Chapter 3

Research Methodology
CHAPTER – 3

RESEARCH METHODOLOGY

In the previous chapter, the review of related literature pertaining to Multiple Intelligences, Creativity and Achievement Motivation was presented.

The modus operandi of the present study is presented in the form of methodology, details of the selection of Variables, Operational Definitions of the Variables, Discussion of the Variables, Hypothesis of the Study, Sample, Research Design, Description of the tools and Collection of data Statistical Techniques used in analyzing the data are presented.

3.1 INTRODUCTION

Methodology has been increasingly used as a pretentious substitute for method in scientific and technical contexts. It is a specific way of performing an operation that implies precise deliverable result at the end of each state. Field study and principles related to a branch of knowledge, the success and efficiency of the research work depends on the method adopted for the study, tools and techniques used for the study, sample selected, procedure adopted for collection of data and statistical techniques applied for the analysis.

An earnest attempt is made here, to describe each of the various stages of research format, beginning from the broad concepts of the research and their functional definitions. The kind of research methodology adopted in present study is the descriptive research [quantitative].

According to John Best and James Kahn [2007] descriptive research uses quantitative methods to describe ‘what is’, describing recording, analyzing, and interpreting conditions that exist. It involves some type of comparison or contrast and attempts to discover relationships between existing non-manipulated variables. Some form of statistical analysis is used to describe the results of the study. It deals with the relationships between variables, the testing of hypothesis, and the development of generalizations, principles or theories that have universal validity. The expectation is
that, if variable A is systematically associated with variable B, prediction of future phenomena may be possible, and the results may suggest additional or competing hypotheses to test.

In carrying out a descriptive research project, in contrast to an experiment, the researcher does not manipulate the variable, decides who receives the treatment, or arrange for events to happen. In fact, the events that are observed and described would have happened even if there had been no observation or analysis. Descriptive research also involves events that have already taken place and may be related to a present condition.

3.2 VARIABLES OF THE STUDY

Variable: Variable is a quantitative characteristic which varies from unit to unit.

- It is a concept that can assume any one of a range of values is called variable.
- A variable is/are the conditions or characteristics that the experimenter manipulates or controls.

Classification of Variables

![Diagram of Variables]

**Fig. 3.1**: Shows the Main Variables and Background Variables Selected for the Study
3.3 DISCUSSION OF VARIABLES

3.3.1 Background Variable

A Background Variable is a quantitative characteristic which is a constant and does not vary from unit to unit.

3.3.1.1 Gender

In the present study, gender refers to the boys and girls studying in the IX standard in the secondary schools of Mysore.

3.3.1.2 Type of School

Refers to the Organisation or Management that runs the school.

**Govt**: Government Schools are under the control of Government Sector. The Government schools are fully financed by the Government.

**Private School**: Private Schools are managed by the private sectors but take partial financial assistance from Government.

3.3.1.3 Locale of the School

Refers to the geographical location of the schools.

**Urban**: Those schools located in the geographical areas referred to as urban by the district authorities.

**Rural**: Those schools located in the geographical Area referred to as rural by the district authorities.

3.3.1.4 Medium of Instruction

Refers to the medium of instruction choosen by the students for their educational pursuits.

3.3.2 Main Variable

A Main Variable is a quantitative characteristic which is not constant, varies from one unit to another unit. In research, a Main Variable is that “factor which is observed and measured to determine the effect of the Background Variables”.

3.3.2.1 Multiple Intelligences

According to Gardner, there are at least ‘7’ way’s that people have of perceiving and understanding the world. Gardner labels, each of these way’s as a distinct “Intelligence”. In other words : Are a set of skills allowing individuals to find and resolve, genuine problems they face.

3.3.2.2 Creativity

Creativity is a process of producing something original and valuable. When solving problems creative people are insightful and tend to do divergent thinking, developing a variety of unusual, new responses, important factors related to creativity include motivation, intelligences, knowledge, personality and environment.

3.3.2.3 Achievement Motivation

Motivation is one of the elements of learning. It takes a major seat in the expression of intelligence. Achievement Motivation, learning, Creativity and Multiple Intelligences are all inter related.

3.4 OPERATIONAL DEFINITIONS OF THE VARIABLES

The Methodology can never be completed without determining the definitions of the terms and concepts as they operate in the total research frame work. Therefore an attempt has been made to explain in what sense these terms and concepts have been used in the study.

The present study has undertaken employing the following variables :

<table>
<thead>
<tr>
<th>Main Variables</th>
<th>Background Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Multiple Intelligences</td>
<td>1. Gender</td>
</tr>
<tr>
<td>2. Creativity</td>
<td>2. Type of School</td>
</tr>
<tr>
<td>3. Achievement Motivation</td>
<td>4. Locale of the School</td>
</tr>
<tr>
<td>5. Medium of Instruction</td>
<td></td>
</tr>
</tbody>
</table>
Main Variables

In research many of the qualities of variables of interest are abstractions and cannot be observed directly. It is necessary to define them in terms of observable acts from which the existence and amount of the variables are inferred.

An operational definition is one “It tells what the researcher must do to measure the variable”. Operational definitions have limited meaning. Their interpretation is somewhat subjective, a fact which may lead experts to give their agreement and disagreement. An operational definition specifies the operation or characteristics, necessary to identify the variable or condition being defined. [Wiersma and Jugs, 2005].

