CHAPTER III

REVIEW OF RESEARCH LITERATURE AND HYPOTHESES
3.1 Intelligence and Academic Achievement:

Intelligence is generally considered as the most important factor affecting academic achievement. Several studies have been conducted to find out the relationship between intelligence and achievement.

Freeman (1942) found that the correlation between I.Q. and academic achievement ranged between 0.40 to 0.60. Crawford and Burnham (1946) found the range of 'rs' between intelligence and academic achievement to be .60 to .65. Lenon (1950) reported that at grade IV and above the correlation between achievement and intelligence was positive.

A study of five factors related to scholastic achievement of grade VIII pupils of Delhi was undertaken by Rao (1965) to find out the relationship of intelligence, study habits and certain attitudes towards the school with the academic achievement in social studies, general science and mathematics. Inter-relationship of different variables showed that intelligence, study habits and school attitude were significantly related to the prediction of scholastic achievement of mathematics. Correlational
coefficient between achievement score and scores of intelligence was 0.81 which was quite high. The variable of intelligence, study habits and attitude towards schooling accounted for sixty-six per cent of the predictability of the scholastic achievement and remaining thirty-four percent of variance in achievement remained to be accounted for. Singh (1965) conducted a study with the aim to discover some of the non-intellectual correlates of academic achievement of college students. The study was conducted on a sample of 370 male students of graduate courses in two colleges of Patna. The study revealed that academic achievement was significantly and positively related to intelligence and concept formation ability.

Sinha (1967) found intelligence and academic achievement to be significantly related (beyond .01 level). Dibble (1967) observed 'r' of the order of .48 between intelligence and the criterion variable of academic achievement. Lewis (1967) while making a multivariate analysis of variables associated with academic success within a college environment found that mental ability was most significantly related to academic achievement. Rattan and Mac Arthur (1968) reported a highly significantly 'r' of .57 between achievement and progressive matrices. Vidhu (1968) explored the relationship of neuroticism and extraversion to intelligence and educational achievement of different age levels on a sample of 300 students from class VIII to X and found that correlation between intelligence and academic achievement was positive and highly
significant. Bhatnagar (1969) found correlation between intelligence and academic achievement to be +.3458. Diwan (1970) obtained coefficient of correlation of .51 between Jalota's Intelligence Test and the annual marks of 9th grade. Simpson (1970) found that there was a 50.3 per cent congruence between I.Q. and GPA ranking. Sinha (1970) found that majority of high achievers (57.83%) belonged to categories of very superior level of intelligence (I.Q. 111 and above), and only a negligible number of high achievers (2.70%) was in the inferior level of intelligence (I.Q. 88 and below). Passi (1972) reported a significant correlation between verbal intelligence and achievement as also between non-verbal intelligence and achievement to be .462 and .422 respectively. Mathur and Hundal (1972) found correlation between achievement and intelligence as high as .83. Mohan et al. (1975) reported that intelligence as measured by Progressive Matrices Scale is positively related with total educational attainment. Dhaliwal and Saini (1976) conducted a study to find out relationship of creativity with over and under achievement and concluded that academic achievement and intelligence are positively related with each other and creativity does not influence achievement devoid of the influence of intelligence. Corey (1978) also reported high correlations between intelligence and achievement. Beniti-Fuchs (1975) claimed that Pearson-Product Moment Correlations between intelligence test scores (verbal plus non-verbal) and combined achievement raw scores (reading
and mathematics) resulted in 'r' of .82 for male and .80 for females. Farmer (1979) claimed Slossom Intelligence Test scores and Gates-Mac-Cinitec Reading Test scores were significantly related for both boys and girls. Yadav (1986) conducted a study by taking a random sample of 40 students of different socio-economic status (20 socially accepted and 20 socially rejected). He found in his study that (1) socially accepted boys, who score higher on the measures of I.Q. also score better on academic achievement; (ii) socially rejected boys, who score higher on I.Q. show a positive correlation between I.Q. and academic achievement. Yadav and Srivastva (1989) conducted a study by taking a sample of 50 students of the two high schools. They found that there is a significant correlation between I.Q. and academic achievement. Dutt (1989) found a significant interaction among sex, intelligence, and inductive strategies of teaching Mathematics in terms of achievement. Budheev (1990) concluded that intelligence had significant influence on the achievement in mathematics. As intelligence of students increases the achievement in mathematics also increases. Kaile and Sharma (1990) conducted a study by taking a sample of 200 ninth class students from four government high/senior secondary schools of district Fridkot. They concluded that (i) verbal and non verbal intelligence are significantly positively correlated with achievement in mathematics at .01 level of intelligence, (ii) verbal intelligence (independent of nonverbal intelligence) correlates significantly at .05 level with achievement in mathematics
whereas non-verbal intelligence (independent of verbal intelligence) has significant relationship with achievement in mathematics at .01 level of significance; (iii) the prediction of achievement in mathematics on the basis of conjoint effect of verbal and non-verbal intelligence is significantly greater than the prediction on the basis of either verbal intelligence or non-verbal intelligence.

