CHAPTER II

REVIEW OF RELATED LITERATURE

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REVIEW OF RELATED LITERATURE

2.1.0. Introduction

The present study is undertaken to investigate into the association of Attitude towards Mathematics, Aspirations, Aptitudes (Specific Abilities for Mathematics), and Personality Characteristics with Achievement in Mathematics. The further presentation is a brief review of related research conducted in India and abroad and which have a bearing on the problem under investigation. The studies are grouped under the following headings.

i) Attitude and Academic Achievement.
ii) Aspirations and Academic Achievement.
iii) Aptitudes and Academic Achievement.
iv) Personality Characteristics and Academic Achievement.

2.2.0. Attitude and Academic Achievement

Studies have been conducted on the relationships between Attitude towards various Psychological Objects and Achievement in general. They are presented further.

Achievers and non-achievers have been found to differ with respect to their attitude towards outlook on life (Eckert, 1935), future occupations (Himmelweit & Summerfield,
1951), and parents (Cooper & Lewis, 1962). Groff (1962), Askov & Fischbach (1973), and Nielson (1978) reported significant positive associations between Attitude and Achievement.

A number of studies like Woodman (1952), Malpass (1953), Bendig & Hughes (1954), Weigand (1957), Frankel (1960), French (1960), Baraheni (1962), Passow & Goldberg (1962), Wilson & Morrow (1962), Finger & Schlesser (1963) have been conducted to find out the attitudinal concomitants of scholastic achievement. It has been generally observed that positive attitudes towards schools and colleges, subjects of study, teachers, etc., are associated with high academic achievement.

A Study of Some Factors Related to Scholastic Achievement Among 500 VIIIth Grade Pupils Selected From 12 Higher Secondary Schools of Delhi was made by Rao (1968). The study demonstrated that there is a low positive correlation between school attitude and scholastic achievement ($r = 0.11$).

Saxena (1972) conducted a Study on Interests, Need Patterns and Adjustment Problems of Over and Under Achievers Among 1769 Boys of Class XI Higher Secondary Institutions of Allahabad. The results revealed that positive attitude towards school, study, peers and school work characterized the over achievers.
According to Zacharia (1977), Attitude is one of the important correlates of Achievement. Students' attitude and academic achievements are shown to be positively related.

Reddy (1978) found attitude to self, learning, achievement, parents, teachers and peers to be positively related to academic adjustment and scholastic performance.

In a study by Chopra (1982), students' home, health, social and emotional adjustment, study habits, and their attitude towards education figured as some of the non-intellectual correlates of academic achievement. The findings showed that academic achievement had a positive relationship with attitude towards education.

Patil (1984) carried out a study on Post Graduate Pupil-Teachers of the Colleges of Education Affiliated to Nagpur University. The study revealed that the coefficient of correlation between the attitude of pupil-teachers (as measured on the Teacher Attitude Inventory by Ahluwalia) and their achievement was 0.16 which was found to be positive and significant.

In his Comparative Study of the Attitude of the High School Drop-outs Towards School Subjects, Subject Teachers and Subject Achievement, Pathy (1989) noted that a
favourable attitude towards the school subject resulted in better achievement in terms of marks secured in the subject and vice-versa.

Desai (1978) concluded that high school low-achievers of high ability had less favourable attitude to the subject. They kept very busy in domestic work, did not receive any outside help for study and described themselves as less regular in work.

But Rowell (1972, 1973) found few significant relationships between Attitude and Achievement and at times found an inverse relationship between Attitude and Achievement as had been reported in the studies of (Greenberg, Gervers, Chall & Davidson (1965) and Deck & Barnette (1976).

The above studies consider the relationship between Attitude and Achievement in general. There are some studies which have considered the Achievement in particular school subjects. Studies which have considered these school subjects other than Mathematics are taken as a group and the latter as a separate group. They are presented below.

Perumal & Visvesvaran (1968) carried out an investigation on a Study of Scientific Attitude of Pupils of Standard IX in Relation to their Achievement in Science in Some
High Schools in Coimbatore. The results showed that there is a significant relationship between scientific Attitude scores and Achievement in Science. Shinde's (1982) study revealed that students with high Academic Achievement had high scientific Attitude, students with average Academic Achievement had average scientific Attitude and the low Achievers had low scientific Attitude, the Achievement being in the subject Science. Hounshell & Hill (1989) examined the microcomputer and Achievement and Attitudes in high school biology. They reported that those who have positive Attitude towards Science score higher than those who do not. Sundararajan & Krishnamurthy (1988) attempted to study higher secondary students' Attitude towards the study of History and their achievement in it. It was indicated that though the relationship between Attitude scores and Achievement scores was found to be positive, it was very low (r=0.23).