In the present study a number of terms and concepts have been used, the methodology can never be completed without determining the definitions of the terms and concepts as they operate in the total research framework. Therefore, an attempt has been made to explain in what sense these terms and concepts have been used in the study.

1. Multiple Intelligences

Multiple Intelligences are an array of different kinds of Intelligences. Gardner identified and introduced seven different kinds of intelligences, namely: Verbal-Linguistic Intelligence: a sensitivity to the meaning and order of words, Logical-Mathematical Intelligence: ability in Mathematics and other complex logical systems, Visual – Spatial intelligence: the ability to “think in pictures” to perceive the virtual world accurately and recreate [after] it in the mind or on paper, Bodily-Kinesthetic Intelligence: the ability to use one’s body in a skilled way, for self-expression or toward a goal, Musical-Rhythmic Intelligence: the ability to understand and create music, Interpersonal Intelligence : an ability to perceive and understand other individuals-their moods, desires and motivation. Intrapersonal Intelligence: an understanding of ones own emotions, Naturalistic Intelligence: understanding of nature, nurturing and classification etc. These intelligences are inherent in human beings, by the support of which they perceive, understand and relate to every aspect in life, which will be tested using Multiple Intelligences scales constructed by the researcher.
2. Creativity

Is considered as a multidimensional attribute possessed by certain individuals, which includes the factor of fluency, flexibility and originality. This will be revealed by the creative expression of the students by the tools used for measurement.

3. Achievement Motivation

Achievement motivation is the inner urge of an individual to accomplish very well or well or nil in the classroom and will be predicted using appropriate instruments.

3.5 HYPOTHESES

- **Hypothesis – 1**: There is no significant difference in the level of Multiple Intelligences in total and type wise between the Boys and Girls studying in the secondary schools of Mysore city.

- **Hypothesis – 2**: There is no significant difference in the level of Multiple Intelligences in total and type wise between the students of Government and Private schools studying in the secondary schools of Mysore city.

- **Hypothesis – 3**: There is no significant difference in the level of Multiple Intelligences in total and type wise between the students of Rural and Urban schools studying in the secondary schools of Mysore city.

- **Hypothesis – 4**: There is no significant difference in the level of Multiple Intelligences in total and type wise between the students of Kannada and English Medium studying in the secondary schools of Mysore city.

- **Hypothesis – 5**: There is no significant difference in the level of Creativity between the Boys and Girls studying in the secondary schools of Mysore city.
• **Hypothesis – 6**: There is no significant difference in the level of Creativity between the students of Government and Private Schools studying in the secondary schools of Mysore city.

• **Hypothesis – 7**: There is no significant difference in the level of Creativity between the students of Rural and Urban Schools studying in the secondary schools of Mysore city.

• **Hypothesis – 8**: There is no significant difference in the level of Creativity between the students of Kannada and English Medium studying in the secondary schools of Mysore city.

• **Hypothesis – 9**: There is no significant difference in the level of Achievement Motivation between the Boys and Girls studying in the secondary schools of Mysore city.

• **Hypothesis – 10**: There is no significant difference in the level of Achievement Motivation between the students of Government and Private Schools studying in the secondary schools of Mysore city.

• **Hypothesis – 11**: There is no significant difference in the level of Achievement Motivation between the students of Urban and Rural Schools studying in the secondary schools of Mysore city.

• **Hypothesis – 12**: There is no significant difference in the level of Achievement Motivation between the students of Kannada and English Medium studying in the secondary schools of Mysore city.

• **Hypothesis – 13**: There is no significant relationship between Multiple Intelligences and Creativity among the students studying in the secondary schools of Mysore city.

• **Hypothesis – 14**: There is no significant relationship between Multiple Intelligences and Achievement Motivation among the students studying in the secondary schools of Mysore city.
3.6 RESEARCH DESIGN

The present study is a descriptive cum correlational study. It is undertaken to find out the relationship between Multiple Intelligences, Creativity and Achievement Motivation. The population for the present study includes students studying in secondary schools from Mysore [Karnataka]. The data collected for the study were obtained from 1053 students of which 1005 students of different schools of Mysore City Urban and Rural and three taluq’s viz., Nanjangud, T. Narasipura and K. R. Nagara taluq were selected.

The data was collected by survey method by administering the selected tools and was analysed using appropriate statistical techniques and SPSS software. The data on the Main Variables were collected through research tools selected for the study as explained in vide 3.7. The data on the Background Variables were collected through the personal data sheet developed by the investigator in vide 3.7.

3.7 RESEARCH TOOLS

This section depicts the “Research Tools” used in the study. The construction of the tools and the details of the pilot study are elaborately given here.

The researcher has used three research tools for the study

1. The “Multiple Intelligences scale” was constructed by the researcher. The other two tests were standardized test
2. Test for general Creativity “A Verbal Test of Creative Thinking” [TCW] by Baqer Mehdi was adopted for the measurement of Creativity.
3. Test for the measurement of Achievement Motivation was adopted by the researcher namely “Deo Mohan’s Achievement Motivation Test” (DMAMS).

Characteristics of a good Questionnaire

Inexperienced questionnaire makers are likely to be negative about the clarity of their questions. Questionnaire makers must defend of refined language alone although there are no certain ways of producing fool proof questions, certain principles can be employed to make questionnaire items more precise. A few are suggested here with the hope to make the questionnaire items as clear as possible.
The questionnaire maker

- Should be aware of double negatives
- Must be careful of inadequate alternatives
- Always avoid the double barreled question.
- Should underline special emphasis
- Always when asking for rating or comparisons, provide a point of reference.
- Please avoid unwanted assumptions.
- Should phrase questions so that they are appropriate for all respondents.
- Must design questions that will give a complete response.
- Must provide for the systematic quantification of responses.
- The researcher must always consider the possibility of classifying the responses by themselves rather than having the respondent choose categories.

