CHAPTER II
Chapter – II

REVIEW OF RELATED LITERATURE

2.0 Introduction

A Summary of the writings of recognized authorities and of previous research provides evidence that the investigator is familiar with what is already known and what is still unknown and untested. The significance of such review of related literature is clearly pointed out by Borg (1965) and observes that “Literature forms the foundation upon which all the future work is built”.

This step eliminates the duplication of what has been come and useful hypotheses and provides helpful suggestions for significant investigation.

The following discussion deals with a very crucial area of research review and thus has its own important place in the understanding of a research work. The various researches carried out in the area and in the related field are organized and reviewed.

2.1 Classification of Studies Reviewed

The studies conducted in the areas are reviewed as below:

i. Cognitive Styles
ii. Creativity
iii. Personality
iv. Intelligence
v. Scientific aptitude
vi. Science Achievement
vii. High, Average, Low and Under Achievers
2.2 Studies Related to Cognitive Styles

Dutt Sunil (1989) investigated the effect of different problem solving strategies on problem solving in science and to study the relationship of cognitive style with problem solving ability among students. Administered GEFT - Group embedded figure test developed by Witkin, Oltman and Ruskin, on a sample of 300 X standard students studying Government schools of Chandigarh.

The data collected there was analysed using mean, median SD, ANOVA and multiple regression analysis and findings were, cognitive style and Intelligence were found to contribute significantly to the total variance in problem solving ability; anxiety did not made any significant contribution and high intelligent students, Generally Scored higher than the field-dependent ones on the problem solving ability test.

Lau Shun and et. al. (1989) Investigated the idea of two pathways to achievement outcomes, a performance and a commitment pathway, examined how cognitive and motivational factors associated with each of these pathways, respectively contributed to the prediction of achievement outcomes in science.

The sample consisted of 491 high school students. Results of hierarchical regression analysis showed that (a) Student's cognitive abilities were the strongest predictors of their performance in science as measured by standardized test scores, (b) Motivational processes were the strongest predictors of students commitment to science in the form of situational engagement and anticipated science related areas.
These results are consistent with Snow's (1989) conjecture that both performance and commitment pathway related factors are necessary for understanding the full range of person-level inputs to achievement outcomes. Study 2 adopted a person-centered approach to examining holistic organizations of psychological factors within individuals and their relations to science achievement and engagement. 4 types of student's characterized by unique configuration of congestive motivational and effective attributes were identified in both the male and female sub samples using inverse factor analysis. Type membership was found to distinguish students in various indicators of achievement. Two of the four types were also found to generalize across Gender Groups. It demonstrates the importance of examining holistic patterns in individual's psychological profiles like cognitive styles, creativity and Aptitude in relation to achievement.

Lalitha Bai (1992) compares the structures of high, average and low achievers in mathematics at the secondary level. The objectives of her study were:

1) To identify the pattern of clustering of the 31 cognitive variables for the total sample.
2) To identify the cognitive factor structures for the three achievement levels in mathematics (High Achievers, Average Achievers, Low Achievers) and
3) To compare the differential pattern of clustering of the 31 cognitive variables for the four groups by comparing the cognitive factor structure of the total sample with the factor structures of the three achievement levels.

The study was conducted on a representative sample of 531 students of X standard selected on the basis of the proportionate stratified sampling
technique. The tools used were an achievement test in mathematics for standard X., a paper from Board Test, a test for spatial ability, a test for perceptual speed, a numerical Ability test, and verbal and non verbal group test of Intelligence. The statistical techniques used were test of significance for difference between means of large, independent samples, factor analysis using the ‘Principal axes’ method, and factor rotation following the criteria of simple structure and positive manifold.

The major findings of the study were:

1) The 31 cognitive variables for the total sample were reduced to a single factor ‘Numerical Ability’, when analysed.

2) For the high mathematics achievers, the 31 cognitive variables were reduced to 3 cognitive factors. ‘Abstract Reasoning’, ‘Numerical - Spatial Facility’ and ‘Non-language Reasoning’.

3) For the average mathematics achievers, the factor identified was ‘General mental Ability’. For the low mathematics achievers two factors were identified. They include Numerical – perceptual Ability’ and ‘Numerical Facility’.

Bhurkalter (1995) investigated that in a experimental educational environment, field-dependent Secondary School students will show cognitive gains similar to those of field - independent Secondary School students scientific discipline.

332 male Secondary School (aged 11-15yrs) were classified by a median split obtained on the GEFT - Group embedded figures test. Analysis of covariance results shared a significant gain difference with the field independent group having highest mean score on the congestive measure.
Findings Corroborate the literature indicating that persons with field-independent differentiation are more likely to show cognitive gain.

Holden (1997) studies the interactive constructive model of learning with its emphasis on the relationship among learner, task and context with the associations among science achievement and learners characteristics of learning style, meta cognition, prior and knowledge and affective attributes of 6th and 7th graders.

Measures of cognitive based and personality based learning styles were used to test the cognitive style.

The results of analyses indicated that the subjects tended to demonstrate a field dependent cognitive style. Style variations between males and females, and the personality styles. Measures were such that males were primarily intuition feeling than females. No clear pattern of relationship emerged between cognitive and personality styles.

Cano-Garcia (1998) examined, whether college students learning styles and thinking styles were interrelated, and if these caused to predict academic Achievement. A total of 210 college students (aged 18-24 yrs) completed 2 inventories one of longitudinal study and other of transversal study. The results of correlation analysis reveals the presence of a moderate relationship between both types of styles.

The results of regression analysis indicated the students academic achievement was related to students transversal study The students that prefer to work individually, that do no enjoy creating, formulating and planning for problem solution and those that have adherence to existing rules and procedures obtained higher academic achievement.
The implications of these findings for education psychologists which include assessment of longitudinal study and transversal study and the need to encourage thinking as an important part of the learning process are discussed.

The behaviours, home and educational backgrounds and cognitive Styles of 207 (92M and 115 FM) 15-18yrs old Kuwaiti secondary school pupils were assessed. These independently rated the backgrounds of students on these pupils backgrounds and home educational background was suited by the social officer in each school.

Secondary school position on the wholist-Analytic and verbal-Imagery demising of congestive styles was assessed by the Arabic version of the cognitive style analysis. A factor analysis of the questionnaire items indicated the factors, conduct background, learning background, stability and physical well being.

With conduct background and learning background, the over all level was higher for females than males and also improved as parents educational level increased. While conduct behaviour was significantly lower for the Analysis than the wholists and for the imagers than the verbalizers. For stability and well being there was a significant interaction between parents educational level and style in their effect on over all rating, with the greatest style effect when the parental educational level was low.