Many research studies have shown that intelligence does not predict academic achievement. Eight hundred and thirty five (835) studies quoted by Rao (1963) show the imperfect nature of correlation between intelligence and academic achievement. In a study involving Combridge science subjects, Gibson and Light (1967) too were unable to demonstrate the presence of any relationship between intelligence and achievement in science. It was also seen that all high IQ candidates succeeded in science but all successful candidates had not high IQ.

Some studies although limited in number have discovered that there exists negative relationship between intelligence and academic achievement. Green and Farquhar (1965) obtained exceptionally low and insignificant negative correlation of -.01 between verbal intelligence and achievement of Negro males, thus indicating that excessive high scores on intelligence may have no effects on academic achievement.
From the above review of literature on the problem related to intelligence and academic achievement relationship, it may be inferred that the range of correlation show a wide variation, that is from -.01 to +.82. Such a wide variation of range may be due to the fact that relationship has always been seen between intelligence and total achievement. To see whether the range of variation remains the same or it decreases, when only a particular subject, that is science rather than total achievement is taken, a brief review of relationship of intelligence with achievement in science is presented. Kulshreshtha (1956) conducted a study on the relationship of intelligence and scholastic attainment of X and XI Class students of Uttar Pradesh on a sample of 1520 students of literature, science and commerce streams from twenty-eight schools and inter colleges distributed throughout the province, found that in all the three tests the science groups proved to be superior to the literature group in each class.

Dosajh (1958) calculated correlation between progressive matrices and three school subjects (Mathematics, General science and language) of boys and girls who appeared in the middle standard examination. There have been 'r' values of 0.6 for mathematics, 0.6 general science and 0.39 for language. Shukla (1958) found out correlation of 0.62 between intelligence and scholastic achievement in science of S.S.C. class.
Gupta (1962) used a battery of tests (composed of paper form board test, abstract reasoning test, English usage test, spelling test and vocabulary test) for predicting college marks of Art and Science students. The correlation ranged from 0.60 (between English marks and the test of vocabulary) to -0.295 for the science group and from 0.485 to -0.550 for the Arts group. In a study by Kundu (1962), scores on three intelligence tests (abstract intelligence test, intelligence test, concrete intelligence test) were correlated with scores in Bengali, English, Sanskrit, Mathematics, History, Geography and science. The correlations ranged between -0.106 to +0.499. Rastogi (1964) reported intelligence equally related to science and English. Mehdii (1967) investigated differential factors in pupils' success in science, arts and commerce courses at the higher secondary stage and demonstrated that differences did exist between the combination of factors required for success in three courses. He doubted the assumption that science courses required a higher level of intelligence than the Arts and Commerce courses. Jha (1970) examined the nature of relationship between intelligence, science aptitude, SES on one hand and achievement in science on the other by taking a sample of 342 boys and 104 girls and found that there was a significant positive relationship between achievement in science and general intelligence. Effect of different factors on high and low achievement in science was studied by Pathak (1972) on a sample consisted of 105
high and 100 low achievers in science, selected from 1910 science students of class X of eleven higher secondary schools in Rajasthan and their intelligence, interest etc. were compared. The important findings were: the high achievers had a significant higher mean IQ (131.2) than the low achievers (93.7).

Reddy (1973) exhibited that the scores on intelligence associated with examination marks in various arts and science subjects at the University level. Mishra (1978) conducted a study by taking a sample of 600 cases (200 from each stream). He found that high achievers in science were higher in intelligence than the low achievers.

The above review of related literature on the problem of intelligence and academic achievement relationship leads to the following conclusions:

(1) Intelligence is a potential factor of total academic achievement as well as in the subject of science.

(2) The range of correlation between intelligence and academic achievement show a wide variation.

(3) The variation in coefficient of correlations (i.e. range of r) as reported by different studies between intelligence and achievement in science are less as compared to the range of 'r' values obtained for intelligence and total achievement.
Rao (1963) quotes 835 studies, Stephens (1960) cites 111 investigations in which the relationship between two variables has been reported to be ranging from 0.1 to 0.91. Keeping this empirically discovered wide range of the degree of correlation in view, it may be asserted that the question whether any factor would supplement intelligence in accounting for the variance operating in the measures of academic achievement has not been answered in equivocal terms. Obviously, the larger the degree of relationship between achievement and intelligence the fewer are the chances that any other factor is causing discrepancy between the measure of two variables and the vice versa is also true. As is reported in the studies referred above, if the genuine relationship between achievement and intelligence arises from the conditions not covered in the test of intelligence and on the other hand, if the degree of relationship under question is 0.1 then so many factors of achievement are likely to be established in addition to intelligence. The interpretation of these two extreme possibilities is meaningful in the sense that in the former cases the discrepancy between achievement and intelligence may be representing most probably the irreducible minimum level of errors contaminating measures of two variables which by way of necessity are obtained on questionably reliable tools and in the later case discrepancy will perhaps be too large to be explained in terms of sheer errors.