3.7.1 Multiple Intelligences
Construction of the Multiple Intelligences Questionnaire
- Developmental Phase: The Phase includes the construction of the tools used in the study.

Stages of Construction of the Multiple Intelligences Questionnaire
Stage 1: Planning
The investigator studied the various forms of questionnaires available in the library, Department of Psychology as well as the internet. This experience actually facilitated the researcher to construct the items. Although scales are available, they are much suitable for the foreign culture. Therefore the researcher has constructed a tool of much relevance to the Indian context.

The Questionnaire was constructed by the researcher, on all the eight Multiple Intelligences, viz., Verbal-Linguistic, Logical-Mathematical, Visual-Spatial, Bodily-Kinesthetic, Musical-Rhythmic, Interpersonal, Intrapersonal and Naturalistic Intelligences. The questions were based on the “Intelligence-specific understandings, skills, activities or tasks, capacities and knowledge”. Due weight age was given to all the dimensions while selecting items. The scale contains ‘80’ statements which represent the ‘universe of content’. The information on the Background Variable was collected by the personal data sheet developed by the investigator.
The aspects taken into consideration while framing the questions are **Verbal-Linguistic Intelligence** : This is a language based intelligence, the Questions in this section are based on the following aspects : alphabets, words spoken or written, Individuals facility with words and languages, Whether they are good at reading, writing, telling stories, memorizing words and dates, explaining, teaching, and learning and oration etc and Interest in learning the language. **Logical-Mathematical Intelligence** : In this area, the questions are based on, Interest / liking for Mathematics, Numerical activity, Performing complex calculations, Logical thinking, Scientific reasoning and Systematic organized behaviour. **Visual-spatial Intelligences** : This area has to do with mental Imagery and spatial judgment, The items on this Intelligence are based on the following aspects: Drawing and painting, Graphic representation, Active Imagination, Image manipulation / forming mental Images, Good sense of direction and Good hand - eye co-ordination. **Bodily - Kinesthetic Intelligence** : This Intelligence has to do with Physical body movements and doing things. The items of this Intelligence are based on the following aspects: Improved body function, Miming abilities, Mind / body connection, Skills and dexterity for fine motor movements such as those required for dancing, athletics, craft making etc and Learning by doing. **Musical - Rhythmic Intelligence** : This Intelligence has to do with rhythm, Music and hearing. The items on this Intelligence are based on : The love / Importance for Music, Sensitivity to Sounds, rhythms and tones and Ability to sing and play musical instruments. **Interpersonal Intelligence** : This area has to do with person to person communication. The items on this intelligence are based on ability to understand the feelings, emotions of the others etc., **Intrapersonal Intelligence** : This are as to do with ones own self ability to perceive about their own strength and weakness and about their goals. **Naturalistic Intelligence** : It is about the sensitivity to nature and nurturing. A persons likes about the flora and the fauna.

**Stage II : Preparation of Items**

The questionnaire consists of eight sections. It was divided into two parts for easy administration as Part I and Part II. Totally there were 104 items. The items were based on the eight intelligences. **Part I** – consists of Verbal-Linguistic, Logical-Mathematical, Visual-Spatial and Bodily-Kinesthetic. **Part II** – consists of Musical-Rhythmic, Interpersonal, Intrapersonal and Naturalistic Intelligences. The questions pivoted on the above mentioned aspects were Multiple choice questions. There are [76] number of favorable questions and [4] number of un-favorable questions.
A five point scale was adopted for choosing the right answer. The student has to choose the response which suits him/her the best. This answer helps the researcher to identify whether the student possess the strength in the particular Intelligence. The responses A and B are positive responses which point strongly towards the particular “Intelligence” in question. D and E are negative responses, if chosen indicates that the individual does not possess the particular intelligence in question. Response C - is neutral. The weight age is given to the position of the response, rather than the response.

Equivalence of weight age of marks given to responses varies in accordance with the question. The weight age is given to the position of the response, rather than the response. The scorings is rated on a five point scale as follows:
Ex : A = 4, B = 3, C = 2, D = 1, E = 0

If we convert, the questions into statements and give common responses as – Strongly Agree, Agree, Neutral, Disagree. etc., as there are 80 questions, the children will find it monotonous and boring. Finally the children will tick the response mechanically. The kind of responses, we have selected are varied and will be much interesting. The children will be enthusiastic and move from one question to another to unravel his / her Multiple Intelligences. The responses are always directed from good rating towards poor rating.

Scoring Key
The responses are recorded against each statement under the five point scale namely: Always, Many times, Sometimes, Never, I don’t know each tryout form was scored giving weight age to each of the alternative responses of the statement in the pattern given below.
- Always - 4 marks
- Many times - 3 marks
- Sometimes - 2 marks
- Never - 1 mark
- I don’t know - 0
Rationale for selecting the responses - Multiple Intelligences

“Commonality of responses is not possible, as similar responses are not obtained to all the questions”, as the researcher is trying to assess the different levels of the Multiple Intelligences type wise and in total in order to obtain a cognitive profile. Therefore when the researcher has framed the questions on the different aspects of the intelligence – specific understandings, skills and activities of the particular intelligences, the responses cannot be similar and standard.

