CHAPTER-III
PLAN AND PROCEDURE

Research work is not a haphazard task rather it requires to go through a specific direction with a particular intention of taking a systematic procedure. Plan and procedure constitute an inevitable part in conduction of a research. No research can be conducted successfully without a plan of action. A well thought plan of action in advance followed by a systematic execution brings out fruitful results. In this chapter the plan and procedure, adopted for conducting the present study, has been discussed. It depicts the true picture of what had been done, what information was needed, how it had been conducted, which tools had been employed and how the data were analysed. This has been discussed through the following heads:

- Methodology
- Population and Sample
- Tools
- Collection of Data
- Statistical Techniques Used

3.1 METHODOLOGY:

The decision about the method to be employed, depends on the nature of the problem selected and the kind of data necessary for its solution. The study was conducted both quantitatively as well as qualitatively. Descriptive survey method of research was used in executing the present study. Descriptive method provides a method of investigation to study, describes and interprets what exists at present, where as survey studies are conducted to collect detailed descriptions, existing phenomena with the intent of employing data to justify current conditions and practices or to make more intelligent plan for improving them. The objectives of this method are not only to analyze, interpret and report the status of an institute, but also to determine the adequacy of status by comparing it with the established standards. Some surveys are confined to gather all these types of informations: (i) data concerning existing status (ii) comparison of existing status with established status and standard and (iii) means of improving the existing status; while other methods are
limited to one or two of these types. This method of research is most authentic and most widely used research method in education because descriptive investigation is of the immense value in solving the problem in the pertaining field.

3.2 POPULATION AND SAMPLE:

3.2.1 The Population: Population refers to any collection of specified group of human beings or of non-human entities such as objects, educational institutions, time units, geographical area, prices of wheat or salaries drawn by the individuals. Some statisticians call it universe. Population in the present study comprises of the students of secondary schools of the Haryana state.

3.2.2 The Sample: The sample of study was comprised 600 secondary students studying in various secondary schools of Haryana. In order to keep the study manageable, purposive sampling technique was adopted in the study. The school in each zone was taken from the list available in the Directorate of Education, was used for the selection of schools for the sample. However Urban and Rural secondary schools were taken separately as sample of the study. 300 students (150 girls and 150 boys) from Urban secondary schools and 300 students (150 girls and 150 boys) from Rural secondary schools constituted the sample. The following figure shows the sample for present study.

![Sample of the Study Diagram](image)
3.3 TOOLS USED:

In order to collect the data required for the present study the following tools were used:

1. Meenakshi Sharma. **Socio-Economic Status Scale (SSESS), English.**
2. Mahesh Bhargava. **Dimensional Personality Inventory (DPI) Hindi/English.**
3. D. Venkataraman. **Style of Learning and Thinking (SOLAT) English.**
4. B. K. Passi. **Passi Test of Creativity (PTC) Hindi/English.**

3.3.1 Tool No. 1 – Socio-economic Status Scale (Meenakshi Sharma. **Socio-Economic Status Scale (SSESS), English, 2004**)

**Genesis**

It is largely assumed that the universe is an orderly place where all events occur in keeping with natural laws. Everything follows the cause-effect relationship. “In essence the universe is a sort of giant machine, says Coleman, which functions according to certain built-in principles. If we had complete information about the machine, we could understand and predict its functioning in every detail.” What is true of the universe is true of the human behaviour also. Human behaviour is also lawful. Given a complete knowledge of the past experiences and situations of the individual, we could be able to predict how he will, indeed must, act or behave. Psychologists view man as a reactive organism.

An important ingredient of human situation is an individual’s economic potential and social status. These two factors serve as vital predictors of his growth and behaviour, his personal reactions and also accomplishment, his promoters as well as restrictors. Financial and material resources are on one hand and social recognition, support and freedom on the other hand would influence a man’s education and opportunity of exposure to the world knowledge and personal development, intellectual and non-intellectual accomplishments and also man's potentialities in the field of vocation and the world of work. Hence the importance of this variable of social-cum-economic status in human affairs. This composite variable consists of four areas namely (a) Finance (b) Property (c) Education and (d) Social status in life. Here, is an effort to gauge an individual’s socio-economic status in a society which he is
surrounded by and of which he is a member, which he affects and is affected by. The questionnaire which has been designed for this purpose is a point-scale; points ranging between 3 and 10 depending upon the component of the variable under assessment.

The scale is comprehensive in nature and does not discriminate between rural/urban of male/female subjects. It has been standardised on a sample of 1127 rural/urban students of classes VIII through XII.

**Reliability**

On 153 boys of class XI in a Senior Secondary School, the Test-retest reliability has been found to be $r = 0.82$, with a time interval of 10 days.

**Validity**

Two samples of $N_1 = 37$ and $N_2 = 42$ of students of a reputed public, school and an ordinary government school respectively were taken to have an idea of the validity of the scale. The average scores of these two groups of students were found to be 116.8 and 54.8 with S.D.’s of 35.9 and 20.1 and differentiating ‘t’ standing at 9.29, significant at .01. Interalia it shows the discriminating power of the scale.

**Administration and Scoring**

The SESS is given to students in groups of 15 to 20 and the purpose of the instrument is explained. They are asked to put a tick mark (v) against the statements which fit them and a cross mark (x) which do not fit them. For each tick mark (v) weightage is being divided partwise.

**3.3.2 Tool No. 2 - Personality Inventory** (Mahesh Bhargava. **Dimensional Personality Inventory (DPI) Hindi/English, 2006**).