Two extremely different view points are available
in the relevant literature. Kelley (1927) cited by Remmer et al. (1967) claims that academic achievement and intelligence tests cover about the same ground but their purposes are different. Similarly, Stephens (1960) asserts that intelligence tests are measuring haphazard learning while achievement tests are designed to measure specific learning. But in contravention to what has been professed by Kelley and others, Oates (1929) cited by Rao (1963) observes that:

The discrepancy that prevents complete agreement between measures of scholastic achievement and intelligence does not arise entirely through errors in our measurement of these two qualities but is probably due to the presence of factors other than intelligence in the situation.

Moreover, the range of relationship between intelligence and academic achievement reported to be from 0.1 to 0.91 and make it sure that discrepancy between the measures cannot be explained in terms of sheer errors and thus, prove the presence of factors other than intelligence in the situation and therefore, justifies further research into this field.

3.2 Socio-Economic Status and Academic Achievement

It is well documented that the low socio-economic status (SES) children perform less successfully than middle-SES-children in many kinds of academic and experimental
situations (e.g. Curry, 1962; Karp and Sigel, 1965; Wiseman, 1967).

Burt (1937) showed that poverty, family size, poor health, inadequate general knowledge were the aspects of low social class which seem to prevent children from taking full advantage to educational opportunities. Davis (1947), Furneaux (1954) and Douglas (1964) with their research literature concluded that the educational achievement of children from middle class homes is better than children belonging to manual working class families. Mathur (1963) study was designed to test the hypotheses that students of higher socio-economic-status (SES) show significantly higher educational achievement. The results revealed that students of higher SES showed significantly higher educational achievement than the students of lower SES.

The investigation conducted by Chopra (1964) aimed at studying the relationship between socio-economic factors and academic achievement while measure of intelligence was held constant. The findings were: (i) None of the sons of father engaged in professional, administrative, executive and managerial jobs expected to discontinue education, the corresponding figures for the agriculturist and unskilled worker groups were as high as sixty-four and sixty-six per cent respectively; 96.09 per cent of students who discontinued education attested the reason of poor economic
condition of the family. (ii) The percentage of failures among the students from the professional, administrative, executive and managerial group was twenty seven, while that for the other groups ranged between fifty-nine and sixty one. (iii) The percentage of students securing first class marks were twenty eight and seven, respectively for the two groups. (iv) On the basis of father's education and occupation, family income, type of lodging, size of the family, cultural level of the home; students belonging to the higher quantitative group showed significantly higher mean achievement than students coming from lower categories. (v) The difference between the academic achievement of different castes was significant of .05 level. (vi) Comparatively larger percentage of people belonging to lower castes were engaged in lower occupation and were thus economically poorer than those belonging to higher castes matched for father's occupation, but they did not show significant difference in achievement. (vii) Multiple correlation between a combination of these factors (.350) was significantly higher than the multiple correlation between those and intelligence test scores (.255). The difference observed in this study was the differences in averages, and the results, therefore, do not imply that children from the higher socio-economic group are bright and that from lower socio-economic group are dull and it will not be possible to predict the academic achievement of the individual children from the socio-economic level of their families.
alone. A study was designed by Jain (1965) to investigate experimentally into the influence of home environment as a correlate of scholastic achievement with reference to particular school subjects and to assess the relative importance of other contributing factors in the education of boys and girls. The study revealed that (i) the influence of intelligence on school achievement was the greatest and it had higher relationship with achievement of boys as compared to that of girls (ii) Socio-economic conditions seemed to have relationship with school achievement.

Chopra (1967) concluded that children belonging to high socio-economic status performed better than the children belonging to the low socio-economic status, on arithmetic concept test. Srivastava (1967) made an investigation into the factors related to the educational underachievement by taking a random sample of 1837 male pupils studying in class X and XI of nine secondary and higher secondary schools of Patna district in Bihar and concluded that underachievement was related to various background and personal factors like age, socio-economic status, father's profession, size of family, number of siblings, birth order. Socio-economic status differences in the free call of categorised items were studied by Glassman (1968). She demonstrated that middle class children scored about one class standard deviation (SD) above than the lower class children.
Siller (1957), in one of the studies with sixth grade, white children, observed that children belonging to high SES did better than children belonging to low SES on all tests of conceptual ability. Vane (1967), found a fairly high positive correlation between achievement and SES of 272 Negro and White children. Chopra (1967) studied matched pairs of achieving and under achieving students of high intellectual ability and concluded that parents of the achiever had better SES level. Wendt (1967) found that high percentage of low achievers were from the families, in which the father's occupation was ranked low. He concluded that children belonging to high SES performed better than children belonging to low SES on arithmetic concept test.