Scoring of Research Tools

In the Multiple Intelligences scale each Intelligences is for a maximum of 40 marks, Verbal-Linguistic Intelligence – 40, Logical-Mathematical Intelligence – 40, Visual-Spatial Intelligence – 40, Bodily-Kinesthetic Intelligence – 40, Musical-Rhythmic Intelligence – 40, Inter-Personal Intelligence – 40, Intra-Personal Intelligence – 40, Naturalistic Intelligence – 40, Multiple Intelligences Total will be equal to 320.

The mean scores obtained by the students are categorized into average level of scores, above average level of scores and below average level of scores by using the standard formula $M \pm \sigma$ which is has follows

Importance of Multiple Intelligences Scores

The Multiple Intelligences scores are an individuals perceived Multiple Intelligences
1. Indicates or unravel the natural intelligences of an individual.
2. It helps in giving a clear picture of all the eight intelligences, i.e., the cognitive profile itself.
3. Each intelligence can be polished, and strengthened.
4. We are at bliss and most successful, when we learn, develop and work in the ways that make best use of our kind of natural intelligences.
5. These scores of Multiple Intelligence scale is not to lable the learner, instead to strengthen or empower.
6. This indicator, helps the learner to focus on the sorts of learning and work, that will be most fulfilling and rewarding.

Content Validity

After the questionnaire was constructed, with 104 questions, these items were given to the experts for the purpose of scrutinizing the items in terms of content, language and structure of the questions.
Based on the suggestions given by the subject experts the researcher included all the constructive suggestions and modified the test items, as per the guidance of the experts. Some items were deleted. After the modification suggested by the experts the number of items remained were 85. After scrutinizing the items were finally edited and they were prepared for the purpose of try out or pilot study.

Stage III : Pilot Study

After constructing the Multiple Intelligence scale, a pilot study was conducted on a random sample of 200, ninth standard students in Mysore City. The pilot study was conducted with the intention of finding out the reliability and validity of the tools and also to eliminate any ambiguity, so that the students could respond to the Multiple Intelligences scale easily. Total score for each intelligence was calculated. The sum of all the intelligences represented the Multiple Intelligences in total score.

The translated versions were scrutinized in consultation with the guide and the experts. They were checked for clarity of language, grammar and comprehension. These tests were administered on the selected sample as detailed in table number 3.1.

Importance of pilot study and the purposes served
1. To identify defective items and to reveal the needed improvement.
2. To determine the difficulty of each individual item, in order that a selection of items may be made.
3. To determine how many items should constitute the final test.
4. To provide data needed to determine appropriate time limit for the finished test etc.,
5. To determine the discriminatory power of each individual item selected to contribute to the central purpose of the finished tool.

Table – 3.1 : Details of the sample selected for the Pilot Study

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the school</th>
<th>Number of students</th>
<th>Place of the School</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>1.</td>
<td>JSS High School</td>
<td>30</td>
<td>24</td>
</tr>
<tr>
<td>2.</td>
<td>Pramathi Hill View School</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>3.</td>
<td>Mahajana’s High School</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>4.</td>
<td>Cauvery High School</td>
<td>29</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>101</td>
<td>99</td>
</tr>
</tbody>
</table>
Administration of the Test

A detailed explanation was given regarding Multiple Intelligences. The purpose of the tool and also the instructions for answering were demonstrated in the class. The student’s doubts were cleared.

Procedure of the Pilot Study

The Questionnaire that was finalized after the scrutiny by experts, was administered by the researcher along with the personal proforma on the front page. The students were instructed to select the responses and mark in the response sheet provided.

The Questionnaire was administered by the researcher herself to a sample of 200 students drawn from the schools of Mysore city. The details of the sample drawn for the tryout purpose are given in table number 3.1 when the multiple intelligence test was administered the students did find difficulty in understanding with respect to some items in the multiple intelligences scale. Such questions were deleted. Scoring was done on the five point scale. [Item analysis was not necessary as this is a attitude scale and not achievement test].

The difficulty expressed by the students while they were answering the test was considered. Maximum number of clarification for a item in a class that is if more than 5 - 6 students used to seek clarification for a particular question such questions were deleted.

Internal Consistency

Once the instruments / tools are constructed, the researchers must demonstrate the instruments constructed are reliable, because without reliability, research results using the instrument are not replicable, and replicability is fundamental to the scientific method.

Internal consistency is the extent to which tests or procedures assess the same characteristic, skill or quality. It is a measure of the precision between the observers or of the measuring instruments used in a study. This type of reliability often helps researchers interpret data and predict the value of scores and the limits of the relationship among variables. It measures whether several items that propose to measure the same general construct produce similar scores. In our research endeavor,
the M.I. test is divided into, 8 categories, as mentioned earlier. The internal consistency reliability test provides a measure that each of these particular intelligences is measured correctly and reliably.

The three main techniques used in our studies for measuring the internal consistency reliability are:

1. **Correlation:**
   Correlation is one of the most common and most useful statistics. It is a single number that describes the degree of relationship between two variables.

2. **Split – halves Test**
   The split – halves test for internal consistency reliability is the easiest type and involves dividing a test into two halves. The questionnaire is divided into odd and even questions.

3. **Test – Retest reliability**
   Is the estimation based on the correlation between two or more administrations of the same item / scale.

