above and most reasonable in the light of whatever knowledge you may have and put a tick mark (✓) on it.

Conclusion:
1. The iron will produce more heat than when new. □
2. The iron will produce the same heat as when new. □
3. The iron will produce less heat than when new. □

Direction: Choose the reason from the following you would use to explain or support your conclusion and put a tick mark (✓) on it.

Reason:
1. The heat developed by an electric iron when connected to 110 Volts is independent of the flow of current. □
2. The current which flows through the iron is reduced when the resistance is increased. □
3. An increase in resistance increases the heat developed. □
4. Increasing the resistance in an electric circuit increases the current. □
5. Electric current of same voltage always produce same amount of heat, and burnt contacts do not decrease the amount of electricity entering the iron. □
6. An increase in electric current increases the heat. □
On the handle of a tea kettle, presence of wood does not make the handle hot. In cold regions the houses are also made-up of bamboo. Wood dust prevents melting of ice cubes. Iron utensils also have wooden handles. What is the principle behind all these facts?

Direction: Give the answer in one line.

7. See the following graph carefully. This graph shows the import of rice.

![Graph showing import of rice from 1966 to 1972]

Question: On the basis of graph, write down the position of import of rice in 1972 in comparison to 1966.

Q.18. Matter is made-up of small molecules. There is intermolecular space between the molecules. All the molecules attract each other. Intermolecular force in solids is greater than intermolecular force in liquids and gases.
Question: Give reason, why the milk placed in a plate become cold earlier than the milk placed in a glass?

Direction: Choose the correct reason from the following and put a tick mark (√) on it.

Reason:
1. Because the intermolecular space is less. ☑
2. Attraction force between the molecules is less. ☑
3. The plate is big and cold. ☑
4. More and more molecules come in contact with air and loose more heat. ☑

Q.19. By combining the following parts,

(i) Make an instrument and label any four parts of it.
(ii) Write the name of the instrument.

Diagram:

Name of the apparatus .................................................................

Q.20. A room is 20 feet in length and 15 feet in breadth. You want to fit the tiles on the floor. The size of the tile is 1x1 foot. What will be the total expenditure, you have to bear to fit the tiles? The cost of one tile is Rs. 2.0.

Direction: Choose the correct answer from the following and put a tick mark (√) on it.

1. Rs. 300
2. Rs. 600
3. Rs. 400
4. None of the above.

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Appendix – C

Measure of Creative Problem Solving
Please fill up the following informations: -

(कृपया निम्न सूचनाओं को भरें)

Name (नाम) ___________________________ Age (आयु) _______ Sex (लिंग) _______

Caste (जाति) __________________________ Religion (धर्म) __________________________

School (शेयर) __________________________ Dated (दिनांक) __________________________

Instructions (निदेश)

This test includes seven interesting problems and we wish how you will solve these problems? Your solutions should be different from that of others as far as possible. Your ideas may turn out to be brilliant and interesting in solving these problems. You please attempt all the seven items with new ways of thinking. All the responses are to be given through sketches and for each item, draw only one brilliant solution.

Example: Show how you would stop a cat and a dog from fighting?

Solution: By making separate cages, one for cat and other for dog.

Vandita is of 14 years old. She has solved the sample problem but has given a traditional and a common solution.

This is a traditional way of stopping two different groups from fighting, i.e., to put cat and dog in separate cages or within their boundaries or keeping them apart. It does not always work, particularly when the two groups cannot be separated in this way.

We are interested to find brilliant solutions.

Vandita should have tried “interesting and brilliant” solutions.

1. All the responses should be in drawing or nonverbal.
2. You may use pencil, pen and colour pencils to draw your responses.
3. The responses should be as clear as possible in idea as well as in expression.
4. The designs should be as interesting and unusual as possible. Try to give an elaborate picture with many details.
5. You may write down a brief description about the design and name its parts.
6. The time limit is 40 minutes.

Give all the answers by drawing sketches for each of the items.

Give your best answer for each item by drawing the sketch.

NATIONAL PSYCHOLOGICAL CORPORATION
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© 1996. All rights reserved. Reproduction in any form is a violation of Copyright Act. Passi-Usha Test of Creative Problem Solving (PUTCPS).
1. Show how you would stop a cat and dog from fighting.

आप एक बिल्ली तथा एक कुत्ते को लड़ने से किस प्रकार रोकिये?

2. If you were zoo-keeper and wanted to find how heavy an elephant is, how would you weigh it?

यदि आप पशुवाहिका (200) की रक्षक करते हैं तथा आप यह जानना चाहते हैं कि एक हाथी का भार कितना है तो आप किस प्रकार से उसे लेंगे?
3. Design a special bed for people who have the problem of less sleep.

एक ऐसे व्यवस्था के लिये आप विशेष प्रकार के पलंग का निर्माण करें जो कि कम सोने की समस्या से पीड़ित है।

4. Design a special rocket in which astronauts can live on the moon for three weeks.

एक ऐसे विशेष प्रकार के रॉकेट का निर्माण करें जिसमें अंतरिक्ष यात्री (astronauts) तीन सप्ताह के लिये चतुर्दश में रह सकें।
5. Draw a picture showing how you could improve the design of your body.

एक ऐसे चित्र का निर्माण करें जिसमें यह दिखाया जाए कि आप अपने शरीर को कैसे विकसित करेंगे।

6. Design a special bicycle for a postman.

पोस्टमैन के लिये विशेष प्रकार की साइकिल को रचना कीजिये।

7. If you were a policeman, how would you deal with bad men?

यदि आप पुलिसकर्मी होते तो आप किस प्रकार से बुरे लोगों के साथ पेश आते?