CHAPTER - I

THEORETICAL FRAMEWORK

In the context of education, we define learning as change in behaviour occurred as a result of total school programme consisting of school environment, the curriculum content, teaching methods and evaluation techniques. The learner's behaviour is changed or modified as a consequence of his interaction with the instructional environment. At the same time, the learning environment is also changed as a result of learner's interaction. The quality and type of behaviour acquired by the learner depend largely on objectives and details of the instructional programme. In fact, the behaviour of the learner is continually changed in intended or in unintended ways as a result of his interaction with social environment provided by family, social groups, cultural traditions and value systems. But the school or the educational environment is designed purposely to bring about desired changes in human behaviour. These desired changes take place as a result of learning which occurs in an institutionalized situation (such as school).

In principle, every individual learner is different from every other learner in all respects; in ability, attitudes, interests, aptitude and values. The obvious implication of this principle is that each and every learner
needs a unique learning environment for most effective and meaningful learning and fullest utilization of his capacities. The process of designing an appropriate instructional environment to suit individual needs is a complex and challenging enterprise. Moreover, different types of learning environments encourage and optimize certain kinds of behavioural changes and discourage and minimize certain others. There are three basic components of a learning situation: (1) the learner (2) the teacher and (3) the learning conditions. Each component is a complex whole of a large number of interacting variables. The learner is no more considered as an empty vessel as in case of certain old philosophical traditions. When a child comes to school for learning, he brings with him a unique personality with certain abilities, attitudes and a unique sociocultural background. All these variables play a vital role in deciding as to what he will be as a result of learning. The teacher also has a very significant role to play in student learning. Associated with the teacher, are again a large number of variables, such as his qualifications, professional training, his attitudes, personality and sociocultural background. The learning condition is a very important component of a learning situation. The classroom conditions, physical facilities, weather, the seating plan, teaching aids, library,
laboratory, teaching method, the quality of books and a large gamut other factors which are external to both the teacher and the learner have a significant bearing on learning.

Thus, learning is a product of a complex process underlying the interaction of the learner variables, teacher variables and environment variables. In an average Indian Classroom, the learning situation consists of a teacher, a room with or without necessary furniture, chalk duster and a large group (class) of students with varying levels of ability, background and motivation. In such a classroom, the teacher variables and learning environment variables are constant for a given group (class) of students. But, the learner variables are different for every individual learner. It is these learner variables that are responsible for variation in learning or academic achievement. Why is it that some students learn better and faster than others when learning conditions and the teacher are the same? This is a question which needs to be answered through analytical and systematic research studies.

Given a teacher and a class room (environment), the learning of a skill or competency depends on three major factors related to the learner:

(1) his innate ability to learn
(2) the opportunity which he received
(3) his level of motivation.

It is believed that ability (measured in terms of general intelligence and special aptitudes) is a single the most important factor that determines the level of learning or achievement. But, the role of opportunity (sociocultural and familial environment) cannot be overestimated. It has been established by numerous research studies that sociocultural background variables are no less important than intellectual abilities. It is a well known fact that a good environment is not a substitute for a poor ability, but a poor environment can certainly suppress a good ability. Also, granted superior innate ability and good sociocultural background, an inadequately motivated learner will learn less efficiently than an adequately motivated learner.

In the sections to follow, the relative roles of three kinds of learner variables, that is, innate ability, opportunity and motivation are analysed critically with reference to significant research findings wherever possible and necessary.

1.1 INNATE ABILITY

Besides the crucial role played by "readiness" in terms of basic skills such as the ability to read or
specialized skills like writing and basic computations, in determining efficiency of learning, learners innate ability to learn occupies a significant position. General intelligence has been considered the most important determinant of learning in all fields. It is widely known that individuals differ greatly, and to a larger extent genetically, in the facility with which they acquire new knowledge and skills.

An intelligence test was used as an early means to quantify or measure this difference as a basis for educational prediction. As stated by Schwarz (1971):

"The basic assumption underlying the classic intelligence test is that the learning of any given skill is a function of motivation, opportunity and an innate ability to learn and that individual differences in the mastery of skills for which motivation and opportunity are equal, therefore, reflect differences in the ability factor alone. Operationally, the constructors of the early intelligence tests reasoned that

1. if gross differences in motivation are avoided by selecting skills that all individuals are expected to develop as a matter of course in the particular culture in which they live, and
2. If gross differences in opportunity are avoided by selecting from these skills a subset that can be mastered on the basis of only those experiences that are uniformly available to all of the individuals to be compared, then individual differences in proficiency in this subset of skills will constitute a reasonably pure measure of the individual's relative ability to learn. And so basic a measure, it was thought, would be predictive not only of academic performance but also of success in most other problem solving situations.

1.1.1 General intelligence:

Although Intelligence is defined in many different ways, most of the definitions fall into one or more of the following categories: (1) capacity to learn (2) capacity to perform intellectual tasks (3) capacity to think abstractly, and (4) capacity to make adequate adjustments to new experiences.