Results are discussed in terms of their practical implications and the nature of the educational system within Kuwait.

Slemmer (2003) investigated the effect of learning styles on student achievement: A meta-analysis- with an objective to identify forms of
technology that may effectively accommodate, the learning needs of students, 48 studies were included in a meta-analysis to determine the effects of learning styles on student achievement. The meta-analysis found that learning styles do appear to influence student achievement in various technology-enhanced learning environment. When all of the students received the same technology-enhanced lesson, there was a significant difference in student achievement between students with different learning styles. \((Z_r = .2952)\) and the studies that use Witkin’s learning style measure indicated a significant interaction between students’ learning styles and technology-enhanced learning environments as measured by students’ achievement \((Z_r = .1873)\), while none of the quadrant-based learning style models indicated a significant interaction.

Kammers (2005) conducted a study on the Gender differences and cognitive styles in the use of digital games amongst advanced level biology students. It is an elaboration on previous work exploring the relationship between Cognitive Style and academic performances in biology, at advanced level. The study reveals that cognitive styles of 581 (212 Male and 369 Female) advanced biology students was correlated with their academic perfect in 5 subjects. The verbal imaginary dimension, wholistic analytic dimension and Gender were not correlated.

Regression Analysis showed that none of the style dimension combination had a significant effect on performance of the subject.

2.3 Studies Related to Scientific Aptitude

The research studies on scientific aptitude indicate that they were studied in correlation with achievement and some other behavioural aspects
rather studied independently. So we can have a look on the relationship between scientific aptitude and science achievement.

Walberg (1969) assessed the possible nascent tensions between scientific and feminine roles, random sub samples of 705 girls taking a new high school science course were compared with sub samples of 1369 boys on 58 cognitive, and behavioral measures.

Four distinguishing patterns of difference were identified. The girls were higher on all 4: verbal aptitude, (but not quantitative and spatial abilities) social values and interpersonal needs, cautiousness about science experiences and aesthetic valuations.

These factors may lead to greater academic achievement in high school but appear to penalize women for later eminence in scientific aptitude and scientific careers.

Mithra (1975) investigated the differences between means of the Suburban Under achiever and over achievers on the composite aptitude test were significant and the means were in favour of the under achiever where as there was no significant difference in the aptitude scores of rural and urban over and under achievers.

Scientific Aptitude has a significant role to play in predicting science achievement. For science achievement both scientific information and scientific aptitude may be the pre requisites for mastery over the basic scientific skills which in turn, which lead to the unfolding of other mental abilities.

Ghuman, (1976) studied the aptitude, personality traits and academic motivation of academic overachievers and underachievers. Among other
things, he found that low-achievement motivation and emotional stability are related to academic underachievement at the higher secondary school level.

Lawson and Thomson (1988) predicted that following instruction, formal operational students would hold significantly fewer misconceptions than their concrete operational classmates.

To test this hypothesis, 131, 7th graders were administered a test on principles of genetics. Responses were categorized in terms of the number of misconceptions present.

The number of misconceptions was compared with reasoning ability (concrete, transitional and formal), mental capacity verbal intelligence (low, medium, high) and cognitive style (field dependent intermediate and field independent) the only S viewable consistently and significantly related to the number of misconceptional was reasoning ability.

Dachingpui (1989) examined the relationships among variables such as achievement in science and attitude towards science. The objectives of her study were, to study the science achievement in science of high school students.

- To find the interrelationship of science achievement and attitude towards science.
- To examine the relevant effect of sex, Socio Economic status type of school an science achievement and scientific attitude on sample of 812 students of IX std selected through random sampling technique. Science test development by investigator and science attitude scale (Grewal) were used to collect the data.
The major findings of the study indicated, significant relationships between scores and Scientific attitude and achievement in science.

- Significant sex differences are seen in achievement in science and scientific attitude existed.
- Type of school, High Social Economic Status favoured achievement in sciences and scientific attitude.

Bhaskar Rao (1996) studied the scientific attitude scientific aptitude and achievement in biology at the sec. school level.

The objectives of his study were to field the Scientific attitude and Scientific aptitude possessed by the Secondary School pupils along with their achievement in biology.

To compare Scientific attitude and Scientific aptitude and achievement in biology of boys v/s girls at Secondary School, private V/s Govt schools, rural and urban schools, on a sample of 600 students of IX standard, selected through stratified sampling.

Kerala University Scientific aptitude test was used to collect the data and mean, S.D., critical ratio and correlation were the statistical techniques used to analysed the data. The major finding of the study were, It was observed that:

- The Scientific aptitude in Secondary Schools pupils was average.
- The pupil of private schools and urban schools held a bit more scientific aptitude, and the achievement in biology was average.
- The rural schools, Govt. schools were better in achievement.
- There was a highly significant and positive association among Scientific attitude and achievement in biology.
Dubey (1992) found that the relevant psychological variables such as cognitive ability, and scientific aptitude had a significant direct influence on science achievement.

Sharma Pushpalatha (1992) studied the effect of differences in educational status and social groups of tribe members and tribe members on their Scientific Aptitudes. 400 tribal students were matched with equal members of non-tribal students.

Trial Social status earned lower scores on a comprehensive scientific Aptitude test than non tribal Social status. Non tribal Social status were superior in terms of detecting illogical conclusions, ability to deduce conclusions, accuracy of interpretation and ability to reason and solve problems.

Chen (1993) examined the effects of the creative problem solving training courses (CPSTC) in higher Secondary school were divided into an experimental group attending the CPSTC and a control group with no training.

Secondary school creative abilities and attitudes to science were compared between the gifted and the non-gifted, the experimental and the control, before and after the CPSTC. The results showed that a significant relationship was existed between the sample tested.

Lenehan and Dunn (1994) studied the effects of learning styles intervention on college students achievement anxiety, anger and curiosity - 203 students were provided with conventional study skill, guidelines, tutoring and advicement assistance. 104 Scientific studies were in experimental group provided home work based on their identified learning style preferences.
Scientific aptitude test scores were compared and indicated that both groups were essentially equal.

The results showed that scientific studies in the experimental group achieved higher science grades than in the control group.

Gustin and Corazza (1999) reviewed and analysed the relative contribution of age, gender, verbal reasoning ability (VRA) and mathematical reasoning ability (MRA) as predictors of success in science courses.

562 boys and 203 girls of mean age 14.3 years enrolled in such courses (biology, chemistry, and physics) were assessed for their mean scores on a test administered following the completion of the course. Scores on the Scientific Aptitude Test verbal and maths sections were used as indicators of Verbal Reasoning Ability and Mathematical Reasoning Ability.