Satyanandan (1969) in his study yielded the following findings (i) the children of graduate parents performed better than the children of matriculate parents. (ii) The children of upper economic strata and lower economic strata differed very significantly (iii) The upper and the middle economic groups, differed significantly (iv) The middle and the lower economic groups did not differ significantly. However, the middle economic group was better than the lower economic group.

Effect of different factors on high and low achievement in science was studied by Pathak (1972) on a sample consisted of 105 high and 100 low achievers in science, selected
from 1910 science students of class X of eleven higher secondary schools in Rajasthan. He found that the overall socio-economic status of high achievers was significantly higher.

Turner (1975) conducted a study to examine the differential effect of SES on the performance of the students. A matrics training task was administered to 120 white male subjects representing low and high SES level. He concluded that high SES group demonstrated improved performance than the low SES group.

Pointing to the importance of SES, Lalithamma (1975) observed that the achievement in the mathematics was positively related to socio-economic status of the children. Attempt was made by Anand (1973) to investigate the effect of socio-economic status on academic achievement of the child on a sample of 1897 pupils of Standard VIII, IX and X chosen randomly from eighteen high schools. The analysis revealed that three SES groups differed significantly from one another in their non-verbal and verbal intelligence. High SES group achieved higher mean score than pupils in both low SES group and middle SES group.

For the underlying cause of such differences in ability, Jenson (1974) has offered a two level theory of mental ability. The theory involves two types of mental abilities-level I and level II and their interaction with
population (SES) differences. Level I ability consists of remote learning, primary memory and characterized essentially by relative lack of transformation, conceptual coding. Level II ability in contrast is characterized by conceptualization, reasoning, solving and general intelligence 'g' factor. Level II and SES are positively correlated since most of the intelligence tests and achievement tests require level II ability and thus middle SES children perform better than low SES children. McArthur (1980) determined that there was a significant relationship between student achievement and professional level of parents.

Patel (1977) found that the mean achievement scores of high, middle and low SES groups were 8.0, 6.9, and 6.7 respectively. Dave and Dave (1971), Thakur (1972), Jachuck and Mohanty (1974), Sethi (1975), Tandon (1978) and Vijay Laxmi (1980) have also expressed similar views.

Gakhar (1983) concluded that high SES accounts for higher achievements on mathematical concepts and low SES accounts for low achievement on mathematical concepts. Siddiqui, Tiwari, Sultane, Malik and Ahmad (1983) in their study found that socio-economic condition of the family definitely affect academic achievement. Similarly study conducted by Gakhar (1987) showed that there exist differences in the achievement of students in arithmetical concepts with regard to SES. From the results of his study, it appeared that the high SES, the more will be the performance of
the child. This may be due to more educational facilities given by the guardians to their wards by way of financial resources.

Jagannadhan (1986) concluded in his study that the routine SES factors viz., father's income, father's education and occupation has got much impact on the academic performance of their wards. It was also found that children hailing from families where they subscribe to newspapers and magazines, progress better in their educational attainment. Probably this may due to their constant contact with the rich literature which is provided to them. However, it is observed that providing monthly pocket money or parent's association with the clubs or some social organisations has no positive effect whatsoever on the attainment of their children in the school subjects.

On the other hand, there are studies which have shown either no relationship or negative relationship or negative relationship between SES and academic achievement. The study was undertaken by Rao (1965) to find out the relationship of intelligence, study habits, socio-economic status and certain attitudes towards the school, with the academic achievement of the grade VIII pupils of Delhi in which 500 boys of twelve higher secondary schools of Delhi formed the sample. The conclusions were that; the three independent variables - intelligence, study habits and school attitude were significantly related to the prediction of scholastic
Singh (1965) conducted a study with the aim to discover some of the non-intellectual correlates of academic achievement of college students. The study was conducted on a sample of 370 male students of graduate courses in two colleges of Patna. The study revealed that relationship between achievement and family income though positive was not statistically significant.

Dhami (1974) also found relationship between SES and scholastic achievement, though it was not very high. Similarly findings of Reddy (1973) and Bansal (1977) revealed that socio-economic status was not significantly related to achievement in any group or group of subjects.

Dutt (1988) described a correlational study by taking a sample of 150 students of Xth grade from five schools of Ambala. Findings were that SES did not effect achievement in science. Only .60% of the total variance of achievement in science was accounted for by the variable of SES.

Since the results of above review of related studies are not conclusive, therefore, there is need to explore this field further.
3.3 **Sex-Differences and Academic Achievement:**

The effect of the sex differences on the academic achievement of the students has been demonstrated by a number of studies.