With this theoretical background, it was felt necessary to construct a personality measure on the basis of dimensions and items are very much suited to a common person. The test is devised with this uniqueness that it is applicable to normal person aging from 14+ to any age limit of either sexes, it is also suitable to neurotics and psychotic patients, women with mensural distress and physically handicapped and disabled in any area of behaviour (Bhargava, 2003). The present
inventory is based on the trait theory model of Eysenck (1947), who thought that traits constitute the most important parts of personality, which refer to observed consistency of behaviour and action tendencies. General cues to the traits are what the person does, how he does it and how well he does it (Singh, 1998). Several traits together constitute a dimension of personality which helps us in making distinction among persons, considering this assumption Singh and Singh (2002) have developed ‘Singh’s Differential Personality Inventory’ which measures ten dimensions of personality-decisiveness, responsibility, emotional stability, masculinity, friendliness, hetero-sexuality, ego-strength, curiosity, dominance and self concept. Dhar and Jain (2001) have also devised a personality measure namely type A/B Behavioural Pattern Scale (ABBPS) where type A measures factors like tenseness, impatience, restlessness, achievement, domineering and work aholic and type B assesses factors like complacegment, easy going, non-assertive, relaxed and patience. Therefore, it is justifying to develop the present inventory which is the need of the time.

Initially 90 items were prepared for this inventory and they were administered on 100 adult healthy subjects. Item Analysis was done and items showing low internal consistency were deleted. It consists 60 statements in simple (easy to understand even by low literates) Hindi / English. It measures six important personality dimensions-(i) Activity-Passivity, (ii) Enthusiastic-non-enthusiastic, (iii) Assertive-Submissive, (iv) Suspicious- Trusting, (v) Depressive-Non-Depressive, and (vi) Emotional Instability and Emotional Stability. Each personality trait is measured by 10 items through three response alternatives-Yes, Undecided and No. The 'yes' is to be scored as 2, 'undecided' is to be scored as 1, whereas 'no' is equal to zero. The total time required for administration is 15 minutes. It is assumed that each of the personality trait is normally distributed. Names of the traits given here are postulated to be located to the right end of the normal curve and opposites of the names are located towards left end of the curve. The areas of Dimensional Personality Inventory are described as below-

(I) Activity-Passivity Trait — The person is active, energetic, enthusiastic, regular, persistent and busy with ability to concentrate for long duration of time, on the one hand and passive, dull, inactive, slow and irregular in working, deviation with constructive output, delayed reactions in work, unwillingness to act on the other hand.
Higher score on this dimension shows Activity trait of one's personality whereas lower score tends the passiveness of an individual.

(II) Enthusiastic and Non-Enthusiastic Trait — It indicates the tendency to be happy go lucky, warm hearted person, enjoying life, fond of being in company of others, social and outgoing, mixing easily in the company of others, witty, loves enthusiastic and courageous work, open hearted, ability to move persons for various functions. This is indicated by the cyclothymic temperament and higher score indicates the greater tendency. On the other hand, lower score indicates non-enthusiastic trend by expressing reservedness, shyness, inhibited, cold, keeping aloof, feeling difficulty to contact other people, slow spoken, nonparticipation of various functions and also known as schizothymic personality.

(III) Assertive-Submissive—It indicates the assertiveness of an individual as person is straight forward in all dealing of life, bold, having traits of leadership, likes to act as a main role player, independent nature, non convincing with other's ideas, dominant, whereas submissiveness keeps his ideas to himself only, not dare to open his mouth, fearful to meet and exchange views with others, accept subordination and act as others say, hesitant to oppose other's views. High score indicates the assertiveness trait of personality, whereas low score is near to submissiveness dimension.

(IV) Suspicious-Trusting—High score shows the paranoid tendency of the individual which is reflected in his suspicious nature about others, apprehensive, having no faith on others, blaming others for his all failures and non achievement, feeling misconception of people about himself and feels that others are jealous of him and want to harm him, whereas low score tends to trusting trait of personality which do not have any such paranoid tendency. This positive dimension of personality is characterized by free of jealous tendencies, accepting conditions, easy to get on with others, adaptable, cheerful, uncompetitive, a good team worker, an open and tolerant person and usually willing to take a chance with people, realizing own weaknesses and faults.

(V) Depressive-Non-Depressive—High score on this personality trait indicates feeling of helplessness, hopelessness, worthlessness, depressed, unwanted, unloved,
suicidal ideas, feeling of inferiority, highly frustrated, lack of self confidence, sad on misdeeds and mistakes done in the past, jealous about others happiness, restless and full of tense. Whereas low score tends to be non-depressive characterized by relaxedness, unfrustrated, composed and satisfied.

(VI) Emotional Instability and Emotional Stability—The high score on this personality trait indicates emotional instability where individual is affected by feelings, emotionally less stable, easily annoyed and upset having low frustration tolerance for unsatisfactory conditions, highly anxious and worrying, fearful, sensitive, touchy, given to mood swings, depressed and sad whenever confronted with stressful situations, having neurotic symptoms like phobias, sleep disturbances and psychotic disorders. The low score is indicative of emotionally stable trait of the personality where person is with full control over his emotional expressions, emotionally mature, stable, realistic about life situations, possessing ego strength, high level of adjustment with unsolved emotional problems.

Administration

This test may be administered on all individuals regardless to sex above the age of 14 years. It can be used individually as self administration as well as in group also. It can also be used by the Test Administrator by taking verbal response alternative on those who can not read and so depleted by illness.