**Methodology**

Normative survey was employed and the data have been collected from a sample of 200 secondary school Boys and Girls of IX std, Mysore, using random sampling technique for conducting pilot study.

The questionnaires were distributed to the students of IX std and necessary instructions were given. The students filled in the personal data sheet first and then the M.I scale. The students took, 30 – 40 mins to fill in the questionnaire.

**Data Analysis**

The data collected was scored, checked for inconsistencies and computerized

Quantitative analysis of data has been carried out using the statistical software, “Statistical package for Social Sciences”. (SPSS Version. 10. 0).
Reliability and validity of the research tools

The researcher has given much emphasis for the validity and reliability of the research tools. The researcher has selected the enquiry form of tool, i.e., the questionnaire for the collection of data for the Main Variable, Multiple Intelligences. The other two tools selected for the collection of data of the Main Variables namely Creativity and Achievement Motivation are the standardized tests namely: A Verbal test of creativity [TCW] by Baqer Mehdi for Creativity and Achievement Motivation Test [n-ACH] [DMAMS] by Prathibha Deo and Asha Mohan.

Before administering the questionnaire to the sample population, the reliability and validity of the questionnaire was conducted. The Questionnaire has a limit in purpose in comparison to the psychological tests or scales or inventories. Most of the time they are one time data gathering devices with a short life.

Meaning of Reliability

Reliability is the degree of consistency that the instrument or procedure demonstrate. The reliability of an instrument is to check whether the instrument or tool is measuring, whatever, it has to measure consistently.

According to Ross “reliability” means consistency.

According to Gay [1990] – “Reliability is the degree to which a test consistently measures whatever it measures, it is an index of accuracy with which a test or instrument measures”.

Meaning of Validity

“The validity of a test concerns what the test measures and how well it does so”. According to Gay [1990] validity is the degree to which a test measures that it is supposed to measure.

Content Validity

Based on the students performance in the Pilot Study and the investigators interaction with the students, a thorough discussion was held with the guide, experienced teachers and subject experts, the content selected for the study were modified.
Establishing the Reliability of Multiple Intelligence Scale

The reliability Co-efficient of the tool for the present study were as follows.

I. The internal consistency of reliability of this tool was established using Co-efficient of consistency cronbachs alpha the & was found to be .8786.
   - The co – efficient of Guttman – split half reliability was found to be .8763.

II. The test and retest was also found to be highly reliable at .7832

III. The correlation between forms was found to he .7865. This indicates that the tool is highly reliable.

3.7.2 Creativity

This is a standardized test and includes four sub-tests, namely consequences test, unusual uses tests, similarity test and product improvement test.

Description of the Verbal Test

The verbal test which has been described is a part of the total battery which consists of both verbal and non-verbal tests. The verbal test of creativity includes four sub-tests, namely, consequences test, unusual uses test, similarity test, and product improvement test.

(i) Consequences Test – The consequences test consists of three hypothetical situations : (a) What would happen if man could fly like birds ? (b) What would happen if our schools had wheels ? and (c) What would happen if man does not have any need for food ?

The subject was required to think of as many consequences of these situations as he / she can, and write them under each situation in the space provided. The situations being hypothetical, minimize the effect of experience and also provide the subject with an unlimited opportunity to make responses. The test encourages free play of imagination and originality. An example is given on the test booklet to acquaint the subjects with the nature of the test. The time allowed for the three problems is 4 minutes each.

(ii) Unusual Uses Test – This test presents the subject with the names of three common objects : a piece of stone, a wooden stick, and water it requires him / her to write as many novel, interesting and unusual uses of these objects as he / she may
think of. The example given on the test booklet properly acquaints the subjects with the nature of the task. This test measures the subject's ability to retrieve items of information from his personal information in storage. Evidently, it also measures the subject's ability to shift frames of reference to use the environment in an original manner. The time allowed for the three tasks was 5 minutes each.

(iii) New Relationships Test – This test presents the subject with three pairs of words apparently different: tree and house, chair and ladder, air and water, and requires her/him to think and write as many novel relationships as possible between the two objects of each pair in the space provided. The test provides an opportunity for the free play of imagination and originality. The time allowed for each pair of words is 5 minutes.

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

The total time required for administering the test is 48 minutes in addition to the time necessary for giving instructions, passing out test booklets to children and collecting them back.

Procedure for Scoring

As there is no right or wrong responses for the test, much care has to be exercised at the time of scoring. Each item has been scored for fluency, flexibility, and originality. The definitions of these terms are given below:

Fluency – Fluency is represented by number of relevant and un repeated ideas which the testee produces. Relevance is judged on the basis of the appropriateness of the response when considered in relation to the test problem. An unrepeated idea is one which has been expressed only once under a given problem.

Flexibility – Flexibility is represented by a person’s ability to produce ideas which differ in approach or thought trend. All ideas which fall under one category of approach or thought trend are treated as one for purposes of flexibility scoring. Thus if five ideas are produced and all belong to only one category of approach or thought trend.
trend, then the score for flexibility will be one but if all the five ideas are based on five different approaches or thought trends, then the flexibility score will be five. There could be intermediate scores for flexibility depending on the number of categories of thought trends to which the responses belong.

**Originality** – Originality is represented by uncommonness of a given response. Responses given by less than 5% of the group are treated as original. The scores may be directly entered on the answer sheet by closely following the scoring guide.