Abraham (1969) conducted a study to determine the influence of the intelligence and basic personality factors on the academic achievement. He concluded in his study that boys were found to be superior in their achievement. Crandall (1969), Shahi (1973), Horner (1974), Lalithamma (1975), Gorden and Will (1978), Jolly and Donald (1978), Jahade (1979) found positive significant differences in respect of achievement and concluded that males are higher achievers than the females. Furthermore, the experiment of Lalithamma (1975) on 732 pupils of class IX has shown that there was significant difference in the performance of boys and girls in mathematics, the difference being in favour of boys. Joshi and Sharma (1969) conducted a study to know the development of algebraic concepts in the pupils at the junior secondary stage and concluded that the boys had a tendency to excel girls in the understanding of concepts.

The second group of evidence is opposed to the first one. Roach (1979) found that mathematical achievement had significant positive correlation with intelligence and
girls had higher mathematical achievement than boys. Wilson and Linford (1979) made investigation of sex effects in the comparison of learning abilities between rural-urban children and indicated that rural female were superior to all other groups but it is suggested that this was due to sampling bias. The study conducted by Nayar (1971) attempted to predict achievement in science with the help of following six variables: Verbal reasoning ability, numerical ability, comprehension and interpretation, problem solving, critical thinking ability and spatial ability. The main findings were: The differences between the mean scores of boys and girls on numerical ability, problem solving and critical thinking were significant at .01 level, boys being superior (ii) The correlation coefficient between the scores on critical thinking criterion, in case of boys, was significant at .05 level, (iii) There were significant differences at .05 level between boys and girls in the correlation in UR and CI, girls being superior in both the cases. Acharyulu (1978) conducted a study by taking a sample of 400 urban pupils (200 boys and 200 girls) drawn from a dozen schools located in Guntur and West Godavari districts of Andhra Pradesh. He found in his study that there were no sex differences in intelligence, figural creativity and achievement in Telugu, general science and social studies. Significant sex differences in verbal creativity and achievement in English and Mathematics were found in favour of girls.
Gupta (1989) described a study of under achievement among ninth class boys and girls by taking a sample of 310 boys and 312 girls of schools of Patiala. The study showed that the extent and magnitude of under-achievement among ninth class boys as well as girls were very great. It also showed that the under-achievement among ninth class girls was significantly less than among ninth class boys.

The last group of studies have failed to find any relationship between sex and achievement. According to Sears and Fieldman (1966), Long and Resh (1976) and Pitts (1980), achievement tests usually reveal no sex differences in academic skill. The results of studies by Anastasi (1958), Dwyer (1973), reported that in general female have been found to excel in reading and male in arithmetic, but differences have varied with age, SES, IQ and the specific sub-skills to be measured. However, Sharma (1977) observed that there were no significant differences in achievement of boys and girls in arithmetic, but in reading test the girls achieved significantly higher scores. Julia (1980) found positive significant sex differences in respect of the achievement and concluded that males were higher achievers than females.

Similarly Aggarwal and Sarswat (1981) found no sex differences as far as socio-economic status and academic achievement were concerned. Dutt (1989) conducted a study
of taking a sample of 128 'X' grade students (64 boys and 64 girls) and found that sex did not account for the differential achievement in Mathematics.

From the above results of review of related studies regarding the relationship of sex and achievement, since there are many gaps, therefore, further research is needed to explore this field.

3.4 Personality and Academic Achievement

In a sample consisted of pupils from standard X, selected from a twenty per cent stratified sample at schools in the Trivandrum educational districts, Abraham (1969) attempted to determine the influence of the temperamental dimensions of neuroticism and introversion-extroversion on academic achievement. It was found that (i) factor analysis of the personality variables and academic achievement evolved a factor pattern in which three factors could be identified, viz. scholastic Aptitude, Neuroticism and Extraversion-Introversion (ii) The personality factors evolved from the analysis of scores obtained from (a) a sample of boys and girls (b) a sample of boys, (c) a sample of girls, were similar; (iii) The personality factor evolved in the analysis had significant loading in the personality variables and so the influence of the personality on academic achievement could be described in terms of personality factors.
Vanarase (1970) in his study found that achievers showed greater verbal ability than the under-achievers; achievers were found to be more self-confident, more independent, more mature, emotionally more stable and more conscientious, when compared with the under achievers. Rao (1963) has also reported the same results.

Dhaliwal (1971) conducted a study with the aim to find the personality correlates of academic success - failure on a sample of 441 high school students and arrived at the result that reservedness, showing the verbal ability, emotional adjustment, sensory feelings corresponding with over achievement whereas outgoing tendencies low verbal ability, emotional instability, assertiveness, happy-go-lucky, temperament, poor adjustment in home, emotional and school adjustment were associated with academic underachievement.

Pathak (1972) in a sample study conducted on 175 high and 100 low achievers in science selected from 1910 science students of class X of eleven higher secondary schools in Rajasthan compared their personality traits. It was discovered that 84% of low achievers frequently expressed fear of failure in excess whereas the high achievers were more optimistic about the academic future.