Instructions

Instructions are very easy. Every individual or group is to be instructed that they should read every statement carefully and his response is to be recorded on the basis of 3 response alternatives-Yes, Undecided and No. He has to decide which statement is true according to his temperament and behaviour. If it is true, he has to put a cross (×) on cell D below yes alternative, if it is not true, then he has to put a cross (×) on cell D below no alternative and if he is in the state of undecided ness, he has to put a cross (×) on cell D below undecided alternative.

Scoring

Each yes response is to be scored as 2, undecided is to be scored as 1, whereas no and unmarked response is to be scored as zero. All the six dimensional
areas of personality are grouped as Part I, II, III, IV, V and VI, each containing 10 statements. Thus on each area of personality, score may range from 0 to 20 and thus may be calculated area-wise and total score of each part may be obtained at that place and then transfer to scoring table below each part against raw scores column.

**Reliability**

The reliability of DPI is determined by following methods:

(i) The coefficient of stability DPI has been computed by employing test-retest method over a period of 3 weeks on a sample of 200 college going students (equally divided into male and female groups) and over a period of 15 days on a sample of 50 narcotic drug abusers and 50 Psychiatric patients and it is found significant in all the cases as shown in Table 3.1 and ensure high reliability.

**TABLE – 3.1**

**Coefficient of stability of DPI (over a period of 3 weeks on normal population and over a period of 15 days on Narcotic Drug Abusers and Psychiatric Patients**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Personality Traits</th>
<th>College going Boys</th>
<th>College going Girls</th>
<th>Narcotic drug Abusers</th>
<th>Psychiatric Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>rtt</td>
<td>rtt</td>
<td>rtt</td>
<td>rtt</td>
</tr>
<tr>
<td>(I)</td>
<td>Activity - Passivity</td>
<td>-.69</td>
<td>-.72</td>
<td>-.67</td>
<td>-.62</td>
</tr>
<tr>
<td>(II)</td>
<td>Enthusiastic - Non-enthusiastic</td>
<td>-.78</td>
<td>-.74</td>
<td>-.72</td>
<td>-.66</td>
</tr>
<tr>
<td>(III)</td>
<td>Assertive - Submissive</td>
<td>-.72</td>
<td>-.64</td>
<td>-.58</td>
<td>-.64</td>
</tr>
<tr>
<td>(IV)</td>
<td>Suspicious - Trusting</td>
<td>-.82</td>
<td>-.78</td>
<td>-.73</td>
<td>-.68</td>
</tr>
<tr>
<td>(V)</td>
<td>Depressive - Non-depressive</td>
<td>-.76</td>
<td>-.72</td>
<td>-.68</td>
<td>-.54</td>
</tr>
<tr>
<td>(VI)</td>
<td>Emotional - Emotional Instability Stability</td>
<td>-.84</td>
<td>-.82</td>
<td>-.69</td>
<td>.48</td>
</tr>
<tr>
<td></td>
<td><em>Total No. (N) =</em></td>
<td>100</td>
<td>100</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

All the rtt are significant at .01 level
(ii) The Inventory has indicated the satisfactory reliability coefficient when split half method was used on various samples in Table - 3.2. Here all the reliability coefficients are significant and ensures the high reliability.

**TABLE – 3.2**

Coefficient of reliability of DPI on College going normal population on both the sexes as well as Narcotic Drug Abusers and Psychiatric Patients

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Personality Traits</th>
<th>College Boys rtt</th>
<th>College Girls rtt</th>
<th>Narcotic drug Abusers rtt</th>
<th>Psychiatric Patients rtt</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I)</td>
<td>Activity - Passivity</td>
<td>-.56</td>
<td>-.57</td>
<td>-.47</td>
<td>-.39</td>
</tr>
<tr>
<td>(II)</td>
<td>Enthusiastic - Non-enthusiastic</td>
<td>-.62</td>
<td>-.61</td>
<td>-.52</td>
<td>-.47</td>
</tr>
<tr>
<td>(III)</td>
<td>Assertive - Submissive</td>
<td>-.57</td>
<td>-.52</td>
<td>-.57</td>
<td>-.52</td>
</tr>
<tr>
<td>(IV)</td>
<td>Suspicious - Trusting</td>
<td>-.75</td>
<td>-.76</td>
<td>-.44</td>
<td>-.47</td>
</tr>
<tr>
<td>(V)</td>
<td>Depressive - Non-depressive</td>
<td>-.68</td>
<td>-.68</td>
<td>-.49</td>
<td>-.58</td>
</tr>
<tr>
<td>(VI)</td>
<td>Emotional - Emotional Instability - Stability</td>
<td>-.78</td>
<td>-.72</td>
<td>-.56</td>
<td>-.63</td>
</tr>
</tbody>
</table>

| Total No. (N) = | 50 | 50 | 50 | 50 |

All the rtt are significant at .01 level

(iii) The inventory has also shown satisfactory reliability by using method of rational equivalence where inter-relationship of various personality traits have determined in 6 x 6 inter-correlation matrix. It is also known as internal consistency. It is assumed that all the items or sub-tests in a measuring instrument should be psychologically homogeneous (Bhargava, 2001). Table 3.3 shows inter-correlations between the various personality traits.
TABLE 3.3
Inter-Correlations between various Personality Traits (N = 100)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Personality Traits</th>
<th>I.</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I)</td>
<td>Activity - Passivity</td>
<td>1.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>(II)</td>
<td>Enthusiastic - Non-enthusiastic</td>
<td>.34</td>
<td>1.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>(III)</td>
<td>Assertive - Submissive</td>
<td>.39</td>
<td>.37</td>
<td>1.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>(IV)</td>
<td>Suspicious - Trusting</td>
<td>–.48</td>
<td>–.52</td>
<td>.31</td>
<td>1.0</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>(V)</td>
<td>Depressive - Non-depressive</td>
<td>–.52</td>
<td>–.42</td>
<td>–.18</td>
<td>.46</td>
<td>1.0</td>
<td>–</td>
</tr>
<tr>
<td>(VI)</td>
<td>Emotional - Emotional</td>
<td>–.42</td>
<td>.20</td>
<td>.29</td>
<td>.33</td>
<td>.41</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Instability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on a sample of 100 Male College going students, values are significant at .01 level. Thus it yields the homogeneity of the various personality traits, hence ensure high reliability.