The studies which are presented further have considered the relationship between Attitudes and Achievement in Mathematics specifically. They are as follows.

Much of the work on Attitudes towards Mathematics per se and on the relationships between Attitudes and Achievement in Mathematics has been based on the assumption or conviction or expectation that Attitudes affect Achievement
(Suydam & Weaver (1975), Fennema & Sherman (1976), Betz (1977), Gilbert (1977), Haladyna & Thomas (1977), and Schofield & Start (1978).

Samant (1944) who undertook a Survey of Teaching of Mathematics in Secondary Schools of Bombay Province reported that students' dislike for Mathematics was found to be one of the main causes for their failure in that subject and the dislike for the subject was more noticed in higher classes than in lower classes. Peskin (1965) and Ohuche (1980) realized that Attitude is a significant factor in Mathematics learning. While preparing instructional material for teaching Mathematics in Standard X, Elamaran & Kandaraj (1967) recognized the weakness of pupils in mathematical concepts and they found it to be related to pupils' Attitude towards the subject. Neale (1969) reviewed three studies concerning Mathematics Attitude and Achievement that were conducted between 1967 and 1968. Each study showed positive correlations between the two variables. The value of the correlations ranged between 0.20 and 0.40.

Sherman (1980) reported that in eighth grade, the only significant sex related difference in Attitude was girls' stronger denial that Mathematics was a male domain. By eleventh grade, boys and girls differed significantly
in many areas. Boys were significantly more confident of themselves as learners of Mathematics and regarded it as more useful and continued to regard it as more of a male domain. As a result boys were performing significantly better than girls in tests of problem solving and mathematical concepts. Schofield (1982) studied sex, grade level, and the relationship between Mathematics Attitude and Achievement in children. It was observed that the correlation between Mathematics Attitude and Achievement within girls was very low, which ranged from -0.16 to 0.24, only intermittently significant and at times negative. However, a somewhat more consistent positive relationship was found between these factors for boys, with correlations ranging from -0.11 to 0.45. While studying a structural model of Mathematics Achievement for men and women, Ethington & Wolfle (1986) indicated Attitude to have a significant influence on Achievement that is stronger for men than for women.

Singh (1986) conducted a Study of Some Possible Contributing Factors to High and Low Achievement in Mathematics of the High School Students of Orissa. The study showed that Achievement in Mathematics was positively and significantly related with intelligence, socio-economic status and study attitudes. Further, high Achievers scored high in the study Attitudes survey while low Achievers scored low.
Kulkarni, Naidu & Arya (1970) undertook an All India Survey of Achievement in Mathematics for Primary, Middle and High School Students. The findings related to students' Attitude and related variables revealed that students who considered Mathematics as necessary for developments in other fields scored higher and students who had favourable Attitude towards Mathematics scored better than those who had unfavourable Attitudes. Cheung (1988) studied the outcomes of schooling, Mathematics Achievement and Attitude towards Mathematics learning in Hongkong. The findings indicated that the correlation between the Attitude dimension and Mathematics Achievements were positive, showing that the more positive the students' Attitude towards Mathematics, the higher their Achievement in Mathematics.

But, Aiken (1970, 1976) in reviewing studies examining the relationship between Attitude and Achievement in Mathematics through elementary, high school, and college levels, usually found low positive correlations, which did not always reach the level of statistical significance. In the study of Robinson (1975), it appears that the correlation of Mathematics Attitude and Achievement observed 15% or less common variance between these variables. Wolf & Blixt (1981) commented that the correlations between Mathematics Attitude and Achievement ranging from -0.06 to 0.25.
with a median of 0.11, indicating a median of only 1% common variance between them. Benbow & Stanley (1982) also reported little relationship between Attitude and Mathematics Achievement.

While studying the Teaching of Elementary School Mathematics, Riedesel & Burns (1973) contended that although it would seem that Attitudes to and Achievement in Mathematics should be positively and substantially related, there was at present nobody of research to support such a relationship.

The researches by Bendging & Hughes (1954), Aiken & Dreger (1961), and Bassham et al. (1964) to relate Attitude towards Mathematics with Achievement in Mathematics have not led to substantial relationships (Kaul, 1978).

Quinn & Jadav (1987) examined a study of causal relationship between Attitude and Achievement for elementary grade Mathematics and reading. The study showed that there was no significant predominant causal relationship between Attitude and Achievement.