A composite of Verbal Reasoning Ability and Mathematical Reasoning Ability was found to be a more powerful predictor of success in science courses than any of the variables considered separately.

Pushpalatha (1995) studied the Aptitude of academic achievers, employed a mixed group test of intelligence and total scholastic score on annual examination at 9th grades as criterion measures, 85 over achievers and 78 under achievers were tested after randomly selected sample of N=500 distributed between the two sexes.

In addition, to composite aptitude, scientific and numerical reasoning and verbal aptitudes functioned as dependent variables.

The Scientific Aptitude Test, Numerical Ability Test, Reasoning Ability Test (Agarwal) and verbal Aptitude Test (Sharma) served as measures of aptitudes. In addition to inter aptitude differentials, sex, stream and locale
differentials on the composite scale of over achievers & under achievers were computed.

The results reveal that:

1) Over achievers excelled significantly higher than under achievers only in Scientific Aptitude Test, whereas the latter scored significantly higher than the former in Numerical Ability Test, Reasoning Ability Test and Verbal Ability Test.

2) The over achievers and under achievers did not show any significant sex- or stream wise differential and

3) Significant locale (urban V/S rural) differences of over achievers and under achievers was found.

Vohra (1997) investigated the relationship among aptitude and academic achievement and choice of students, mean, SD'S correlation t value and factor analysis were used. The findings showed that academic achievement and aptitude, were positively correlated in the whole sample as well as samples in different branches. This was further supported by the factor analysis as both these variables formed one common factor.

Spelke (2005) in her article considers 3 claims that cognitive sex differences and level accounts for the differential representation of men and women in high level careers in science and mathematics.

The results showed that a) Males are predisposed to better learning about mechanical systems, b) Males have a profile of spatial and numerical abilities producing greater aptitude for science and maths, c) Males are more variable in their cognitive abilities than females.
It provides the evidence that scientific and mathematical reasoning develop from a set of biologically based cognitive abilities and capacities. These capacities lead men and women to develop equal talent for science and mathematics.

2.4 Studies Related to Creativity

Raina (1968) compared high creative and low creative students on the measures of cognition, personality and Socio Economic Status. The results shown that,

The high creative student exhibited greater achievement dominance, autonomy, change and endurance than the low creative males showed greater achievement autonomy, dominance and aggressive than the low creative males. The high creative females were significantly higher than the low creative females on achievement, dominance and endurance.

Passi and Lalithamma (1973) studied self-concepts and creativity of over, normal and underachievers amongst X grade students of Baroda. They, among other things, found that over achievers were more creative and no mean differences were found among the groups in self concepts.

Mehdi (1977) found that intelligence and creativity were slightly negatively correlated in the urban sample where as, in the rural sample a significant positive and significant correlation between creativity and school achievement.

Srivastava (1977) conducted a study to find out the relationship between extroversion and creativity and neuroticism and creativity. The tools that were employed for the study were the Mehdi’s test of creative thinking and Hindi adaptation of Eysenck’s personality inventory. The major findings
were that there was no significant correlation between neuroticism, extroversion fluency, flexibility, originality and total creative score.

Jody and Fitz (1978) found that poor creativity is the cause of academic underachievement at the secondary school stage.

Dharmangadhan (1981) observed that urban students scored significantly higher than rural students in flexibility and originality measures of verbal and figural creativity.

Agarwal and Gupta (1982) observed that locality plays a significant role in developing creative potential among the students and at the same time their findings did not discriminate between the students residing in the homes and those residing in hostels.

Rastogi and Nathawat's (1982) study on a sample of 50 boys and girls from IX, X and XI standards of the central schools revealed no significant sex differences in creativity.

Singh and Singh (1984) administered a creativity test to 120 students of VII and VIII class. Results showed that urban students were more active and responsible but placid than rural students, rural students were less ascendant than urban students.

Syama Trimurthy (1987) also found that boys were significantly more creative than girls on a sample if 200 Gujrathi speaking children (70 - boys and 130 - girls) randomly selected from four different schools. The interaction effect among the three independent variables - Sex, I.Q and study habits was highly significant. It revealed that boys with high with high I.Q and low study habits were more creative than girls with low I.Q and high study habits.
Harnek, Gurusagar Manjit (1988) conducted a study to find out the relationship of sex and creativity on a sample of 200 IX class students (100 boys and 100 girls) from 5 rural government schools of Ludhiana and found no significant difference between the creative potential of boys and girls.


The study focuses on the creative development of Secondary School children in relation to sex, intelligence and urban and rural background.

The findings are:

- The development of creativity was at its peak between the age of 13-14 years.
- The girls showed excellence as compared to boys in creative development.
- The trends of creative development of boys and girls were not linear.
- Urban students were superior to rural students in creative development.
- There existed a low but positive relationship between creativity and intelligence.
- The creativity and intelligence of rural students were lower than urban students.

Srivastav (1988) explored the relationship between need and the three components of creativity, fluency, flexibility and originality among 540 high school pupils.
The major findings of the study are: In every case of boys and Girls belonging to urban and rural locality there existed a difference among the fifteen needs associated with high, average and low level of intelligence.

Sudesh Bal (1988) studied the relationship between creativity, cognitive styles and academic achievement among college students, 150 Secondary school in the age range of 16-18 year were only drawn. The sample had high, middle and low academic achievers in equal number.

Torrance Test of Creative Thinking (TTC) and verbal Form and Remote Association Test (RAT) were administered. The ANOVA of the creative scores on various measures revealed that both cognitive styles and academic achievement and related to Fluency, Flexibility and Originality scores of TTC as well as creativity measured by RAT. It was also observed that cognitive styles and academic achievement significantly interact with RAT creativity and not with TTC creativity.

Riaz, Mah (1989) in their investigation explored the relationship between academic excellence, creativity achievement in science and psychological differentiation; using 39 academically superior and 29 below average Secondary school. Students who completed a test of creativity and measures of psychological differentiation and academic achievement in science.

Academically superior students earned significantly higher scores on all these tests. The correlations between scores on creativity and science achievement tests were significant for the academically superior group but not for the below average group. Correlations between creativity, psychological differentiation and science achievement were insignificant in both the groups.
Indayraj (1989) investigated the relationship between creativity and scholastic achievement among class X Students, on a sample of 30 drawn through stratified technique and found that there was no significant relationship between science achievement and creativity of high school students.

Srivastav (1992) investigated creativity in relation to scientific aptitude and attitude towards science.

The sample of the study comprised 1200 students covering 600 boys and 600 Girls who were drawn from higher secondary classes of Agra city.