Somasundran (1980) conducted a study by taking sample of 123 over achievers, 60% normal achievers and 106
under-achievers. He found that (i) All personality variables except the sense of personal worth, sense of personal freedom, withdrawing tendencies (freedom from) and community relations discriminated between over achievers and non over-achievers (ii) The variables of social standards introversion, family relations, test anxiety and community relations discriminated between under achievers and non-underachievers.

Hemalatha and Renuka Devi (1987) concluded that (i) majority of high achievers are experimenting, critical, liberal, free thinking, socially precise, follow self-image, happy-go-lucky, impulsive and lively. (ii) Majority of the low achievers are experimenting, critical, analytical, sober, prudent, serious and taciturn.

Roy, Pandey and Kumari (1988) found in their study that anxiety acts as a motivating factor in some subjects if not in all, to make concentrating efforts for higher achievement.

Mohan and Gulati (1989) found the positive correlation between extraversion and academic achievement.

On the other hand there are studies which have observed negative relationship between personality and academic achievement. For example, Jain (1965) found that personality factors tended to bear almost a negative and significant relationship with the scholastic achievement. Vidhu (1968)
in her study on a sample of 300 students from classes VIII to X, concluded that extraversion and academic achievement were negatively associated and relationship between neuroticism and educational attainment and between neuroticism and vocabulary were negative. Mishra (1962), Fatehpuria (1966) and Jha (1970) also obtained similar results.

Jha (1970) examined the nature of relationship between intelligence, adjustment, anxiety, extraversion and socio-economic status on one hand and achievement in science on the other and concluded that (i) there was a significant negative relationship between achievement in science and anxiety in the case of boys and combined samples, but not so in the case of girls (ii) there was no relationship between achievement in science and extraversion.

Sontakey (1988) conducted a study with the objective to find out the different personality traits of high and low achievers in Biological sciences. A sample of 295 students was selected of which 195 were high achievers and 100 low achievers from class IX, X and XI. She concludes that (i) high achievers are more intelligent, possess brighter over all personality disposition, tend to be less excitable. Besides, they are found to be tough minded, self reliant, realistic in comparison to low achievers. (ii), The high achieving boys are also intelligent, tend to be less excitable and vigorous and restful than their counterparts, i.e., the low achieving boys (iii) the high achieving girls
are also found to possess brighter overall personality disposition. They tend to be more conscientious and persevering. Besides, they are more apprehensive and worrying than the low achieving girls.

Verma and Chaturvedi (1989) conducted a study by taking a sample of 100 male students and found that there was no significant difference in academic achievement of high, average and low manifest anxiety groups.

Therefore, the empirical evidences related to personality and achievement showed that there exists a significant relationship of personality and achievement and this advocates the need of further investigation into the relationship of personality traits and achievement of the urban and rural senior secondary students in Biology.

3.5 Creativity and Academic Achievement:

Since the publication of Getzel's Jackson (1962) study of relationship among creativity and academic achievement many studies have been conducted in this area. A large number of such studies in recent years including those of Getzel's Jackson (1962), Torrance (1962), Wallach and Kogan (1975), Israel (1971) have reported significant correlations among creativity and academic achievement. Yamamoto (1962) found that the relationship between creativity
and achievement remain significant even after partialling out the effect of intelligence. The studies of Nuefeld (1964), wallachand Kogan (1965), Cropley (1967) and Iwawa (1968) have shown significant relationship between creativity and achievement. Passi (1972) aimed at exploring the relationship between creativity on the one hand and the variables of intelligence, scholastic achievement, sex and residential background on the other hand. The result of his study established a correlation of .385 between creativity and achievement. Gakhar and Wahi (1979) found the creativity and achievement are significantly positively correlated (r = .418).

It was found by Gupta (1979) on a sample of 100 students of VIII class that creativity and academic achievement scores of the students were positively and significantly related (r = .70). Singh, Mathur and Saxena (1977) obtained significant and positive correlation (r = .506) between creativity and academic achievement. In a similar study Raina (1968), Lalithamma (1973), Pandit (1976) and Mehdi (1977) also found that creativity was positively and significantly correlated with academic achievement. In other study Singh (1978) in order to find out the relationship between general and scientific creativity and intelligence and academic achievement of the students in science subjects obtained that urban students were found to be significantly better than semi-urban students in scientific creativity; general creativity and scientific creativity were positively
and significantly related \( r = .79 \), scientific creativity and academic achievement in science subjects were positively and significantly correlated \( r = .42 \), scientific creativity and intelligence were positively and significantly correlated \( r = .41 \), general creativity and achievement in science subjects were positively and significantly correlated \( r = .35 \).