If the scorer comes across responses which are not mentioned in the scoring guide, he should briefly mention them on the backside of the scoring sheet and score them for originality after all the test scripts have been scored. The instruction for scoring the new responses for originality are also given on the scoring sheet.

Flexibility categories for such new responses will also have to be determined at the time of scoring. If he / she knew response falls in a category which is already given in the scoring guide, the same should be used. But if the new response seems to belong to an entirely new category then a new alphabet serial should be used for scoring.

**Interpretation of Scores**

Norm tables for urban and rural samples of IX standard had been provided for the different scores obtained on the test. It was however suggested that norms should be used only as guide, if the test user thinks that his / her sample was different from the samples for which norms have been prepared. Norms for special groups and for pupils at different age levels will be developed as more and more data are collected on the test.

The following points have been mentioned in order to facilitate the interpretation of scores by the test under:

1. The scores on the test give information about those thinking abilities which are not measured by intelligence test. These abilities have been found to be related to creative thinking.
2. In the absence of norms for different groups, interpretation has to be based on high and low scores on the tests. If the group is sufficiently heterogeneous, it is recommended that scores which are 1 S.D. above the mean should be used to mark out the ‘high creativity’ group, and those which are 1 S.D. below the mean should be used to designate the ‘low creativity’ group.

3. The total raw fluency, flexibility and originality scores should not be added up to obtain a composite creativity score without converting them to standard scores. The composite creativity scores should be based on standard scores instead of raw scores. As has been pointed above, this is the differences in standard deviations of fluency, flexibility and originality scores.

4. In the absence of information about the use of separate factor score recommended that only the composite creativity score should be grading pupils on creativity.

5. Research workers who use the test on a specific sample should present their own norms, if necessary for the translated version of Creativity test using the scale alpha was conducted.

**Reliability co-efficient of the translated version**

For the translated version of Creativity test using the scale alpha was conducted and the reliability coefficients were found to be .9061 for a sample of 246.

**3.7.3 Achievement Motivation**

Achievement Motivation (n-Ach) Scale: Deo-Mohan achievement motivation scale (1985) was used to measure the achievement motivation of adolescents. The scale has been constructed by Dr. (Mrs.) Pratibha Deo and Asha Mohan in 1985, Hindi and English version. English form of Achievement motivation scale was used in the present study. The scale consisted of 50 items having the distribution as achievement motivation, need for achievement, academic challenge, achievement anxiety, importance of grades, meaningfulness of task, relevance of school/college to future goals, attitude towards education, attitude towards education, work methods, attitude towards teachers, interpersonal relations, individual concern, general interests, dramatics, sports etc. Out of 50 items, 13 are negative and 37 are positive items. The scale has test-retest reliability and
split-half reliability of .56 and item validity of .54. The reliability coefficients were found to be .69 and .78 for male and female groups respectively. Cronbach's alpha coefficient for overall male and female was found to be 0.86.

The scale was administered in a group of about 30-35 subjects. With the use of microphone and a few assistants to help, even a much larger group can be given the scale at a time. The subjects should be seated comfortably, at some distance from each other and all within such distance that every subject can clearly hear the tester's voice. The tester should make sure that each subject has a pen for marking responses. First, the answer sheets should be distributed, one to each subject and the subject should be asked to write down his/her particulars i.e. name, age, gender and college/school name and address, phone number, residence particulars etc. After ensuring that this is properly done by all the subjects, the tester should distribute the scale booklets giving one to each subject. Directions printed in the test booklet should be read out loudly and d verbally. If any one has any queries, doubts or questions, should be properly clarified and explained. The subjects should be told about the time limit but they are expected to work fast and give their first response to each item. Every item is to be answered by the subjects finish marking their responses, the test booklets should be collected along with the answer sheets. That completes the procedure action.

Stencil keys are to be used for scoring, one for positive items and one for the negative items. Positive item carries the weights of 4, 3, 2, 1 and 0 for the responses Frequently, Sometimes, Rarely and Never respectively. The be scored 0, 1, 2, 3 and 4 for the same categories respectively. Separate keys for positive and negative items are provided, core is the summation of all the positive and negative items scores. Sum score obtained can be 0 (zero) and the maximum can be 200 Ranging in between these limits. Is a quick-scoring, self-administered scale which is also quick in and very easy for use in administration as well as scoring.

**Reliability co-efficient of the translated version**

For the translated version of Achievement Motivation test using the scale alpha was conducted the reliability coefficients were found to be .6768 for a sample of 246.
3.8 SAMPLE

A Sample is a small proportion of a population selected for observation and analysis. Samples are not selected haphazardly: they are chosen in a systematically random way.

The sample of the study was representative of the Mysore City in the urban locale, representing two different types of schools Govt., and Private. Further it has also provided comparison between the boys and girls, rural and urban Locale of the School and Kannada and English Medium Schools.

Random Sampling

In the present study the researcher is using only two major kinds of schools, viz., government schools and private schools. Sample for the study was selected using the random sampling technique. A total of one thousand and Five [1005], sample population was collected from various govt. and private schools of Mysore city and selected taluque’s of Mysore.

The selection of schools was done randomly from among the secondary schools [govt. and private] in Mysore City, and selected taluque’s. From the total number of schools [10 number of govt., 16 number of private schools] were selected on the basis of their readiness and willingness to extend co-operation for the data collection.