The major findings of the study were:
1) The science students of higher secondary school having more scientific aptitude were more creative than those having less scientific aptitude.
2) In the field of Creativity, The boys having favourable attitude towards science were slightly better than those having unfavorable attitude towards science where as the Girls with favourable and unfavourable attitude towards science did not differ.
3) The Girls were more creative than boys.
4) The boys had more scientific aptitude than the girls.
5) The girls had more favourable towards science than boys.

Singh (1992) investigated to find out the relationship between the creativity and problem solving ability of 650 tribals and non tribal students.

The main findings are:
- Urban students were significantly better than tribals in fluency, flexibility and originality.
- There were no sex differences with respect to scientific creativity.
There was a significant relationship between scientific creativity and problem solving and

Girls were superior to boys in problem solving ability.

Kumar (1992) examined the creative thinking ability of the 200 government secondary school students in Arunachal Pradesh.

The findings are:-

1) The male and Female students did not show any significant difference in their creative thinking ability.

2) The type of school in which students studied was also found to influence their creative thinking ability. The Govt. school students had an edge over the central school students in creativity.

2.5 Studies Related to Personality

A number of investigations carried out with regard to the Personality traits which differentiate bright-normal and under achievers. Many results appear to be contrary to one other. But many results seem to be more clear when specific Personality traits been measured.

Goyal (1970) studied personality trait of creative children at the middle school stage of Patiala district in Punjab using his own valid and reliable tests of creativity developed on the lines of Torrance, he concluded that the creative pupils at the middle school stage possessed a higher level of energy, they rejected suppression for the control of impulses; they were more of introverts and more independent in both thought and action, had open minds could tolerate ambiguity and entertained opposing values.

Bhaduri (1971) conducted a comparative study of certain psychological characteristics of over and underachievers in higher secondary schools. By
comparing the expected achievement and actual achievement in school examination marks, 213 overachievers and 216 underachievers were selected.

Among other things, the study revealed that anxiety, neuroticism, poor study habits and unfavourable attitude towards school are the psychological factors associated with underachievement of higher secondary school students.

Dhaliwal (1971) conducted a study to know about some of the factors contributing to academic success and failure among high school student's personality correlates of academic over and under achievement.

The sample consists of 887 high school students. The tools used are, a measure of intelligence, the Raven's progressive matrices and the two forms of the Cattell's culture form intelligence test.

The results showed that anxiety and need for achievement has a curvilinear relationship with over and under achievement implying there by that both over achievement and under achievement go with higher need for achievement and greater anxiety in comparison to normal achievement.

Paramesh (1972) conducted a study on the personality correlates of creative persons, and concluded that the high creative individuals are neither significantly more or less introverted than the low creative individuals. The high creative individuals are not significantly different from the low creative are significantly high in ego strength than the low creative individuals. The high creative differed significantly from the low creative on theoretical and aesthetic values.
Saxena (1972) studied the interest, need patterns, adjustment problems, study habits and personal and background factors of over and underachievers involving a cluster samples of 1769 of XI standard students. Then over and normal achievers were identified by using multiple regression equation for each subject separately.

The major findings of the study were:

i) Personality characteristics like submissiveness, timidness, roodiness, impulsiveness and dependent type of immaturity are related to academic underachievement of higher secondary school students.

ii) Poor adjustment and poor study habits are related to academic underachievement of higher secondary school students.

Menon (1973) made a comparative study of personality characteristics of over and underachievers of high ability. This study, among other things revealed that more extraversion, maladjustment, less academic interest and poor socio-economic status are related to academic underachievement of secondary school students.

Jayagopal (1974) investigated the personality factors of high achievers and underachievers of some schools in the city of Madras. The annual marks of VIII standard were converted into Z scores and arranged in descending order. Upper and lower quartiles of this distribution formed high and underachievers in this study. The samples thus selected included 61 students in each group of high and underachievers.

The study, among other things, revealed that personality factors such as guild proneness, diffidence and emotional instability are related to academic underachievement at the secondary school level.
Rao (1975) conducted an experimental study of bright underachievers and found that emotional problems and needs are related to academic underachievement.

Beedawat (1976) conducted a study of academic underachievement amongst secondary school pupils. The study revealed that average emotional stability is associated with academic underachievement of secondary school pupils.

Puri (1987) studied the personality traits and self concepts of 16 to 18 years old underachievers and found that lower scholastic ability, poor S.E.S. and anxiety are related to academic underachievement at the secondary school level.

Mohan Gita (1988) attempted to assess the relationship of cognitive preferences with certain academic and personal variables among 1000 IX Std. Students of 27 high school students selected through stratified proportionate sampling technique in mysore city.

The major findings of the study were the overall subject preferences showed no relationships with 4 of the 6 dimensions of cognitive preferences and the personality variables of extraversion, neuroticism and achievement motivation taken together showed no significant relationship with any of the cognitive preference development.

Dagaur (1988) attempted to study the relationships among neuroticism, anxiety and creative thinking in the context of extraversion and sex.

Dixit (1989) attempted to study the effect of personality factors and self concept on educational achievement as well as to see the interaction among these variables.
Personality factors are significantly influenced the educational achievement and intelligence was related to educational achievement, were the major findings of the study.

Dadu Prathiba (1992) attempted to study the urban and rural male and female students with regard to their personality.

Cattell's 16 P.F. scale and B.B. Chatterjee's socio economic status scale were administered on the sample of 300, X standard students of age group 16-18 years, selected through multistage stratified random sampling.

The findings of the study are as follows: Rural male and urban male students did not differ in their personality traits and between rural female and urban female students, there existed a significant difference in personality traits.

Eysenick's personality questionnaire was administered on a sample of 394 X standard students selected through stratified random sampling technique.

The major findings of the study are as follows: the higher the level of neuroticism, the higher were the mean scores on Fluency, Flexibility and Originality. At higher and average levels of neuroticism, there was no significant difference in the originality scores of males and females and at low levels of neuroticism female extroverts showed more flexible and fluent behaviour than introverts.

Ham Shrion (1992) Examined personality characteristics of 21 male and 11 female 6 graders who were gifted in science. Students completed form A of the High School Personality questionnaire. Standard Scores tended to be self assured, self-confident, and assertive, suggesting that self concept
correlates highly with academic achievement. Boys tended to be more outgoing and external in their approach, while girls were more internal and excitable.

One or the other Personality Characteristics have time and again been found to be conducive to success in the academic field. The studies of Mukherjee (1969), Ravindu (1977), Patel (1981), Zachawal (1982) have revealed the influence of Personality on achievement of students.

Joswig Helga (1994) Examined cognitive components and motivational aspects of the personality of gifted pupils (HA) 250, 7th and 8th graders (aged 12-13 years) participated.

177 of whom applied for entrance to a special school, and 73 of whom formed control group. Cognitive components were tested using the RPM and result of the entrance exam of the special school.