Mishra (1978) conducted a study by taking a sample of 600 cases (200 from each stream). The findings of the study were: (i) the high achievers in science were higher on the level of creativity than their low achieving counterparts (ii) the high achieving boys in science were higher on the level of creativity than their low achieving counterparts. The high achieving girls in science were higher on the creativity level than their low achieving counterparts. Acharyulu (1978) also obtained same results. On a sample of 425 pupils Vijay Lakshmi (1980) obtained significant difference between the high creatives and the low creatives in academic achievement.

Asha (1980) designed a study to find out the relationship between creativity and academic achievement of high school students. The sample of the study consisted of 800 students of class X. Of these 400 were male and 400 were female. The Wallach and Kogan's tests of creative thinking were used to collect the data in respect of the creativity of the students, and the achievement scores of the students
were taken from their annual examination. The findings of the study revealed that there existed a positive and significant relationship between the creativity and achievement scores of male as well as female students.

To find out the relationship between creativity and academic achievement and to compare the creativity scores of art and science students, Jariah (1981) took a sample of 200 students of class IX, studying in six secondary schools of the city of Indore. It was found that students academic achievement was positively and significantly related to their non-verbal creativity scores and on verbal creativity, the art students scored significantly higher than the science students, whereas in non verbal creativity science students scored significantly higher than the arts students.

Dutt (1988) described a correlation study by taking a sample of 150 students of Xth grade from five schools of Ambala. He found that there is a positive and significant relationship of achievement in Science with total verbal creativity as well as various factors of creativity. Only 20.43% of the total variance of achievement in Science was accounted for by the variables of creativity (19.83%). Yadav and Srivastva (1989) conducted a study by taking a sample of 50 students of two high schools. They found that the academic achievement and creativity are highly correlated with each other.
In contrast to the above studies reporting high correlation between measures of creativity and achievement, there are instances in the research literature where low correlations have also been demonstrated between creativity and achievement. Pathak (1972) reported very low correlation between the two variables under consideration. Edwards and Tyler (1965) indicated that the generality of Getzel's and Jackson findings of high relationship between creativity and achievement is limited and does not apply to all kinds of creativity and achievement tests.

However, MacKinnon (1962), Flescher (1963), Edward and Tyler (1965); Badrinath and Satyanarayan (1979) have shown no relationship between creativity and academic achievement.

Paramesh (1973) and Sharma (1981) in their study to find out the relationship between creativity and achievement in different school subjects revealed that there was no significant relationship between student's creativity and their achievement in different school subjects.

Bagga (1973) conducted a study with the following aims: (i) to investigate difference in convergent ability between high and low science achievers and (ii) to compare differences between two groups of achievers on verbal
creativity and non-verbal creativity. The sample of the study consisted of 75 students of class IX of Malav Kanya Higher Secondary School, Indore. The findings of the study were (i) high achievers and low achievers did not differ significantly on total verbal creativity and non-verbal creativity, (ii) positive and significant relationships were found between achievement and non-verbal fluency, and achievement and non-verbal flexibility, but negative and insignificant relationship was found between achievement and total verbal and non-verbal creativity. (iii) science achievement was significantly related to measures of convergent production and not to the divergent production, and (iv) multiple correlation between science achievement and the four predictor variables, viz., intelligence, cognitive simplicity-complexity, divergent product and non-verbal creativity came to 0.435 and the intelligence and cognitive simplicity-complexity were the best predictors while the divergent thinking and verbal, non-verbal creativity did not add anything to this prediction. Badrinath and Satyanarayan (1979) also concluded that no significant difference exists in the creativity scores of low, middle and high academic achievement.

Sandhu (1979) conducted a study with the aim to find out the relationship between creativity and achievement in science subjects. The sample of the study consisted of 217 male students of class X, studying in various
rural higher secondary schools of Panjab. The findings of the study were: (i) the creativity scores of the students were significantly related to their achievement in science subjects; there was no significant relationship between creativity and achievement in science, when the effect of intelligence was partialled out.

Results of the review of studies related to creativity and achievement in different subjects are indicative of the fact that some relationship exists between creativity and achievement. To see the direction and extent of the relationship between creativity and achievement in Biology of urban and rural senior secondary students is the aim of the present study.

3.6 Urban, Rural Differences and Academic Achievement:

Singh (1965) conducted a study with the aim to discover some of the non-intellectual correlates of academic achievement of college students. He found in his study that academic achievement was positively related with non-intellectual factors of urban students.

The study conducted by Nayar (1971) attempted to predict achievement in science with the help of following six variables: Verbal reasoning Ability, Numerical Ability, Comprehension and interpretation, Problem solving, Critical thinking ability and Spatial ability. He found that there
was no significant difference between the mean performance of rural and urban students on six experimental and criterion variables.

Agarwal (1975) conducted a study by taking a sample of 1408 class XI students selected through the stratified sampling technique. The major findings of the investigation were: (i) the underachievers were comparatively less emotionally mature, less calm, less placid, less prone to getting into difficulties and less able to face reality and possessed less ego strength than the over achievers (ii) the rural over achievers in comparison to urban over achievers were relatively more outgoing, more warm hearted, more easy going, more participating, more trustful, more adaptive and more social. The urban underachievers as compared to rural underachievers were relatively more tense, more driven, more over wrought and more frustrated.