The sample was collected from the IX standard students as they are best suited for the present studies as the cognitive development would be complete. They have sufficient knowledge about themselves. The level of Intrapersonal Intelligence would be adequate for responding to research tools. They are aware of their strengths and weaknesses. Self awareness would be well developed. Their receptive levels are found to be sound and will be able to respond to the questionnaire accurately.
Table – 3.2 : Distribution of the sample with respect to the schools

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Details of the School</th>
<th>Area</th>
<th>Type of School</th>
<th>Medium of Instruction</th>
<th>Gender</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. 1</td>
<td>Sree Cauvery High School, Kuvempunagar</td>
<td>U</td>
<td>Pvt.</td>
<td>E</td>
<td>27</td>
<td>29</td>
</tr>
<tr>
<td>3.</td>
<td>Rotary west school, Mysore (B)</td>
<td>U</td>
<td>Pvt.</td>
<td>E</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>5.</td>
<td>Mahabodhi High School, Saraswathipuram</td>
<td>U</td>
<td>Pvt.</td>
<td>E</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>6.</td>
<td>St josephs School, Jayalakshmiapuram</td>
<td>U</td>
<td>Pvt.</td>
<td>E</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>7.</td>
<td>Somani High School, Kuvempunagar</td>
<td>U</td>
<td>Pvt.</td>
<td>E</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>Maharaja’s Government College, JLB Road</td>
<td>U</td>
<td>Pvt.</td>
<td>E</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>12.</td>
<td>Somani High School, Saraswathipuram</td>
<td>U</td>
<td>Pvt.</td>
<td>K</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>13.</td>
<td>Vanivilas Girls High School</td>
<td>U</td>
<td>Pvt.</td>
<td>K</td>
<td>0</td>
<td>80</td>
</tr>
<tr>
<td>15.</td>
<td>Government High School, Yadavagiri</td>
<td>U</td>
<td>Pvt.</td>
<td>K</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>II. 17</td>
<td>Vidyodaya, T. N. Pura</td>
<td>R</td>
<td>Pvt.</td>
<td>E</td>
<td>37</td>
<td>15</td>
</tr>
<tr>
<td>18.</td>
<td>JSS Suttur, Nanjangud</td>
<td>R</td>
<td>Pvt.</td>
<td>E</td>
<td>33</td>
<td>18</td>
</tr>
<tr>
<td>IV. 20</td>
<td>Vidyodaya, T. N. Pura</td>
<td>R</td>
<td>Pvt.</td>
<td>K</td>
<td>42</td>
<td>0</td>
</tr>
<tr>
<td>22.</td>
<td>JSS Suttur, Nanjangud</td>
<td>R</td>
<td>Pvt.</td>
<td>K</td>
<td>29</td>
<td>16</td>
</tr>
<tr>
<td>25.</td>
<td>Government High School, T. N. Pura</td>
<td>R</td>
<td>Pvt.</td>
<td>K</td>
<td>0</td>
<td>43</td>
</tr>
<tr>
<td>28.</td>
<td>Composite PU College, T.N. Pura</td>
<td>R</td>
<td>Pvt.</td>
<td>K</td>
<td>65</td>
<td>0</td>
</tr>
</tbody>
</table>

**Grand Total** | **525** | **480** | **1005**
Sample Distribution

Sample 1005

- Boys - 525
  - Rural - 286
    - Govt. - 110
    - Pvt. - 129
  - Urban - 239
    - Govt. - 110
    - Pvt. - 176
- Girls - 480
  - Rural - 189
    - Govt. - 52
    - Pvt. - 239
  - Urban - 291
    - Govt. - 104
    - Pvt. - 85

Kannada - 294
- English - 231
Kannada - 289
- English - 191

Fig. 3.2 : Distribution of the sample with respect to the Background Variables

Table 3.3 : Details of the Total Number of Samples with Respect to Background Variables

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Background Variables</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Boys</td>
<td>525</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>480</td>
</tr>
<tr>
<td>2.</td>
<td>Govt.</td>
<td>376</td>
</tr>
<tr>
<td></td>
<td>Pvt.</td>
<td>629</td>
</tr>
<tr>
<td>3.</td>
<td>Rural</td>
<td>475</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>530</td>
</tr>
<tr>
<td>4.</td>
<td>Kannada</td>
<td>583</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>422</td>
</tr>
</tbody>
</table>
3.9 COLLECTION OF DATA

The most tedious part of the research endeavour is the collection of data which helps us to test the hypothesis or answer the questions.

The collection of data was initiated after the required tools were constructed and validated. The research tool selected here is the inquiry forms i.e., the questionnaire.

1. A Questionnaire was constructed by the researcher for the quantification of “Multiple Intelligences”.
2. A standardized test for general creativity “A Verbal Test of Creative Thinking” [TCW] by Baqer Mehdi was adopted for the measurement of Creativity.
3. A standardized test for the measurement of Achievement Motivation was adopted by the researcher namely “Deo Mohan’s Achievement Motivation Test” (DMAMS).

The researcher herself visited the selected schools in Mysore City. The Questionnaires were administered personally to all the students in the selected class. The Govt. and Private schools were randomly selected on the basis of the readiness of the school to provide for data collection.

The students were given a good introduction on the topics of Multiple Intelligences, Creativity and Achievement Motivation in order to get them acquainted to the tests. Later, specific instructions recommended on the tests were read and they were requested to give responses on the scales namely, Multiple Intelligence Scales, Creativity Test and Achievement Motivation Test. The scales were given one at a time. The data collection was done in III Phases.