There were significant differences between the 2 groups in terms of cognitive and motivational components, which formed the special school.

A positive correlation was found between special school applicant’s mathematics and physics exam results and the extent of primary motivation and knowledge.

Seddon (1997) studied 741 secondary school students aged (15-19 years) worked through a self-instructional chemistry program after completing the tests of extraversion, neuroticism, verbal intelligence and non verbal intelligence.

The Eysenck’s personality inventory, the AH5 group test of High-grade intelligence and High School Chemistry were used.
The existence of significant interactions involving extraversion, neuroticism with the measures of intelligence and present performance was investigated.

Results showed that none of the interactions involving neuroticism was significant and indicate that the significant interaction involving extraversion and chronological age was not due to the parallel effects of verbal intelligence and non verbal intelligence and background knowledge.

Sinha (1999) says apart from minimum academic requirements, the quality of scholastic performance depends upon certain personality characteristic factors. The so called the tests of intelligence and aptitude touch only peripheral qualities. Individuals for whom test results indicated high probability of achievement nevertheless failed.

A number of recent studies have drawn attention to personality correlates with school achievement. There is statistically significant correlation between pupils achievement and scores on various personality scales.

Entwistle (2000) in his study 257 students were given an Eysenck’s personality questionnaire relating to academic motivational studies. A correlation analysis of these in relation to academic performance at the end of the first year shared the superiority of introverts and students with good thinking styles and study methods, and explained the high academic performance.

Several lines of evidence indicate poor personality adjustment is associated with inferior achievement.

Norvilitis and Norvilitis (2002) examined students intuitive physics ability and characteristics associated with physics competence in 2 studies.
In study 1, 150 students completed questionnaires about physics knowledge. Many students did well on a physics quiz, more than 25% of students perceived scholastic competence but not related to a number of personality variables.

In study 2, further explored personality and academic variables and also examined student's awareness of their own physics ability. Students completed questionnaires assessing physics ability, social desirability, neuroticism boundary orientation and executive function.

Results indicate that, the personality variables were again unrelated to ability.

2.6 Studies Related to Intelligence

The relation between intelligence and Achievement is one of the most prolific areas of educational research during the first half of the present century. It is virtually impossible to cover the entire range of studies on this theme. Only a few representative and more recent studies have been covered by the present review with special emphasis on Indian and Foreign studies.

One of the pioneering studies by Freeman F. S. (1962) in this area is available in respect of the SB test of intelligence. It reveals the following correlations.

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<th>Reading</th>
<th>Higher Arithmetic</th>
<th>Spelling</th>
<th>Knowledge of Literature</th>
<th>Science</th>
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Kidd (1962) suggested that we are dealing with a mixture of ability, school achievement and social background scores on standardized individual and group intelligence task have been known to vary according to a child's
Achievement in various subject matters generally correlates about 0.5 with intelligence. Intelligence levels also influence qualitative aspects of achievement. It affects tasks and the strategy of problem solving. High I.Q subjects are more likely to correct mistakes independently to verify solutions to use logical approach to employ a more efficient method are to be persistent.

Naidu and Asron (1969) have established the relationships between Intelligence and achievement. The study shows that intelligence is a major factor that contributes towards achievement of the pupils. The correlation was found to be significant at 0.01 level between I.Q and science achievement.

Vanarase (1970) investigated the relationship between ability and scholastic achievement, involving 43 pairs of normal achievers and underachievers from IX standard and 32 pairs of normal achievers and underachievers from X standard.

Mathew (1971) found the correlation between total I.Q scores and achievement in science as .348. Anandavally, obtained only a low correlation of .15 between intelligence and achievement. Nair, used a state wide sample of secondary school students on whom PMT and BGT tests of intelligence have been administered. The urban pupils were consistently superior to rural groups in both the tests.

The difference in achievement quite naturally from the differences in I.Q. and in association with mental age. Achievement is not however perfectly
correlated with mental capacity. The correlation usually range from about 0.40 to 0.75. These correlations generally indicate that the brightest students do not do work of quality high as their capacity and that the dullest students do work better than one would normally expect from their intelligence tests.

Sharma (1978) studied the attributes of underachievement of undergraduate students. The application of regression equation of academic achievement on intelligence resulted in 177 underachievers.

This study revealed that withdrawal tendency, inferiority complex, emotional instability, poor study habits and poor socio-economic status are related academic underachievement of undergraduate students.

Kenneth (1983) parsley junior studies the popularity, SES, Intelligence and academic achievement of 110 secondary school children of Jallunder city were found to be correlated. Girls have found to be more advanced than boys in their ability to perceive details quickly and accurately. Boys ordinarily do something better than Girls in numerical reasoning and problem solving. Girls usually surpass boys in mechanics of computation excelling than in both speed and accuracy.

Shukla (1985) in a study to find the relationship between intelligence and ability of scholastic achievement obtained the following correlations science 0.45 and maths 0.62.

Mian, Shamshada (1988), attempts to compare boys and girls with regard to intelligence, neuroticism, scholastic achievement and need achievement. The sample consisted of 1008, X standard students of Siliguri district.
The major findings of the study were:

1) Girls were superior to boys in intelligence and scholastic achievement; on the other hand boys compared to girls had a higher score on achievement motivation.

2) No significant difference was found between boys and girls in neuroticism and ego ideal.

3) High intelligence boys, as compared to, high intelligence girls, were less neurotic and high in scholastic achievement.

Kaur Parvinder (1992) investigated into the prediction of achievement in different school subjects on the basis of different dimensions of creativity and intelligence.

Torrance Test of creative thinking and science achievement tests were administered on a sample of 300 boys and 300 girls of X Standard students, drawn from both rural and urban areas of Patiala Dist of Punjab.

The major findings of the study were, for males, intelligence was positively correlated with fluency, flexibility and originality, for males Fluency, Flexibility and originality and creativity were positively related with achievement, for females as well as the total sample 'Fluency', 'Flexibility', 'Originality' and creativity were positively and significantly related to achievement and for males as well as females intelligence was positively related with achievement and intelligence was found to be the better predictor than 'Fluency', 'Flexibility', 'Originality' of achievement.

Dass (1996) studies the correlation between achievement scores and intelligence test was undertaken by D. P. Pavaniasam and Dr. Bhatia's performance test of intelligence to 200 boys and 200 girls of 8 high schools of
urban and rural areas. The percentage of marks of pupils constituted the achievement scores. Analysis of data revealed that there was no difference existed in the performance between boys and girls.

2.7 Studies Related to Science Achievement

Academic achievement is of paramount importance, particularly in the present Socio Economic and cultural context. Obviously, in the school, great importance and emphasis is placed on achievement right from the beginning of formal education.