An investigation into the Attitude and Study Habits related to Achievement in Mathematics of Class IX students in Shillong was undertaken by Caroline Ngailiankim (1988).
The study concluded that there was no significant difference among high, average, and low Achievers in their Attitude towards Mathematics.

2.3.0. Aspirations and Academic Achievement

Clear and definite educational and occupational aspirations are expected to have motivational effects on the performance of students, and as such, to be conducive to high academic achievement. Though most of the studies show that high achievers not only have more definite educational and occupational aspirations, there are a few studies which take an exception. Below are presented studies grouped according to what they indicate in their results about the relationship between aspirations and achievement. The studies which show a positive relation are presented first, followed by no relation studies, and further by negative relation studies. The studies which show a positive relation are as follows.

Several investigators namely, Marshall & Simpson (1943), Weitz, Clarke & Jones (1955), Krippner (1961), Todd, Terrell & Frank (1962), and Jamuar (1963), have shown that students having definite educational and vocational goals are high achievers.

Studies of Myers (1950), Preston & Botel (1952),
and Malloy (1955), have indicated a clear relationship between aspirations and academic achievement. Further, they also found high achievers to have high aspirations. Uhlinger & Stephens (1960) observed greater expectancy for academic success and higher minimal grade goals in high achievers than in low achievers. Similarly, Wilson & Morrow (1962) studying bright high school students reported high achievers to possess higher and more academically oriented career aspirations, and Jones (1962) concluded lower grade aspirations in poor students.

Pierce (1952) carried out a study among 222 bright students of high school. Students were divided into high and low achieving groups by sex and grade level. It was contended that low achievers had less will to adjust, liked school less, and had lower educational and occupational aspirations than their high achieving peers.

While studying two college groups of probationers, Weigand (1953) mentioned that goal-orientation (definiteness of vocational choice) and goal involvement (students' personal interest in the goal) were powerful motivating forces which influenced the academic performance of students.

Teahan (1958) undertook a study of future time perspective, optimism, and academic achievement and reported
that high academic achievers tended to look mostly to the future. They were predominantly "anteverts" in so far as their recent thoughts and conversations were concerned.

In a comparative study of achievers and under-achievers, Frankel (1960) found that more achievers planned to enter fields of science while under-achievers tended in the direction of technical and applied fields.

Davids & Sidman (1962) studied high ability high school boys and noted that high achievers were more future-oriented in their fantasies and imaginal processes and were less concerned with immediate gratifications. They were better able to plan future goals.

Studies made by Austin (1964), and Nichols & Davis (1964) have observed that the Merit Scholars have plans and goals which are different from others. They mentioned such ambitious plans as to be professors, research workers, etc.

Sinha (1965) conducted a Study Among 185 High Achievers and 190 Low Achievers. The high achievers were students who scored 55% and above, while the low achievers were repeaters and those passing in 3rd division. The results revealed that high achievers had clear and definite vocational plans,
while the low achievers displayed considerable vagueness about the nature of the stated vocations. Also the high achievers displayed greater reliance on their own thinking and placed a premium of novelty in expression and often valued research as a career.

The findings of the study by Vanarase (1970) showed that as compared with the under-achievers, greater number of normal-achievers reported disparity between their aspiration and achievement. Further, the under-achievers aspired for immediate gratification, while the normal achievers could delay it.

In their All India Survey of Achievement in Mathematics for Primary, Middle, and High School Students, Kulkarni Naidu & Arya (1970) found that students with higher aspirations performed better. Sewell & Hauser (1972) noted aspirations to have the strongest relationship to educational attainment, mediating much to the impact of family background and the other independent variables.

Prenter & Steward (1972) studied Educational and Vocational Aspiration of New Zealand Adolescent Girls in Relation to Achievement Motivation, and concluded that high I.Q. and superior classroom performance were positively related to high vocational aspirations.
While making a comparative study of personality characteristics of over-achievers and under-achievers of high ability, Menon (1973) reported that job satisfaction, educational aspiration and general ambition were strongly associated with high achievement, particularly for girls.

Hoppe (1930) proposed that success or failure at any task is related to the level of aspiration and the level of achievement. Uniyal & Shukla (1973) investigated a study of academic achievement and behaviour in level of aspiration situations. They indicated that level of aspiration determines the limit of academic achievement.

While studying academic adjustment in relation to scholastic achievement of secondary school pupils, Reddy (1978) observed that scholastic performance and consistency in vocational preference were unrelated.

Sharma (1978) conducted attributes of underachieving undergraduate students and concluded that unrealistic level of aspiration adversely affected the academic achievement.