Validity

In order to establish the validity of Dimensional Personality Inventory (DPI), the present Inventory is correlated with other measures of personality and allied concepts as external validating criteria-

(i) When different personality traits of DPI are correlated with the same personality traits of original English version of Sen’s (1966) Personality Trait Inventory (PTI) on six factors out of eight. On a group of 80 subjects, the coefficient of correlations (r) have been obtained in Table 4 (on page 11) and all are highly significant at .01 level.

(ii) When six dimensions of DPI are correlated with the Hindi Translation of Personality Trait Inventory of Sen’s PTI which was done by Verma, Pershad and Mahajan (1990b) on a sample of 80 subjects, the coefficient of correlation (r) have
been obtained in Table 5 (on page 11) and they were significant satisfactory at -01 level.

**Norms**

For the purpose of finding out the personality traits based on the scores obtained for each of the Six Personality Dimensions, Standard Scores in form of Z-Score have been prepared.

**3.3.3 Tool No. 3 – Learning Thinking Tool** *(D. Venkataraman. Style of Learning and Thinking (SOLAT) English, 1994.)*

**The concept of SOLAT tools**

The right and left hemisphere preferences for information processing for the concepts selected were identified as indicated in the literature available and in the studies by others in the area and these preferences accepted as applicable for the study are listed in the table 3.4 given below:

**TABLE – 3.4**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Right Hemisphere</th>
<th>Left Hemisphere</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concept : Verbal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Understanding movements of action</td>
<td>Understanding Verbal explanations</td>
</tr>
<tr>
<td>2.</td>
<td>Talking while reading or writing</td>
<td>Getting things quiet while reading or studying.</td>
</tr>
<tr>
<td>3.</td>
<td>Learn best by instruction which uses visual presentation</td>
<td>Learn best of instruction which uses verbal</td>
</tr>
<tr>
<td>4.</td>
<td>Likes to draw more pictures</td>
<td>Likes to talk and write</td>
</tr>
<tr>
<td>5.</td>
<td>Expression of feelings through music, dance and poetry</td>
<td>Expression of feelings and thoughts in plain language (or open mindedness)</td>
</tr>
<tr>
<td></td>
<td>Concept : Content preference</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Interest in soft sciences</td>
<td>Interest in Hardsciences (vocational interest in engineering)</td>
</tr>
<tr>
<td>7.</td>
<td>Open ended lessons</td>
<td>Structured lessons</td>
</tr>
<tr>
<td>8.</td>
<td>Likes to learn through main ideas/Basic concepts</td>
<td>Likes to learn through details and specific facts</td>
</tr>
<tr>
<td>9.</td>
<td>Writing/likes fiction</td>
<td>Writing non-fiction</td>
</tr>
<tr>
<td>10.</td>
<td>Learning through exploration</td>
<td>Learning through examine</td>
</tr>
</tbody>
</table>

**Description of SOLAT**

The initial version of style of learning and thinking (SOLAT) tool was intended for school children from eighth standard and upto college students, and consisted of 100 items based upon accumulated research findings concerning the specialized functions of the left and right hemispheres. Each item provided the respondent with three choices - one representing a specialised function of the left cerebra] hemisphere, the second representing a parallel specialised function of the right hemisphere and the third is checking of both the items representing the integration of right and left hemisphere functions. Test takers asked to indicate which of the three specific styles of thinking and/or learning best described about their own typical behaviour.

**Construction of style of learning and thinking**

For construction of SOLAT tool, the investigator has gone through the literature dealing with hemispheric functions connected with education. After reviewing the related literature and consulting medical books, psychology books and journals, the functions of right hemisphere and left hemisphere were listed. After listing the hemispheric functions, characteristic and activities of creative students, the items were prepared based on these lists. The hemisphere functioning in two different areas such as learning style and thinking style was considered for identification of dominance and items and concepts were written subjected to jury’s opinion, consisting of twenty professors and ten doctors who were working in the field of
psychology, Neuro-Psychology, Anatomy, and Education. On the basis of the jury’s opinion some items were deleted. Some were modified and finally 50 items in Learning Style and Thinking Style were retained. Thus, in all hundred statements were written. The tool was so refined consisting of 100 items for the 50 preferences. It was then administered to the students of private and government schools to two hundred higher secondary students. The main purpose of this pilot study was to ensure comprehensibility elucidated and difficult sentence were altered and modified into easy language of understanding and thus the tool was finalized.

**Reliability of the tool**

The reliability of the tool was measured by test-retest method. One month after the first test, retest was conducted to 300 students of 150 boys and 150 girls. The reliability coefficient of correlation for the right hemisphere function was found to be .89. For the left hemisphere function the coefficient of correlation was found to be .65. The coefficient of correlation for the integrated score was .71. These coefficients suggest that the SOLAT possesses reliability to a significant level.