The effectiveness of any educational system is gauged to the extent the principle involved in the system achievement, whether it is cognitive, conative or psycho motor domain. In general terms, achievement refers to scholastic or academic achievement of the student at the end of the education program. To maximize the achievement a given set up is therefore the goal of every educationist – a trainee or an educational administrator. Research has come to an aid to promote achievement.

Pillai (1981) conducted study to know the sex differences in certain psychology and aptitudinal dimensions related to science achievement. The personality variable study were, interest in science, attitude towards science and attitude towards problem solving and these aptitudinal variables were number social science information, formulation, spatial ability, verbal comprehension, interpretation and science aptitude.

The result showed that total science achievements and all the 9 select variables were found to be significantly correlated for both boys and girls. The relationship between the selected variable and achievements in physics,
chemistry and biology taken separately was found to be significant for both boys and girls.

Harvey and Goldstein (1990) investigated sex differences in science for more able people. Significant differences with boys performing better than girls were found in the following measure towards school science. It is suggested that no sex difference effects were apparent.

Harvey and Wareham (1994) assessed students ability at (1) observation during a teacher-led demonstration of a practical lesson and (2) carrying out individual practical work; on 451 VIII standard school students randomly selected from all male schools, all female schools at all mixed schools with single sex science classes.

The result indicates no significant difference between the performance of boys and girls. Findings show that chemistry topics were most popular among all secondary school students. Physics was least popular among girls but not boys. Girls took the same amount of time to do the experiments as boys, reflecting the notion that girls work more slowly and thoroughly than boys and no advantages to having single sex classes in single sex or mixed-sex schools were evidenced.

Sharma and Muktha (1996) investigated 196, male Science Students from 2 secondary schools in Jaipur, India, completed scales of scientific interest, knowledge and aptitude. Results indicate that secondary school students experiencing discordance between their aptitudes had significantly lower academic achievement than secondary school students without such discordance.
Julie Wilson (1999) presented a research paper - on high and low achievement classroom interaction pattern in an higher primary classroom, Melbourne, Australia - sought to examine if students achievement level influenced their interaction levels in the classroom.

It used qualitative data gathering methods of semi participant observations, interviews and field notes to describe and investigate the nature and frequency of the interaction patrons of 3 high and 3 low achieving students. Purposive sampling method was used.

Findings revealed that the high achieving informants initiated more interactions than the low achievers. The nature of the high and low achievers interactions in the study also varied. The high achievers were found to initiate interactions to volunteer answers, whereas one of the low achievers interacted purely for the purpose of help seeking. The high achieving information attempted a greater number of students initiated interaction than the low achieving students. The low achieving informants were still reluctant to interact even after the teachers encouragement.

O’Brien (1999) presented the theoretical background an outline of a study in its initial stages at North Carolina State.

The purposes of the study are to investigate cognitive style patterns among students and their achievements in high schools. Traditional V/s contextual/problem-based approaches to teaching and learning and related differences in the academic performance of students.

The results showed that there is a significant relationship between cognitive styles and science achievement, and personality and science achievement.
Hassan Mohammad and Khalifa Amna (1999) investigated sex differences in science achievements at the final high school level and changes in their differences for student across ten academic years, 1000 boys and 1000 girls majoring in science, 100 boys and 100 girls for each academic year were randomly drawn and tested.

The result in general indicates that girls scored higher on final examinations. Across years these differences favoured girls. The results were discussed in the light of social, psychological, educational and biological factors.

Katz, Larry (1999) examined the Gender and academic program relationship to attitudes and learning styles of 190 science students of age 17-21. In comparing learning styles with comfort using a computer. In assessing the effect of gender and academic program, no difference was found regarding the motivation to do well or the perceived amount of time required.

Girls reported significantly less comfort using computers, yet they viewed the computer as more useful than men. Men were significantly more confident that they would do well in the course.

Mau wei-cheng and Lynn Richard (2000) in their research work obtained gender differences in maths, reading science and amount of homework done out of school for 10th standard students from the American National Educational longitudinal study.

Males obtained significantly higher mean scores in maths and science and Females obtained significantly higher mean scores in reading and amount of homework. There were significant correlations between test scores
and amount of home works, suggesting that amount of home work contributes to test scores.

Ogunkola (2000) investigated the relationship between performance on the Biology cognitive entry point test (BCEPT) at school session entrance and performance 6 weeks later on the Biology achievement test of secondary students.

Secondary students were 150 male V/s female, rural V/s urban (average age 15 years) in Ogun state (Nigeria). The results revealed a positive high correlation between performance on the CEPT and academic achievement in biology.

Analysis showed that 44.89% of achievement in biology was attributed to CEPT performance of male and female students or urban and rural students. However, urban students had significantly higher biology achievement than rural students.

Ma Xin (2001) in his article based on Canadian's data from the third international Maths and science study examined the stability of within school. SES gaps in the maths and science achievement of 7th and 8th grade students.

Student characteristics had significant effects on student's achievement. School characteristics were at most marginally related to School average achievement and had no effect on within school SES Gaps.

With in-school SES Gaps were highly correlated between Maths and science, and this correlation was not affected by student and school characteristics.
Muller stage and Kinzie (2000) examined the effects of race, ethnicity and gender of school science achievement growth rates. 5690 8th grade students completed science tests. Results show that SES and Intelligence of 8th grade across all racial and ethnic groups by gender.

For all racial/ethnic groups, made secondary school achievement was higher than that of females within the same racial/ethnic groups. African-American and exhibited lower level of science achievement than did Asian-American and Latino exhibited lower levels of science achievement than did Asian-American and white secondary school students.

Tyrrell, Diann Marie (2001) in her research concerns a note taking and teaching strategy that involves seventh grade science students. The investigation measured student achievement under three prescribed conditions. The treatment conditions were reviewing, guided notes and guided notes with reviewing.

For this experiment, the Solomon four-group design was utilized. This 2x2 factorial design tested for treatment effect and pretest sensitivity. Data was collected from 139, 7th grade - 119 boys and 10 Girls. Comparisons were made between boys and girls groups.

The results showed that achievement improved significantly when reviewing and using graded notes independently. This research showed that both boys and girls significantly improved their achievement in science equally well for all treatment conditions. The cognitive ability worked best for high or low achieving students.

Schneider (2002) examined the effect of project based science instruction on a national measure of science achievement. This study shows
that students participating in a PBS curriculum were prepared for testing. White and middle class PBS students outscored the national sample on 44% of National assessment of Educational progress.

Educators should be encouraged to use inquiry based approaches and cognitive testing devices to implement reform in the schools.