Tiwari & Morbhatt (1980) studied the effect of anxiety and aspiration on academic achievement. The findings revealed that high level of aspiration promotes achievement.

The level of aspiration of teacher-trainees of rural
and urban areas in relation to their achievement was undertaken by Uniyal & Sah (1981). The study showed that high achievers are negligent in respect to their aspiration, while low achievers are over-anxious in respect to their aspiration. It also observed that one's level of aspiration is more affected by his/her academic achievement (high/low) rather than his social belongingness (rural/urban).

Deka (1985) made a causal-comparative study of high and low achievers. Results indicated that incidence of school success and failure was positively associated with study facilities at home and future vocational plans. High achievers preferred to enter some standard vocations like medicine, engineering and high school and college teaching, while low achievers contemplated to become primary teachers, nurses, clerks, businessmen and technical workers.

Das (1986) studied peer influence and educational aspiration of secondary school students in relation to their academic achievement and reported that educational aspiration was the second powerful predictor of academic achievement with a contribution of 8.58% of variance.

The above studies have shown a positive relation between aspirations and achievement. Below are studies which claim no evidence of such a relationship.
Gould & Kaplan (1940), Holt (1946), Schultz & Ricciutti (1954), Red, McCary & Johnson (1962), Roberts (1962), however, do not support the relationship between level of aspiration measures and academic achievement. While comparing 19 achievers and 16 non-achievers of high ability college freshmen, Dowd (1952) found no significant difference in respect of their level of aspiration. Sharma (1978) undertook a study of self-concept, level of aspiration and mental health as factors in academic achievement, and contended that the level of aspiration did not influence academic achievement.

In contrast to both the groups of studies, namely, those showing a positive relationship and those showing no relationship, the following studies show a negative relation between the variables under consideration.

Muthayya (1965) while studying some correlates of achievement motive among high and low achievers in the scholastic field, found no difference between the two groups with regard to their aspiration level.

The study of Rai (1974) attempted to find out whether level of aspiration could be one of the variables to differentiate between the low and high achievers. The study concluded that level of aspiration was not a significant correlate of achievement.
Dwivedi (1983) carried out a study of performance on linear programme in a segment of biology in relation to level of aspiration and socio-economic status and reported that level of aspiration did not influence performance of students.

The above discussions show that though there are many studies conducted, still the gaps call for an attempt to find out how aspirations and achievement are related and in particular with reference to the achievement in Mathematics.

2.4.0. Aptitude and Academic Achievement

Aptitudes are the specific abilities in an individual that promote attainment in a particular field. Researchers have identified certain specific abilities in relation to achievement in certain subjects of study. Following are the studies which have been worked in that direction.

Menon (1982) looked into the performance of students belonging to two government run polytechnics in Haryana. The results showed that numerical ability, general mental ability, abstract reasoning, mechanical reasoning, academic achievement (at matriculation examination) and language usage (spelling) accounted for 38.23 per cent of the variance in the criterion variables (scores obtained by the students in their final examinations of the first year of the polytechnic course).
An Investigation into Some Factors Related to Achievement in Science by Students in Secondary Schools was done by Jha (1970). The findings revealed that there was a significant positive relationship between achievement in science and scientific aptitude. Pal (1982) made an inquiry into the factors involved in the learning of science by adolescent pupils and observed that general ability, scientific aptitude, reasoning, speed and precision and problem-solving ability were significantly responsible for the learning of science. In the study of Mehna (1986), scientific aptitude is indicated as a significant predictor of academic achievement in science.

Agrawal (1973) identified aptitude as an important correlate towards academic success in certain specific fields. Further, medical aptitude was found as a contributing factor for proficiency in medical examination.

With regard to achievement in Mathematics in particular, Jain (1979) reported that for learning Mathematics at the high school stage, the factors playing a vital role were intelligence, abstract reasoning, numerical ability, mathematical background, attitude towards Mathematics, degree of motivation, study hours and the status of Mathematics in the family. While studying the academic achievement of
high school boys, Thakur (1974) concluded that there was a positive correlation between aptitude and achievement in Mathematics. Those who had aptitude but disliked the subject did not show significant achievement.

Researches have also been conducted with particular abilities in consideration. Chhikara (1985) arrived at a positive relationship between reasoning abilities and achievement of concepts. The study of Tiwari (1986) suggested a similar conclusion. While using Spatial Relations Test of the Differential Aptitude Tests (DAT), Fennema & Sherman (1977) reported that the correlations between Mathematics achievement and spatial visualization were approximately as high \((r = 0.5)\) as the correlations between Mathematics achievement and verbal ability.