Ojha (1979) in his study on 1,050 male students of class XI belonging to both rural and urban intermediate colleges of Jaunpur District (U.P.) obtained a significant positive correlation of 0.34 between achievement and socio-economic status (SES) for rural boys and 0.69 for urban boys. The achievement of rural boys was found to be better than that of urban boys. For both rural and urban students the t-test analysis led the investigator to conclude that the higher the SES, the better would be the academic achievement of students at the high school.
level. Parental education, occupation and income were also related with the educational achievement of both rural and urban boys of class XI.

Sharmistha Chakrabarti (1988) observed that students from urban area were found to be significantly better than students from rural areas in regard to achievement test and school examination marks.

Here also, the studies are scarce and inconclusive as far as the relationship of urban and rural socio-psychological variables with the achievement of the students in different subjects is concerned. Moreover, lack of any study into the relationship of socio-psychological variables with the achievement of the urban/rural senior secondary students in Biology further motivated the researcher to explore this field.

3.7 Hypotheses:

It was proposed to test the following hypotheses with a view to conduct the research study under consideration:

1(a) Intelligence of urban senior secondary students correlates significantly with the achievement of the students in Biology.

1(b) Intelligence of rural senior secondary students
correlates significantly with the achievement of students in Biology.

1(c) Intelligence of urban and rural senior secondary students correlates differentially with the achievement in Biology.

2(a) SES of urban senior secondary students correlates significantly with the achievement of the students in Biology.

2(b) SES of rural senior secondary students correlates significantly with the achievement of students in Biology.

2(c) SES of urban and rural senior secondary students correlates differentially with the achievement in Biology.

3(a) Creativity of urban senior secondary students correlates significantly with the achievement of the students in Biology.

3(b) Creativity of rural senior secondary students correlates significantly with the achievement of students in Biology.

3(c) Creativity of urban and rural senior secondary students correlates differentially with the achievement in Biology.

4(a) Personality characteristics of urban senior secondary students correlates significantly with the achievement of the students in Biology.
4(b) Personality characteristics of rural senior secondary students correlates significantly with the achievements of the students in Biology.

4(c) Personality characteristics of urban and rural senior secondary students correlates differentially with the achievement in Biology.

5(a) Intelligence, SES, creativity and personality factors cluster together in group factor/s with the achievement in Biology in case of urban senior secondary students.

5(b) Intelligence, SES, Creativity and personality factors cluster together in group factor/s with the achievement in Biology in case of rural senior secondary students.

5(c) The factor structure underlying the measure of intelligence, SES, creativity, personality factors and achievement in Biology of urban senior secondary students differ from that of rural senior secondary students.

6(a) Intelligence, SES, Creativity and personality factors are different predictors of achievement in Biology in case of urban senior secondary students.

6(b) Intelligence, SES, Creativity and personality factors are differential predictors of achievement in Biology in case of rural senior secondary students.
6(c) Conjoint effect of the variables of intelligence, SES, Creativity and personality factors is higher as compared to their separate prediction in predicting the achievement of urban senior secondary students in Biology.

6(d) Conjoint effect of the variables of intelligence, SES, creativity and personality factors is higher as compared to their separate prediction in predicting the achievement of rural senior secondary students in Biology.

7(a) There are significant differences in the achievement (in Biology) of urban senior secondary students at different levels of intelligence.

7(b) There are significant differences in the achievement (in Biology) of urban senior secondary students at different levels of SES.

7(c) Extraversion ($E^+$) and introversion ($E^-$) accounts for significant difference in the achievement (in Biology) of urban senior secondary students.

7(d) The levels of anxiety namely high and low contribute to significant differences in the achievement (in Biology) of urban senior secondary students.

7(e) There are significant differences in the achievement (in Biology) of urban senior secondary students at different levels of creativity.

7(f) There are significance differences in the achievement
There are significant differences in the achievement (in Biology) of rural secondary students at different levels of intelligence.

There are significant differences in the achievement (in Biology) of rural secondary students at different levels of SES.

Extraversion ($E^+$) and Introversion ($E^-$) accounts for significant differences in the achievement (in Biology) of rural senior secondary students.

The levels of anxiety namely high and low contribute to significant differences in the achievement (in Biology) of rural senior secondary students.

There are significant differences in the achievement (in Biology) of rural senior secondary students at different levels of creativity.

There are significant differences in the achievement (in Biology) of rural senior secondary students at different levels of sex.

Significant difference exists in the achievement (in Biology) of urban and rural senior secondary students at different levels of intelligence, SES, creativity personality characteristics and sex.
10. Significant difference exists in the achievement of Biology in case of urban and rural senior secondary students.