**Validity**

(i) **Content Validity Evidence**

A compilation of findings was made from an extensive survey of literature on specialised cerebral functions of the hemisphere (Venkataraman 1989). The items were constructed by attempting to translate research findings on hemisphericity into a multiple choice format, without representing particularly right hemisphere functioning or left hemisphere functioning.

The original inventory consisted of 62 items, and out of them 12 items were deleted on the basis of pilot study (Small group study) and opinion from the experts. The items were finally selected for inclusion based on the sustained experts’ opinion, from professors and doctors connected in the field of Psychology, and Neurosurgery respectively.

(ii) **Construct Validity Evidence**

The initial construct validity study was conducted by the author. The SOLAT
was tested with 50 students from a variety of academic disciplines. As part of the course, each student took several tests of creativity which provided to construct validity evidence. Creative problem solving and creative thinking call for both left and right-hemisphere functions. Considerable evidence suggests that the essence of creative behaviour calls for right-hemisphere functions and judgment, evaluation and elaboration require left-hemisphere functions.

(iii) Concurrent Validity

The SOLAT tool was constructed and validated with the help of standardised SOLAT tool constructed by Paul Torrance. To find out the validity of the tool, both the SOLAT tools, (i.e. Tool prepared by Paul Torrance and tool prepared by the investigator) were administered to 300 subjects. The correlation between the two test scores was .842 for the right hemisphere part; .621 for the left hemisphere part and .678 for the integrated part. The correlation coefficients reveal that the SOLAT tool possesses reasonable level of concurrent validity.

Administration

The style of learning and thinking tool is constructed with simple sentences and can be easily administered in a group. It can be administered from eight standard and upto graduation or post graduation.

The Solat Tool can also be administered to the students below 8th standard but it is not recommended since they may check the items vaguely against their preferred style, understanding the partial or different meaning of the items.

Good testing conditions should be arranged and maintained throughout testing. The) should be ordered to be quiet, as distractions are possible. The temperature of the room should be comfortable. Make sure that the decision-making process is clear. For each item, there are two statements, and there are four ways to respond:

1. Check the first statement if it describes you.
2. Check the second statement if it describes you.
3. Check both statements, if both are applicable to you.
4. Check neither statement if both are not applicable to you.
Students should record their responses in the blank on the test sheet. They should examine their responses thoroughly to make sure that they have made firm marks which will enable to assess hemisphere dominance correctly.

**Answer Key**

Solat has a built-in scoring key which makes scoring easy. Count the number of first item of serials as 'R' (Right) and the number of second item of serials as ‘L’ (Left). If both the items are checked count it as ‘I’. There is no need to count if the items are not checked.

In the tool, the first item indicates right hemisphere, the second item indicates left hemisphere and checking of both the items indicate integrated hemisphere.

**Scoring Procedure**

To score your SOLAT Test:

In the tool, against serial numbers I to 50, checking of the first items indicates right hemisphere; second item indicates left hemisphere and checking of both the items indicates integrated hemisphere (or) whole brained.

1. First Count the number of items you checked both boxes for an item, and write that number in box “W”.

2. Second Count the number of items you checked only for an item and write that number in box “L”.

3. Third Count the number of items you checked only “R” for an item, and write that number in box “R”.

The hemisphericity dominance is determined on the basis of the highest score in three categories of dominance, as far as a group testing or score is concerned. For individual scoring and comparison with a reference population kindly read the next section of norms.

**Norms**

In many research applications, the examiner will have no need to convert the raw scores obtained from the test to sten scores. However, commonly the users would
like to know where an individual stands in relation to a defined population. For this purpose the raw scores are converted into sten scores. The term ‘sten’ comes from “standard ten”. The sten score is distributed over ten equal intervals of standard score points, from 1 to 10. The use of sten scores has been found to be very satisfactory, especially, with people inexperienced in statistical techniques involved in psychological testing.

3.3.4 Tool No. 4 – Creativity Tool (B. K. Passi. Passi Test of Creativity (PTC) Hindi/ English, 2006, 2001)

Like many other concepts in education, there is hardly any definition of creativity which could be accepted by all researchers in the field. Related to intelligence, a great deal of research has been completed, yet it has not led to any universally accepted definition. Creativity is relatively a 'new area of research and has not been explored as thoroughly as intelligence and personality. The definition of creativity which was used as the basis of these tests (PTC) is as below:

Creativity is a multidimensional (verbal and non-verbal) attribute ‘differentially’ distributed among people and includes chiefly the factors of seeing problems, fluency, flexibility, originality, inquisitiveness and persistence.

Measurement of Creativity

The measurement of creativity poses complex problems. According to Guilford (1950), the difficulties are mainly related to : (a) establishing the practical criterion, (b) frequent fluctuations in creative performance, (c) types of items and their contents, and (d) complexity and subjectivity involved in the scoring problems. Getzels and Jackson (1962) and Cropley (1966) also pointed out the difficulties, such as : (a) securing the creative subjects, (b) obtaining the co-operation of, especially, the younger children, and (c) evaluating young children's responses.

Inspite of various complications involved in the measurement of creativity, efforts have been made to measure it by employing different types of media and methods of investigation depending upon specific situations. Taylor and Holland (1962) submitted the classification of prevalent measures: firstly, traditional measures, such as' school grades, accumulation of knowledge and intelligence tests,
and secondly, multidimensional approach covering the cognitive factors recognized through the factor analytical studies of Thurstone (1952), Guilford et al. (1951, 1952) and Wilson et al (1954). The second category also involves non-intellectual measures, such as motivational, biographical, sociometric and other personality characteristics. The third measure is a single test approach followed by many researchers in different parts of the world.