Sex differences in the aptitude and the specific abilities have drawn the attention of researchers quite often. Fennema (1974) and Kelly (1978) have indicated that in most studies of mathematical aptitude and achievement, the sex differences have increased at higher achievement and age levels. But, the study conducted on Palestinian students in the Israeli occupied West Bank by Awartani & Gray (1989) showed no significant difference between Mathematics aptitude and achievement scores of men and women university students.
Stallings (1979) undertook a study of factors influencing women's decisions to enroll in advanced Mathematics courses. The findings revealed that spatial ability distinguished between those girls who continued their mathematical study and those who did not. This has been supported by Sherman (1980) who concluded that spatial visualization scores were more highly predictive of mathematical attainment for girls than for boys.

From 1972 through 1979, the Study of Mathematically Precautious Youth (SMPY) conducted six talent searches for students having aptitude for Mathematics. The data for these searches reported large sex differences in mathematical reasoning ability by grade seven (Benbow & Stanley, 1980, 1983). Since SMPY was a longitudinal study of its participants, the consequences of this sex difference was assessed at different junctures. Utilizing results from SMPY's first follow up of its students (i.e., after high school), a relationship between sex differences in achievement in Mathematics in high school and the earlier sex difference in mathematical reasoning ability was detected (Benbow & Stanley, 1982).

Pattison & Grieve (1984) attempted to find out whether spatial skills contribute to sex differences in different
types of mathematical problems. Results indicated that boys excel in problems dealing with measurement and proportion and in spatial problems, whereas girls perform better on more abstract deductive problems.

From an overview of the studies mentioned above, it seems appropriate to consider that there are some specific abilities which may be related with the achievement in Mathematics. The most conspicuous of these specific abilities seem to be numerical ability, abstract reasoning, and space relations.

2.5.0. Personality Characteristics and Academic Achievement

A host of studies have attempted to find out the relationship between different personality characteristics and academic achievement. A brief account of some of the studies is given below.

Garrett (1949) mentioned about 63 studies in which personality factors were studied as predictors of academic achievement. The reported correlation of these factors with college grades varied between 0.30 and 0.64. Rao (1968) conducted a study of some factors related to scholastic achievement. The results showed that certain personality factors affect academic achievement. In one of their studies Cattell, Barton and Dielman (1972) found that personality factors also predict the academic performance.
Numerous investigators like Tiebout (1943), Wedemeyer (1953), Parneil (1954), Gough (1955), Egner & Obelsky (1957), Hershey (1958), Ryan & Davie (1958), Teraoka (1958), Pierce (1959), Witherspoon & Melberg (1959), Butcher & Gorsuch (1960), Keimowitz & Ansbacher (1960), Erb (1961), Pierce (1961), Roberts (1962), Rosenberg et al. (1962), Watley & Martin (1962), Carter (1963), Fink (1963), Warburton, Butcher & Forrest (1963), Muthayya (1964), Rao (1964), Watley & Merwin (1964), Webb (1965) and Norfleet (1968) used inventories and questionnaires of various kinds on different groups of students. Their findings are not being elaborated as they relate to varieties of personality characteristics, but most of them do point to the association between some of the personality characteristics and academic achievement.

Researches have drawn attention to personality correlates of school attainment. Cattell, Sealey & Sweeney (1966) and Eysenck & Cockson (1966) have indicated low but statistically significant correlations between pupils' achievement and scores on various personality scales. A study of the causes of failure in the high school examination was made by the Department of Education, Allahabad University (1961). The study revealed that certain aspects of personality and scholastic achievement have definite relationship. Pal (1961) and Bhatnagar (1968) carried out studies to find out whether
different personality factors have any association with achievement in general and scholastic achievement in particular. They proposed that there is some association between scholastic achievement and personality factors. While using Jr-Sr High School Personality Questionnaire, Butcher et al. (1963) observed that thirteen variables of the questionnaire correlated with academic achievement. Goodstein, Crites & Heilbrun Jr. (1963) concluded that personality does contribute to college achievement but in a general rather than specific way. No identifiable patterns of personality characteristics was consistently related to success in college other than a tendency of more intellectually-oriented males to obtain higher grades.