Stamovlasis (2002) explored the relation between students achievements in chemistry-problem-solving and Mobility-Fixity dimension, Fixity characterizes consistency of function of field-independent subjects in a field-independent fashion while mobility provided for variation according to circumstances. The effect of this cognitive variable was examined as a function of the type and the complexity of the problem. The subjects had to carry out different mental tasks. Mobile subjects demonstrated higher achievement than fixed subjects. The results of this study support the hypothesis that the M-F dimension can serve as a predictor variable of student's achievement in science.

Haussler and Hoffmann (2002) examined the physics related interests of students suggests applying different measures to reduce or reverse that trend such as, 1) Improving the ability of teachers to support girls in the development of a positive physics related self concept 2) Changing to an organizational sitting that gives girls a better chance to improve their scientific interest in order to achieve better in the subject.

They examined whether these hypothetically effective measures lead to an improvement to the situation for girls in their achievements.
The immediate and Long-term achievements, as well as their change of interests in physics-related self-concept were assessed by tests at various stages of intervention.

The intervention proved significantly successful in improving the indicators for girls (and boys) in the experimental group.

Mc Gillicuddy and Ann Richard (2002) in their study, on applying theory and research, links the development of sex differences in cognition to biological foundations multiple social relations, and types of personalities in relation to patterns in children’s and adolescents thinking problem solving, academic performance and social conditions that are related to behaviors in each of these areas examined.

Wilkins and Jesse (2002) used data from the longitudinal study of American youth, hierarchical linear models were used to model the growth of student science achievements in 3 areas (Physics, Biology and Environmental science) during middle and high school. The sample size was 3.116; students were in 7th grade at the beginning of the study, which finished when they were in 12th grade. Results show significant growth in science achievement across all areas. At the student level, SES, age, locality were related to the rate of growth in all areas. Particularly there were no gender differences in the rate of growth in any of the 3 areas.

At the school level, variables associated with school context variables associated with school climate and cognitive factors were related to the growth in science achievement.

Holmes (2003) studied museum-based learning; informal learning settings and their role in student motivation and achievement in science,
examined changes in student motivation and achievements in science in relationship with cognitive style and science from the viewpoint of gender. The study was based on the pretest-post test control composition of groups.

Mbajiorgu and Ali (2003) investigated the relationship between STS approach, scientific literacy (SL) and achievement in biology. A quasi-experimental design of the non-equivalent groups was employed. Four secondary schools, eight teachers and 246 students from Nigeria were involved in the study. Two instruments were used to collect data; an achievement test on reproduction and family planning and a scientific literacy scale. Results showed that there is no relationship between scientific literacy and AIB. The split wise pretest regression showed a weak positive relationship between scientific literacy and AIB for the experimental groups and, a no relationship for the control groups. However, STS approach mediated between scientific literacy and achievement to effect a slightly strong significant positive relationship. The slope of scientific literacy was greater when controlled for instruction showing that the relationship between scientific literacy and AIB is not spurious when instruction is taken into account.

Bacharach Verne (2003) examined that a substantial disparity exists for academic achievement in science between Black and white primary school children. A similar Gap exists between boys and girls. The extent to which secondary education influence these achievement gaps has not been established. The author’s reports analyses showing how these science achievement gaps change as a function of secondary education. Analysis of data form a large, nationally representative longitudinal study of academic
achievement showed that racial disparities and disparities associated with gender continue to increase throughout high school.

2.8 Studies Related to High, Average, Low and Under Achievers

Srivatsava (1967) investigated into the factors related to educational underachievement. The sample consisted of 1837 students studying in class X of nine secondary schools of Patna district in Bihar.

Findings indicated that 1) Underachievement was related to poor study habits, poor health and poor school emotional adjustment. 2) Underachievement was related to various backgrounds and personal factors like age, Socio-economic Status, birth order etc. and 3) No significant relationship was found to exist between under achievement and inactness of attitudes.

Achievement than their peers with low thinking skills. In one of the 4 studies the net gain of low achievers was significantly higher than for high achievers. These findings strongly suggest that teachers should encourage students of all academic levels to engage in tasks that involve higher order thinking skills.

Tolor (1969) studied the incidence of under achievement, he has defined an under achiever as a student with at least average intelligence whose achievement test placement is at least one standard error of the estimate below expectancy based on his own IQ. He has considered these children also as under achievers, who have failed to achieve satisfactorily in their academic work, in spite of having an average / above average intelligence, unimpaired motor ability, adequate sensory functioning and emotional balance.
Saxena (1972) studied the Interests, need patterns and adjustment problems of over normal and under achievers defined these groups as Underachievers are those individuals whose actual achievement falls at least one standard error of estimate below the regression line of prediction on achievement. Further he has defined over achievers as those individuals whose actual achievement falls at least one standard error of estimate above the regression line of predication on achievement.

Verma (1977) concludes as: The rural school classes shared slight superiority over the urban schools class as far as acceptance, trustfulness, adjustability of the classroom conditions and school background. The academic achievements of the urban and rural schools were at par but there was a significant difference in the intellectual standards of the rural and urban pupils. The mean differences of the classroom climate for adaptability and emotional relationship were significant in favour of the classrooms of the private schools. The privately managed schools had a more learning conducive climate influenced the pupils achievement.

Desai (1979) and Hirunval (1980) in their studies conducted in Gujarath observed a positive relationship between classroom climate and pupils academic achievement.

Rani (1980) and Shashidar (1981) concluded that the academic achievement was influenced by institutional factors.

Subramanyam (1981) highlighted the importance of conditions of school vis-a-vis pupils achievement. Subramanyam (1982) it was revealed that among the school factors, accommodation, educational level and
experience of teachers, availability of instructional method, books and reading room facilities influenced the achievement of students.

Pal (1982) concluded that students belonging to the advanced schools had done better in science achievement test than those in less advanced schools having the same or more or less identical general ability.

Field and Corpley (1988) studied 106 girls and 112 boys of rural high schools in New South Wales. Their result showed 30% girls were tested and limited to concrete operational thought (Piaget) and 11% of boys were similarly restricted a difference reported as significant beyond the .004% level of probability.

They also found a significant difference $P<.01$ between the performance of the two sexes on a standardized test of achievement in science and students level of cognitive functioning.

Khatoon (1988) investigated the relationship of some personality factors of adolescents among high and low academic achievers, with an objective to investigate the personality factors of high and low achievers and also to determine the effect of sex and locality of high and low achievers of 1381 students of 10th standard drawn as sample through stratified random sampling and 370 were found to be the high achievers.

The results were, the high achievers obtained a higher mean value on personality factor "H" and lower mean value on factor "I", than the low achievers. And also the rural students achieved higher mean values on factor E than their urban counterparts.