A variety of tools such as checklist, the word association test, interest and temperament inventories, personality inventories, self-ratings, supervisor's ratings, peer nominations or rankings, problem-solving test etc. have largely been used to measure creativity. The creative behaviour has also been predicted and assessed by taking into account the factors of home and school environment. The assessment of creativity through the PTC includes verbal and non-verbal test situations.

**General Description**

The PTC (both in English and Hindi) are developed for the purpose of measuring creativity in school children. In all six tests, namely: (i) The Seeing Problems Test, (ii) The Unusual Uses Test, (iii) The Consequences Test, (iv) The Test of Inquisitiveness, (v) The Square Puzzle Test and (vi) The Blocks Test of Creativity, are included in the test battery. These tests are classified on the lines of Torrance (1962) as follows:

(a) Tests consisting of verbal tasks, namely, the Seeing Problems Test, the Unusual Uses Test and the Consequences Test;

(b) Test with verbal response tasks using mostly non-verbal stimuli, namely, the Test of Inquisitiveness,

(c) Test consisting of non-verbal tasks comprising the Square Puzzle Test and the Blocks Test of Creativity.

The nature of the Tests of Creativity permitted freedom of responses, both qualitative and quantitative, within specified time limits, thus ensuring suitability of the tools for measuring divergent thinking. Instructions and practice items are provided before the actual commencement of the administration of the different tests.
The subjects are supposed to write their responses in the answer book provided for the purpose. All the tests are available both in Hindi and English. Responses are acceptable in anyone of the known languages like English-Hindi etc. A brief and specific outline of all the six tests of creativity is given in the following captions:

(i) The Seeing Problems Test- It is a verbal, and an individual and group administered test. The Seeing Problems Test was developed by adopting the pattern followed by Guilford, et al. (1952). It is designed to measure a factor of sensitivity to problems, which is a component dimension of creativity as described by Guilford. The test is proposed to measure the ability to comprehend problems concerning the working of simple and handy articles of common use. The test of Seeing Problems includes four items, namely, Shoes, Pen, Chair, and Post-card. The maximum time limit for the test is kept eight minutes so that two minutes could be devoted to each of the items. Instructions to this effect are specifically mentioned in the instruction booklet.

(ii) The Unusual Uses Tests-It is a verbal, and an individual and group administered test. This is designed on the lines of the Brick Uses Test by Guilford et al. (1952) and Torrance's (1962) the Unusual Uses Tests. This test includes the names of things which could be used for numerous purposes. It includes only those items which have proximity with the psychological and physical environment of the subjects. The test of Unusual Uses includes two items, namely, Piece of Cloth and Bottle. The subjects are expected to write down as many interesting and unusual responses to each stimulus article (item) as they can. The maximum time limit for the test is kept eight minutes so that four minutes could be devoted to each of the items. Instructions to this effect are specifically mentioned in the instruction booklet.

(iii) The Consequences Test - It is a verbal, and an individual and group administered test. The pattern of the test is based on the test of Guilford, et al. (1952) and Torrance (1962). The test measures the dimensions of fluency, originality and creativity (creativity score is the sum of the scores of fluency and originality). The Consequences Test includes four items, namely, "If human beings start flying like birds"; "If all houses start flying"; "If all people become mad"; and 'If all females become males', The maximum time limit for the test is kept eight minutes so that two
minutes could be devoted to each of the items. Instructions to this effect are specifically mentioned in the instruction booklet.

(iv) **The Test of Inquisitiveness** - It is a verbal, and an individual and group administered test. In order to provide an unfamiliar and novel situation, the test includes a relatively less familiar object providing sound and movement as the test content, a metronome. In order to provide a situation for greater inquisitiveness a play card bearing in capita/letters “A FEW CHILDREN CANNOT TOUCH IT”, is displayed along with the metronome in a working condition.

The subjects are expected to imagine and write as many questions as possible within six minutes. They are told that the questions should be mutually exclusive to one another in contents and meaning. The test, thus, presents the non-verbal stimuli but the responses are to be accepted in writing in any of the languages--English, Hindi or Mother tongue. Instructions to this effect are specifically mentioned in the instruction booklet.

(v) **The Square Puzzle Test (Test of Persistency)** - It is a non-verbal and an individually administered test. The rationale, for including the dimension of persistency in creativity was, firstly based on the comments made by Eysenck (1947) about the significance of persistency for the effective use of a person's ability and secondly, on the plea of Fernald (1912) that "The success or failure of an individual depends largely on the ability to endure and continue to strive for the sake of achievement inspite of fatigue and discouragement."

The present test aims at measuring persistency with the help of a performance test. A difficult situation is set-up for the subjects with the help of a puzzle--The Square Puzzle Test.

The Square Puzzle Test consists of five identical right-angled triangles and five identical quadrilaterals made-up of plastic. Instructions are clearly laid down for constructing a square by using all the ten given plastic pieces without leaving any gap for overlay in between the pieces. The response square can be constructed in more than one way so that if any subject happened to construct the square before the maximum time of 40 minutes, he is asked to take a chance to rearrange the pieces in
different combination to get a square again. The score of persistency is considered as the time taken in complete minutes on the task. Instructions to this effect are specifically mentioned in the instruction booklet.

(vi) **The Blocks Test of Creativity (BTC)** – It is a non-verbal and an individually administered test. The Blocks Test of Creativity is a performance test and is administered individually. This test chiefly follows the pattern of the Lowenfeld Mosaic Test LMT (1952) which was described by Ames and Frances (1962) as useful tool for providing greater opportunity to observe individuals engaged in performing dynamic designs.