According to McClelland et al. (1953), and Entwistle (1968), personality traits, motivation, inter-personal relations and such other factors play a significant role in the academic achievement of students. Buxton (1966) reported a significant relationship between personality characteristics and academic achievement. Studying the effects of personality characteristics on academic achievement of boys reading in Class X, Srivastava (1974) found that personality traits of 'reserve-outgoing', and 'less intelligent - more intelligent', were significantly correlated with academic achievement at 0.01 level of significance. Seetha (1975)
attempted an inquiry into the psychological and social factors affecting academic achievement and contended that out of Cattell's 16 personality factors, only three factors namely, A, B, and L had significant relationship with academic achievement. Some psychological correlates of school achievement was investigated by Verma & Upadhyay (1981) and indicated that certain personality factors are significant determiners of the educational achievement of the individual.

Studies have been conducted to compare the personality characteristics of over-achievers and under-achievers or high-achievers and low-achievers. Burgess (1953) studied the personality of over-achievers and under-achievers and found over-achievers to be more intellectually adaptive, more constricted and inhibited, more cautious and realistic in approach to problems and having greater need for achievement and self-improvement whereas under-achievers were found to be more on dependency needs and need to be free from restraint. Bhaduri (1971) carried out a comparative study of certain psychological characteristics of the over and under-achievers indicating over-achieving students to be less neurotic and less anxious than the under-achievers. Saxena (1972) mentioned that over-achievers had sufficient endurance and possessed a capacity for fighting out their
case while the under-achievers were meek, submissive, timid, brooding, impulsive and dependent type of immature individuals. Ghuman (1976) attributed over-achievement primarily to non-intellective personality variables and under-achievement to intellective factors. The study by Gupta (1983) showed that over-achieving boys were less expedient, less shy and had less undisciplinary self-conflict than the under-achieving boys, whereas, over-achieving girls were less affected by feelings, more emotionally stable, less shy, more vigorous, zestful and had less undisciplined self-conflict than the under-achieving girls.

Pierce (1952) conducted a Study Among 222 Bright High School Students and Divided Them into High and Low Achieving Groups by Sex and Grade Level. The study revealed that high achieving students are less aggressive possessing more leadership ability whereas low achieving students are more aggressive developing less leadership ability. While undertaking the prediction of college grades from personality and aptitude variables, Holland (1960) noted that only high achieving girls were characterised by lack of tension and that the result was not valid for boys. Sinha (1966) attempted a psychological analysis of some factors associated with success and failure in university education among 185 high achievers and 190 low achievers. The findings showed
that the high achievers were more persistent and enthusiastic than the low achievers. The study of Jayagopal (1974) found high achievers to be reserved, humble and tough-minded in comparison with under-achievers whose personality profile reported that they were characterised by spontaneity, vigour, spirit to associate with the group readily and uninhibited and zestful in nature. Srivastava (1976) made a study of personality factors as predictors of academic achievement of high school students and indicated that reserved, intelligent, submissive, adventurous, zestful, tender-minded and high strength of self-sentiment were the typical personality characteristics of high achievers among high school students. Vanarase (1970) studied ability and scholastic under-achievement and observed achievers to be more self-confident, more independent, more mature, emotionally more stable and more conscientious when compared with the under-achievers.

While investigating the self-concept of bright under-achieving high school students as revealed by an objective check list, Bell (1960) found that male under-achievers have more negative feelings towards themselves than did the achievers. Agarwal (1975) examined a psycho-social study of academic under-achievement. The results demonstrated under-achievers to be comparatively less emotionally mature, less calm, less placid, less prone to getting into difficul-
ties, less able to face reality and possessing less ego-strength than over-achievers. Beedawat (1976) undertook a study of academic under-achievement among Class IX secondary school students of Bikaner division in Rajasthan. The study reported under-achievers to be out-going, warm-hearted and easy going. Attributes of under-achieving undergraduate students were studied by Sharma (1978). It was noted that personality traits namely, sizohythmic, threctia, acetia, guilt proneness, low integration, high ergic tension contributed significantly to academic under-achievement. Conducting a psychological and ecological study of under-achievers, Tandon (1978) indicated that male group of under-achievers were easy-going, out-going, emotionally less stable, low in frustration, shy, apt to inferiority feeling, diffident, pessimistic, moody, depressed, highly anxious, not deligent, and gossip monging. Further, they took less interest in studies, spent time in roaming, were not obedient, were not regular in attendance and did not have sophisticated friends circle. On the other hand, female group of under-achievers were pessimistic, harsh, assertive, highly anxious, and not deligent. Further, they took less interest in studies, spent more time in roaming and had less sophisticated friends. Deka (1985) investigated school failure by making a causal comparative study of high and low achievers. The study concluded that low scholastic
achievement was significantly and positively associated with inferior leadership qualities and less adventurousness.