Rowell (1989) showed that the significant difference ($0.01 < P < 0.05$) between the mean scores of boys and girls exists for class of 8th, 9th and 10th
standard 294 boys and 116 girls students and the scores of two sexes in each case. When summer over all classes. (0.001 < P < .01). The observed significant difference is in favour of the boys.

No significant difference exist between the variance of the success of the two sexes.

Sarojamma (1990) investigated around under, normal and over achievers and their reading ability and social maturity with an objective to measure and compare the reading ability of these categories of 1000 high school students based on sex type of schools and social maturity.

The major findings of the study were, there was a significant difference in the reading ability of a) Normal and under achievers, b) Over and normal achievers, c) Girls and boys, d) Students in government and private schools.

Edward (1990) studied the characteristics of achieving and under achieving high school boys of high intellectual ability. The areas covered in his study were aptitudes, interests, home and family background.

An achiever was defined as a student in the top or first quartile of his class with a scholastic average at least 89% for X and XI year.

An under achiever was defined as a student in the lowest or IV quartile of the same class with a scholastic average of 79% or less.

Rajyaguru (1991) compared the achievement in mathematics, personal characteristics of over achievers and under achievers, with objectives, to find out over achievers and under achievers in mathematics, to compare the personality environment and cognitive aspects of over achievers and under achievers in mathematics and to find out characteristics of over achievers and underachievers in mathematics.
Desai and Bhatt (1992) studied the effect of intelligence and mathematics achievement test were administered on a sample of 1093 X standard students who hail from rural and urban schools, selected through stratified proportionate cluster sample to collect the data.

The findings were, there was a positive and significant relation between intelligence and achievement of over achievers and under achievers, the over achievers and under achievers did not differ in intelligence and there was no association between achievement in mathematics and sex and location.

DeMars Hong (1998) compared preferred home work of Chinese student's who were characterized by,

1) High v/s low self perceived Home work achievement and attitude.
2) High v/s low teacher rated Home work completion and quality.
3) High v/s low academic achievements in science.

The study also examined differences of Home work styles in these students. Standard Scores were 329 5th graders (172 boys and 157 girls) and 244, 7th graders (130 boys and 114 girls).

More distinguishing Home work style elements were found with the self perceived Home work achievements and attitude levels than in, the teacher rated achievement levels. Neither gender differences nor gender achievement interaction effects were indicated. As expected the motivated elements distinguished the high low levels of all types of achievement and attitude towards Home work. A number of environmental and organisational elements also distinguished the high from the low achievers. The importance of the teacher and the parent role in student achievement was discussed.
Siegel and Reis (1998) investigated whether female high achievers viewed the quality and importance of their work, effect and ability differently than male high achievers. The sample included 2709 males and 2,676 females' 4th - 8th graders who were identified as talented by their teachers.

Teachers consistently rated females higher than males on effect and the quality of their work. Female students rated their language arts ability higher than males while the males rated their science, maths and social studies abilities higher.

Beaumont-waiters and Soyibo Kola (2001) determined Jamaican high school students level of performance on the authors test of 5 integrated science process skills and difference were related to gender, grade level, school location, school type, student type and Socio-Economic Background.

The 305 students comprised 133 males and 172 females; 146 9th graders, 159 10th graders, 15.0 traditional and 155 comprehensive high school students; 164 students from the reform of secondary education (ROSE) project and 141 non - ROSE students. 166 urban and 139 rural students, and 110 students from high Socio-Economic Background and 195 from a low Socio-Economic Background.

Results indicated that students mean score was low and unsatisfactory and their performance was in decreasing order. There were statistically significant differences in their performance based on their grade level, school type, student type and Socio-Economic Background in favour of 10th grader, traditional high school students ROSE students and students from a high Socio-Economic Background.
There was a positive, statistically significant and fairly strong relationship between their performance and school type, but weak relationship among their student type; grade level and Socio-Economic Background and performance.

Neber Heinz (2002) examined the issue of self regulated learning among 93 highly gifted students in science - That high school students were experiencing, less investigation in science, highly gifted girls science related motivational beliefs were less positive than those of boys and path analyses indicate that the levels of investigation in the study science learning environment strongly determines motivational prerequisites of self regulatory strategic use.

The results indicate that exploration and discovery should be enabled and strengthened in science classrooms of highly gifted students.

Quihuis Gissell (2002) examined whether gender difference in motivational belief and scientific aptitude exist for science among high achieving high school students. Survey and research data showed that gender differences previously found in Ecclers research for science among a select a group of high achieving high school students. Yet these gender differences did not explain student’s scientific Interest aptitude and science engagement as well as other science related experiences. Parents can expose their children male and female alike to science, at home and teachers to sustain and develop an interest in science at school.

Lastly it is important to note that this study found Eccler’s model of motivation in understanding not only gender differences in maths and the hard science.
Zohar, Anat and Dori Yahudit (2003) studies whether low achieving students were able to deal with tasks that require higher order thinking skills. This issue was examined in 4 different studies, by asking whether low-achieving students would gain from teaching and learning processes that are designed to foster higher order thinking skills. Each of the 4 studies addressed a different project. The studies included 7th - 12th grade students. The findings showed that students with higher thinking scores gained high academic

All the above studies highlight the importance of environment provided by the educational institution itself in the promotion of better achievement.

2.9 Rationale of the Study

From the above cited research studies, both national and international, it can be said that the findings of all studies are conclusive or conflicting. The reason may be that all investigators used different types of tests available are standardized depending upon the severity of the problem to be studied in hand, dealing with different cultural samples and subjects. The another reason may be that they used different structural design of the study.

Studies so far reviewed have reported mixed results. Some of them have shown facilitating and others non-facilitating effects of the various variables on science achievement of high, average, low and underachievers in secondary stage.

Research is also needed at school level especially science subjects (Physics, Chemistry and Biology together) along with this it has been noticed that most of the studies are related to one psychological factor and their impact on achievement of high school students in science.
In majority of the studies the long term effect has not been investigated. The issue of gender, locality of the school and type of the school, the students study in, taken together. Similarly the interaction between cognitive styles, creativity, personality, intelligence and scientific aptitude in relation to science achievement has not been taken care of in the earlier studies. It indicates that there is much to be studied between all the variables listed and the science achievement. Keeping these factors in view, a need is felt that cognitive styles, creativity, personality, intelligence and scientific aptitude on science achievement, as all these psychological factors do have an influence on science achievement.

Hence there is a need to conduct present study to study the role of these psychological factors on the science achievement of tenth standard students. Hence the present study is a venture in this direction. Hope that the findings of the present study would help in classroom practices and practitioners.