I Phase : The Multiple Intelligences scale was administered. The time required for the students to complete all these measures was a total of 30-40 minutes. A questionnaire containing 80 questions was constructed, with keen interest giving much importance to the criteria’s of construction of a questionnaire.

II Phase : A Verbal Test of Creative Thinking was administered. The time required for the students to complete all these measures was a total of 48 minutes.

III Phase : Achievement Motivation scale was administered. The time required for the students to complete all these measures was a total of 40 minutes.
3.10 STATISTICAL TECHNIQUES USED IN ANALYZING THE DATA

Is a body of mathematical techniques or processes used for gathering, organizing, analyzing and interpreting the numerical data.

Parametric data

Data of this type are measured data, parametric tests assume that “Data are normally or nearly normally, distributed,” Parametric tests are applied to both interval and ratio scaled data.

Statistics

In the present research study the researcher has used both descriptive data analysis as well as inferential data analysis. Researcher has applied both the types of statistic application which are relevant to the study.

Descriptive Data Analysis

Descriptive statistical analysis limits generalization to the particular group of individuals observed no accession are extended beyond this group and any similarity to those outside the group cannot be assumed. The descriptive data analysis gives a general depiction of the types of statistics used in educational research. The descriptive data analysis that has been used are Measures of Central Tendency: Mean, Measures of Dispersion: Standard Deviation and Measures of Relationship Coefficient of Correlations.

Table – 3.4 : Details of the different levels of mean scores of Multiple Intelligences

<table>
<thead>
<tr>
<th>Multiple Intelligences</th>
<th>Below Average Level</th>
<th>Average Level</th>
<th>Above Average Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple Intelligences Scales</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal-Linguistic</td>
<td>0 – 24</td>
<td>25 – 33</td>
<td>34 – 40</td>
</tr>
<tr>
<td>Logical-Mathematical</td>
<td>0 – 22</td>
<td>23 – 33</td>
<td>34 – 40</td>
</tr>
<tr>
<td>Visual-Spatial</td>
<td>0 – 23</td>
<td>24 – 32</td>
<td>33 – 40</td>
</tr>
<tr>
<td>Bodily-Kinesthetic</td>
<td>0 – 21</td>
<td>22 – 32</td>
<td>33 – 40</td>
</tr>
<tr>
<td>Musical-Rhythmic</td>
<td>0 – 20</td>
<td>21 – 31</td>
<td>32 – 40</td>
</tr>
<tr>
<td>Inter-Personal</td>
<td>0 – 23</td>
<td>24 – 32</td>
<td>33 – 40</td>
</tr>
<tr>
<td>Intra-Personal</td>
<td>0 – 21</td>
<td>22 – 32</td>
<td>33 – 40</td>
</tr>
<tr>
<td>Naturalistic</td>
<td>0 – 23</td>
<td>24 – 34</td>
<td>35 – 40</td>
</tr>
<tr>
<td>Multiple Intelligences Total</td>
<td>0 – 196</td>
<td>197 – 253</td>
<td>254 – 320</td>
</tr>
</tbody>
</table>
Inferential Data Analysis

Inferential statistical analysis always involves the process of sampling and the selection of a small group assumed to be related to the population from which it is drawn. Provides the concepts of statistical inference and the central limit theorem. Researchers used common inferential statistical procedures like ‘t’ test.

Descriptive Statistical Measures

Provides summary information about the distribution, Variability and Central Tendency of a Variable.

Ordered Array

The ordered array in the present study is the classification of the data into above average, average and below average level of scores.

Several basic types of statistical measures are appropriate in calculating and analyzing data in a meaningful way.

Measures of central tendency

Non statisticians use averages to describe the characteristics of groups in a general way. But for statisticians the term average is unsatisfactory for there are number of types of averages. Only one of which may be appropriate to use in describing given characteristics of a group. Of the many averages that may be used, these have been selected as most useful in educational research is the mean, the median and the mode.

Mean [Arithmetic average]

The mean of a distribution is commonly understood as the arithmetic average. [The term-grade point average] familiar to students, is a mean value. It is computed by dividing the sum of all scores by the number of scores.

The range

The range, the simplest measure of dispersion, is the difference between the highest and lowest scores. In the present study the range is taken as above average level scores, average level of scores and below average level of scores.
The variance $[\sigma^2]$

The sum of the squared deviation from the mean, divided by N is known as the variance – t-test.

**Standard deviation**

The standard deviation, is the square root of the variance, is most frequently used as a measure of spread or dispersion of scores in a distribution.

**Standard deviation for samples [S]**

The variance and standard deviation for a population have just been described. Because most of the time researchers use samples selected from the population.

**Table – 3.5 : Details of the statistical techniques used for the Analysis of Data**

<table>
<thead>
<tr>
<th>Details of Analysis</th>
<th>Statistical Techniques Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives – 1, 2, 3,</td>
<td>Descriptive Statistics</td>
</tr>
<tr>
<td>Objectives – 7, 8</td>
<td>Co-efficient of Correlation</td>
</tr>
<tr>
<td>Hypothesis – 13, 14</td>
<td></td>
</tr>
<tr>
<td>Objectives – 4, 5, 6</td>
<td>T-test</td>
</tr>
<tr>
<td>Hypothesis – 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12</td>
<td></td>
</tr>
</tbody>
</table>

In the next chapter the details of the statistical techniques applied for the analysis and interpretation of data is presented.