Studies by Harris (1931, 1940), Muthayya (1965), Ainsworth (1967), Lall (1984), and Gopalacharyulu (1984) draw particular attention for researchers. Harris (1931) made review of 147 studies conducted prior to 1930. In many of these studies an attempt was made to correlate selected personality characteristics of students with their college grades. The reviewer reported that the findings up to that time had been conflicting and inconclusive. Another survey of such literature was published by the same author in 1940, in which 328 studies of academic prediction, investigated mostly between 1930 and 1937, were reviewed. From the review of these studies, Harris concluded that in order of importance the factors of achievements were ability, effort, circumstances (personal, social, economic and academic). Some personality factors were found related to academic achievement in some ways. While comparing high achievers with low achievers in scholastic field, Muthayya (1965) observed achievement to be negatively related to obstacle dominance among high achieving groups and ego-defence response among low achieving groups. Ainsworth (1967) indicated that none of the 14 personality factors under investigation correlated significantly with school attainment. Lall (1984)
noted that academic success was negatively and significantly related to personal problem and sensitivity, anxiety and neuroticism. Gopalacharyulu (1984) studied relationship between certain psycho-sociological factors and achievement of student-teachers in teacher training institutes of Andhra Pradesh. The results revealed that the 16 personality factors could not discriminate between high and low achievers either in theory or practicals or the combined subjects.

The personality characteristic of introversion-extroversion in particular has drawn the attention of many investigators. Many of them have reported that attainment is related positively to introversion. Among them are Himmelweit (1946), Eysenck (1947), Franks (1957), Lynn & Gordon (1961), Savage (1962) and Kline (1966). Similar idea has been given by Entwistle & Shirley (1961), Dotson & Templer (1969), Finlayson (1970), Kline & Gale (1971), Wilson (1971), Mohan & Nehru (1972), Mohan et al. (1975), Bierhoff-Alfernon (1976), Brar (1976), Mohan (1976), Goh & Moore (1978), Masqad (1980), Chandra & Kundu (1981) and Mohan et al. (1981, 1982), when they suggested that low accumulation of reactive inhibition and its faster dissipation ought to be advantageous to the introverts during the examination which results into better achievement by introverts. Further, Eysenck (1957) contends that extroversion is associated with fast accumulation and
slow dissipation of reactive inhibition. So, an extroverted person is not expected to perform well on a sustained work. Accordingly, in educational settings also, it is hypothesized that introverts would be better achievers than extroverts. Lynn & Gordon (1961) observed four reasons for the better academic achievement of introverts than of extroverts. They are:

i) Introverts form conditioned response more quickly than extroverts, so they possess a larger vocabulary and greater learning speed.

ii) Neurotic introverts tend to be more intelligent.

iii) Introverts are more capable of doing sustained work.

iv) Introverts tackle tasks slowly and accurately, whereas extroverts are quick and inaccurate.

A good number of researchers like White (1931, 1932), Stagner (1933), Owens & Johnson (1949), Furneaux (1957), Broadbent (1958), Lynn (1959), Bendig (1960), Holmes (1960), Warburton & Hadley (1960), Jamuar (1961), and Child (1964) have studied school and college students with various questionnaires and have found introverts to be better achievers than extroverts. While studying the prediction of scholastic success through the use of a forced choice problems and attitude inventory, Bloomberge (1955) noted that college
students showing high academic performance are somewhat more introverted than students with low achievement. Using a personality scale measuring introversion to predict grades, Fleeming (1932) indicated that the correlation between introversion and grades was 0.26. But in three other studies Guilford & Voas (1930), Held (1931), and Eckert (1935), the same scale correlated zero or practically so with scholarship. Neel & Mathews (1935) concluded that what is called introvert behaviour is associated with grades than its opposites. Vidhu (1968) investigated into the relationship of neuroticism and extroversion to intelligence and educational achievement at different age levels and reported that extroversion and academic achievement were negatively associated. Basu (1970) indicated that both extroversion and neuroticism have significant effect on academic performance. Menon (1973) made a comparative study of the personality characteristics of over-achievers and under-achievers of high ability in Kerala. Results showed that over-achieving groups of boys and girls of superior ability as well as the general group were found to be less extrovert and less maladjustment than under-achievers. The former also showed greater academic interest and endurance. Altus (1948) studied college achievers and non-achievers using the Minnesota Multiphasic Personality Inventory and contended that achievers revealed introversion
tendencies and non-achievers a love for and a dependence on people, i.e., social extroversion. Sinha (1967) carried out a study of intelligence and some personality factors in relation to academic achievement among male students of Class X in Patna and Gaya. The study demonstrated academic achievement to be positively and significantly related with extroversion – introversion and neuroticism at 0.05 level. While studying the influence of basic personality factors on academic achievement, Abraham (1969) observed the influence of the temperamental dimensions of neuroticism and introversion – extroversion on academic achievement indicated sex differences.