The Blocks Test of Creativity consists of nineteen identical cubes and twelve diagonally cut semicubes. The material provided two types of blocks and three types of surfaces namely, squares, rectangles and right-angled triangles. The six surfaces of the cubes are painted in red (top), blue (bottom), yellow (face), green back), white (left side) and black (right side). The twelve diagonally cut semicubes have in all twenty four right-angled triangular surfaces twenty four squared surfaces and twelve rectangular surfaces. These twelve semicubes are so cut that the four triangular faces of each colour can be obtained. The rectangular faces obtained as a result of cutting the cubes diagonally are painted brown colour. In this way, the test material employed a colour scheme consisting of seven different colours. The subjects have the option of using two types of blocks, three types of surface, and seven types of colours in different combinations simultaneously. Besides this, a 10" x 10" wooden board covered with a white paper is also provided to be used as a base for assembling the blocks to make designs or structures.

The subjects have to produce as many interesting and unusual designs as can be possible in ten minutes. They are further required to write down the headings (titles) of designs. While students are busy in constructing designs, the investigator is simultaneously drawing the figures of these designs, so that this record may be used for scoring and analysis of the responses at a later stage. The scores of fluency, flexibility, originality and creativity (creativity score is the sum of the scores of fluency, flexibility and originality) are proposed to be scored from the designs and structures developed by the students. Instructions to this effect are specifically
mentioned in the instruction booklet.

The material for non-verbal tests of the Square Puzzle Test and the Block Tests of Creativity is separately available with the publisher. But in case of the test of Inquisitiveness the metronome may be available from any laboratory of Psychology.

For the purpose of standardization of the PTC, the usual steps of preparing the preliminary draft, item analysis, reliability, validity, norms, etc. were undertaken and are being described below.

**Reliability and Validity**

Reliability and validity of any psychological test determine its utility and efficiency. The studies for reliability and validity were conducted on a sample of sixty subjects of IX, X and XI grades representing both boys and girls drawn from the average schools. The composition of the sample is given in Table 3.5.

**TABLE – 3.5**

Sample for Reliability and Validity Studies

<table>
<thead>
<tr>
<th>Sex</th>
<th>Grade Level</th>
<th>IX</th>
<th></th>
<th></th>
<th>X</th>
<th></th>
<th></th>
<th>XI</th>
<th></th>
<th>N</th>
<th></th>
<th>Percent</th>
<th>N</th>
<th>Percent</th>
<th>N</th>
<th>Percent</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>Percent</td>
<td>N</td>
<td>Percent</td>
<td>N</td>
<td>Percent</td>
<td>N</td>
<td>Percent</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>IX</td>
<td>9</td>
<td>15·00</td>
<td>6</td>
<td>10·00</td>
<td>7</td>
<td>11·67</td>
<td>22</td>
<td>36·67</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>13</td>
<td>21·67</td>
<td>18</td>
<td>30·00</td>
<td>7</td>
<td>11·66</td>
<td>38</td>
<td>63·33</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XI</td>
<td>22</td>
<td>36·67</td>
<td>24</td>
<td>40·00</td>
<td>14</td>
<td>23·33</td>
<td>60</td>
<td>100·00</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td>36·67</td>
<td>24</td>
<td>40·00</td>
<td>14</td>
<td>23·33</td>
<td>60</td>
<td>100·00</td>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

The sample size was considered appropriate for the purpose of conducting reliability and validity studies in view of the difficult process of administration and time consuming scoring procedures. Moreover there is research evidence to support the appropriateness of taking a sample of this size.

**Reliability**

The test-retest reliability was found to be most workable with the PTC. The split-half technique was also employed with tests having more than one item. Parallel
form method was not applicable since parallel form tests were not prepared. The K-R formula could not be used for the simple reason that the nature of responses on the test items were not available in the form of proportion to correct responses. It was, however, thought worthwhile to test internal consistency in terms of inter-test correlations.

Test-retest reliability coefficients for the PTC and the composite scores of creativity were established on a sample of sixty students. The age of the sample ranged from 15 to 17+. A gap of a fortnight was kept between the first administration and second administration. The stability of the PTC was determined through \(t\)-test of significance of difference between mean scores of first and second administrations. Split-half reliability method could be used with only three verbal tests, namely, the Seeing Problems Test, the Unusual Uses Test and the Consequences Test. The results were obtained by employing the Spearman Brown formula. The reliability results are given in the following Table 3.6.

**TABLE - 3.6**

**Test Retest Reliability Coefficients and Split Half Reliability Coefficients of the PTC Having More Than One Item**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the Test</th>
<th>Test-Retest Reliability</th>
<th>Split-Half Reliability (r_{11})</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Seeing Problems Test</td>
<td>0.68</td>
<td>0.88</td>
</tr>
<tr>
<td>II</td>
<td>Unusual Uses Test</td>
<td>0.97</td>
<td>0.51</td>
</tr>
<tr>
<td>III</td>
<td>Consequences Test</td>
<td>0.71</td>
<td>0.80</td>
</tr>
<tr>
<td>IV</td>
<td>Test of Inquisitiveness</td>
<td>0.74</td>
<td>-</td>
</tr>
<tr>
<td>V</td>
<td>Square Puzzle Test</td>
<td>0.91</td>
<td>-</td>
</tr>
<tr>
<td>VI</td>
<td>Blocks Test of Creativity</td>
<td>0.83</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Creativity (Total)</td>
<td>(a\cdot92)</td>
<td>-</td>
</tr>
</tbody>
</table>
The review of reliability literature helped to evaluate the present findings. Torrance (1963) found the test-retest reliability of the Minnesota Tests of Creative Thinking as 0.80 with the stability of the part scores to be in the vicinity of 0.65 to 0.70. Wodtka (1964) reported reliability coefficients ranging from 0.28 to 0.75 for verbal creative test battery. Hoepfner (1967) reported test-retest reliability coefficients of the Torrance's Tests of Creative Thinking which ranged from 0.71 to 0.93 over two weeks interval and from 0.35 to 0.73 over three years interval. Moss and Duenk (1967) estimated the reliability of the Minnesota Tests of Creative Thinking which ranged from 0.68 to 0.83.