However, by undertaking a study of behaviour and background of students in college and secondary schools, Strang (1937) concluded a lack of relationship between scholarship and various measures of introversion – extroversion.

Banks & Finlayson (1973) conducted a study of success and failure in secondary schools and suggested that the type of school system and the curricular subjects studied might mediate the relationship between the personality dimensions and school achievement.

Researches have been carried out in the area considering achievement in particular subjects. Jha (1970), Mathew
(1976) and Sontakey (1986) have worked using achievement in science as the variable. Mathew (1976) made a study of some personality factors related to under-achievement in science among standard IX students in the district of Trivandrum in Kerala. The findings revealed that the mean scores of over-achievers significantly exceeded the mean scores of under-achievers in cases of self-reliance, sense of personal freedom, freedom from withdrawing tendencies, freedom from nervous symptoms, social standards, social skills, freedom from anti-social tendencies, family relations and community relations. While making a comparative study of personality factors and achievement motivation of high and low achievers in natural and biological sciences, Sontakey (1986) found that personality factors were consistently associated with achievement in natural as well as biological sciences. Factors $E^-$, $G^-$, $I^+$, $Q_3^+$, $Q_4^-$, and neuroticism came out as predictors of achievement in biological sciences, whereas, $E^+$, $G^+$, $I^-$, $Q_3^-$, $Q_4^+$, and neuroticism as predictors of achievement in natural sciences. Jha (1970) attempted to study some factors related to achievement in science on a sample of 342 boys and 104 girls drawn from two boys and two girls secondary schools. The results reported no relationship between achievement in science and extroversion.

The following studies have been conducted taking
achievement in Mathematics into consideration. Fennema & Sherman (1977) observed that confidence in Mathematics ability was strongly related to Mathematics achievement ($r = 0.22$ to $0.47$), and the extent of relationship depended on sex and grade level. The studies by Perl (1979), Reyes (1984), and Hunt (1985) have shown that students who are confident of their ability to learn mathematics are more likely to take Mathematics in school when it becomes optional. Kloosterman (1988) undertook a study of self-confidence and motivation in Mathematics and indicated that in general, students who are confident of their ability in Mathematics feel comfortable when confronting mathematical situations.

Elizabeth (1972) made a study of personality characteristics of high school students and found introverts to be superior in Mathematics and social studies, whereas, extroverts to be superior in science.

Ridding (1967) mentioned that over-achieving boys in arithmetic are more surgent than average or under-achieving boys whereas, over-achieving girls are more conscientious than under-achieving girls. In the study of Iyer (1977), the personality variables like self-reliance, sense of personal freedom, feeling of belonging, withdrawing tendencies,
nervous symptoms, social skills, school relations, community relations, general anxiety and test anxiety discriminated effectively between over-achievers and normal-achievers, normal-achievers and under-achievers, and over-achievers and under-achievers in relation to achievement in Mathematics. Somasundaran (1980) carried out a comparative study of certain personality variables related to over, normal and under-achievement in secondary school Mathematics. While introversion and self-reliance had significant positive relationship with achievement in Mathematics, general anxiety, test anxiety, and masculinity had negative relationship.

Kaul (1969) studied personality traits of high and low achievers in Mathematics. The study reported high-achievers to be emotionally mature, more dominant, assertive and independent minded, while low achievers to be demanding, impatient, excitable, over-active, more dependent and attention seeking. Koul (1978) investigated personality needs of high and low-achievers in Mathematics taking a sample of 1030 students from six male higher secondary schools of Ajmer city in Rajasthan. The study pointed out that students belonging to high achieving group were found to be high on the scales of n Order, n Dominance, Change and n Endurance and low on the scales of n Exhibition, n Succorance, n Heterosexuality and n Aggression. The low achieving
group in Mathematics were found to be more exhibitory, succorant, heterosexual and aggressive.

A study of certain factors related to differential patterns of achievement among bright students was examined by Kulshreshta (1981). The study concluded that the bright under-achievers in Mathematics were more warm-hearted than normal-achievers.

A careful look into the different researches which were reviewed along with discussion with experts and the researcher's own thinking led to the formulation of hypotheses of the present study, which are already given in the previous chapter.