In the light of above results and related literature it seems that the PTC should be considered as a reliable tool.

**Validity**

The concurrent *i.e.*, convergent and divergent and factorial validity methods were employed to validate the PTC. Validity studies were conducted on the sample of sixty subjects. The scores of subjects on the PTC were taken separately and collectively; and the scores on the Things Done-On-Your-Own check-list, non-verbal intelligence, verbal intelligence, and achievement, were also obtained. Thus, four external criteria were employed to see the validity of the PTC. These criteria were:

(i) The things Done — On-Your-Own check-list adopted from Torrance's (1962) check-list


(iii) Verbal Intelligence (The Jalota's 1964; Group Test of General Mental Ability), and

(iv) Achievement (Common examination marks in school subjects).

The concurrent validity results are of two types. Firstly, convergent validity, that is fairly high correlations with other tests of the same trait and with measures of behaviour that should be associated with it. (refer Adams, 1966, p. 138), against the criterion of the Things-Done-On-Your-Own, which was assumed to measure creative behaviour, was worked out. Secondly, the results relate to the discriminant validity,
that is low correlations with the tests from which it is supposed to differ (refer Adam, 1966, p. 138) against the criteria of non-verbal intelligence, verbal intelligence and achievement.

**Scoring**

The responses to the six tests of the PTC are of divergent nature. It is not possible to employ ordinary stencil scoring system because the content and nature of responses are not known in advance. Consequently, for each tool of measurement, a separate system of scoring had to be devised with the help of a panel of judges comprising eleven post-graduate students of the Department of Education. They were asked to give their opinions about relevance and categorization of responses to different tests or items wherever and whenever necessary. Besides this, the investigator himself analysed the relevance and categorization of responses and, in case of conflicts, discussions with the judges were held in order to take a final decision. The detailed scoring procedure for each test’s given in the separate Booklet namely Scoring Key for PTC. The Passi Test of Creativity (PTC) provides fifteen different types of variables related to creativity. These are: Seeing Problems (SP); Unusual Uses Fluency (UF); Unusual Uses Flexibility (UX); Unusual Uses Originality (UO); Unusual Uses Creativity (UC); Consequences Fluency (CF); Consequences Originality (CO); Consequences Creativity (CC); Inquisitiveness (INO); Persistency (PER); Blocks Fluency (BF); Blocks Flexibility (BX); Blocks Originality (BO); Blocks Creativity (BC) and Total Creativity (CY).

**Norms**

Based upon a sample of 600 students, the scores of creativity on the battery of the PTC were subjected to the descriptive statistic in terms of mean, median, mode, standard deviation, skewness and kurtosis. Percentile norms of the total scores of the tests of Seeing problems, unusual uses, consequences, inquisitiveness, square puzzle and blocks test of creativity as well as the total scores on the PTC were worked out for grades IX.

**3.4 COLLECTION OF DATA:**

Data collected from both Urban and Rural secondary schools of Haryana by
administering various tools of data collection and personal data sheet to get information about various demographical variables such as socio-economic status, Gender i.e. Girls & Boys, Background of the students i.e. Rural & Urban schools. Scoring is done according to standard procedure given in the manuals of different tools used in the study for data collection. The relationship seen in socio-psychological correlates, learning-thinking style and creativity and the comparisons made in secondary students in respect of socio-psychological and some demographical variables mentioned earlier.

Keeping all the objectives of the present study in mind, the investigator made full preparation and planning for administration of the tools. Having an authority letter the investigator visited the heads of the schools. She introduced herself to the heads and stated the purpose of coming over there. She asked for permission and time from the schools for the administration of the tools and then visited the schools one by one.

Having got the permission, the investigator visited the classrooms, introduced herself to the students. Firstly she established rapport with the student and then told them about the purpose of her visit to them and gave some hint about the tools she would administer. She also assured the students that their responses would be kept confidential and be used for research purpose only. Then all the tools were distributed to the students one by one. The students were asked to go through the instruction given in the tools. They were also instructed to complete their profile given in the beginning in the tools and to go through each and every item. The students were also encouraged to enquire about any item from the investigator if they find it difficult. While administrating the tools the teacher help the investigator in maintaining disciplining in the class. After collecting the data the investigator thanked the students for their cooperation.

3.5 STATISTICAL TECHNIQUES USED:

Statistical data analysis is the culmination of the long process of hypotheses formation, tools construction and data collection. Statistical analysis can take a number of forms but generally consists of analyzing relationship between two or more
variables. In the present study the techniques which have been used and the rationale for using these techniques are given below.

(i) Correlation technique was employed in order to find out the correlation between socio-psychological correlates with dependent variables i.e. learning-thinking style and creativity of secondary school students.

(ii) ‘t’ test was employed to assess whether there exist any significant difference in the scores of various variables of study.