A more recent definition of intelligence has been offered by Stoddard:

"Intelligence is the ability to undertake activities that are characterized by (1) difficulty (2) complexity (3) abstraction (4) economy (5) adaptiveness to a goal (6)
social value and (7) the emergence of originals, and to maintain such activities under conditions that demand a concentration of energy and a resistance to emotional forces". Most of the studies related to intelligence and achievement have correlated I.Q scores and scores on some achievement test. In certain studies, teacher's ratings or marks obtained in public examinations were used as measures of academic performance. Since correlations do not involve necessarily a causal relationship, one cannot conclude that high IQs cause high achievement or vice versa. Nonetheless, the correlation coefficients between intelligence and achievement scores as reported in research studies in various subjects are between 0.50s and 0.70s, which indicate substantial degree of relationship. However, the degree of association depends on (1) nature of achievement and intelligence tests used, (2) the nature of subject matter (3) and the nature of students. Intelligence scores tend to correlate more highly with standardized achievement test scores than with school marks. Some of the correlations are in the 0.90s. Correlations of intelligence tests with standardized achievement tests are appreciably higher than with school marks, because the same test taking skills and attutudes enter into both the variables, and there is a lot of overlapping in the nature of content. In fact both types of tests measure what has been learned, both 'Content' (word
meanings, number, facts etc.) and strategies for problem solving. The achievement test measures mostly what has been learned in the classroom; the intelligence tests draws upon broader contexts. The difficulty with treating intelligence as a linear, unitary trait would seem to indicate that intelligence tests are best thought of as "general achievement" tests, on which scores depend largely, though by no means entirely, upon material learned outside the classroom.

Pupil's intelligence is probably one of the earliest factors which, besides teaching, was found to cause variations in achievement. As a matter of fact, such was the degree of faith among some research workers that they ascribed variations in achievement to intelligence alone. That this view was in error and only partially true became evident by observations of a moderate correlation (Rao, 1915) between intelligence and achievement (0.14 to 0.81 with a mean of 0.55). Moreover, many studies including the one conducted by Sharma (1958), reported the incidence of low achievement among intelligent children.

1.1.2 Specific aptitudes:

Based on his study on factor analysis of intelligence tests, Spearman (1904) reported that mastery of
a skill depends not only on general intelligence but also on a specific ability involved in the learning of that skill. Later on Thurstone (1946) and Guilford (1957) suggested that ability to learn or intelligence is made up of a number of independent factors. While Thurstone suggested eight independent factors, Guilford extended the number to 120 and later on to 180 (Guilford 1981). These separate abilities were called by some specialists as special "aptitudes".

In the present age of science and technology, when we select candidates for a course or for a job, we are not much interested in the general intelligence. Rather, we are more interested in specific abilities needed for success in that particular course or job. There is a sharp demarcation between aptitude and achievement. Aptitude is the capacity to learn, a forecast of how much students can achieve under favourable conditions. Achievement is how much students have learned up to a particular point in time. In other words, we can say aptitude tests are meant to be predictive of future achievement, and achievement tests are meant to assess the present level of attainment. Concisely, both measures learning but their aims are different.

Aptitude tests are frequently criticized because the results are influenced to some extent by the type of environment in which the child has been reared. For example,
children in culturally impoverished environments make lower scores on intelligence tests than children who are reared in more fortunate circumstances.

Aptitude tests are sensitive to changes in the individual's intellectual capacity at any particular point in time. When such capacity is altered aptitude tests are the first and best method for detecting the change. Aptitude should be thought of as aptitude for the next step in education, rather than as some innate and unchanging characteristic of the student. The distinction between aptitude and achievement is too important and too well founded in practical experience to be ignored. Seldom does the student with high aptitude make poor grades even if he is under adverse conditions in the classroom and at home. Conversely, seldom does the 'slow learner' begin to make excellent grades after even the best of individual attention. However, moderate and sometimes even marked differences are found between measures of aptitude and achievement and when are, they are of real diagnostic importance.

Academic achievement in specified areas is correlated with certain type of cognitive abilities known as aptitudes. Generally, it is observed that aptitudes correlate more highly with the criterion than general
intelligence. For example, scores on a mathematical aptitude tests will correlate more highly with achievement in mathematics than scores on a test of general intelligence.

1.2 ACHIEVEMENT AND GENERAL INTELLIGENCE:

Whatever may be the definition of intelligence, its measurement consists of administering a series of tasks and observing responses to them. From these responses, teachers infer something about the intelligence of the examinee. The statement that "intelligence is whatever is measured by an intelligence test" may appear to be vague but it does point out that I.Q. score based on two different tests are not comparable and have different meanings.

There have been innumerable research studies on the relationship between intelligence and achievement, especially during the later half of the 20th century. However, the present investigator has reviewed only the most recent and the most relevant ones.

Baker, Schutz & Hinze (1961) tested the hypothesis that the academic achievement of pupils with "average" and "high" mental ability does not differ significantly when socioeconomic status is controlled. Ss were assigned to a "high" or an "average" mental ability group. Socioeconomic status was controlled in analyses of covariance involving
seven achievement criterion variables. For each criterion, evidence was obtained to reject the hypothesis at the .01 level. The two mental ability groups differed significantly on all achievement criteria even after adjustments were made for individual differences in socioeconomic status. McCandless, Roberts and Sternes (1972) conducted a study on intelligence in relation to scholastic achievement - using the California Test of Mental Maturity for obtaining intelligence scores. The correlation coefficient between intelligence and academic achievement including reading, language, arithmetic social studies & science was found to be as high as 0.56.

Chatterji & Mukerji (1974) also attempted to predict achievement scores from the knowledge of the Differential Aptitude Test Battery scores. Highly significant relationship was found between the aptitude scores and the total marks of the subject. Glossop, Appleyard and Roberts (1979) studied achievement in relation to general intelligence. The results showed a positive linear relationship between intelligence and achievement scores. The correlation coefficient of intelligence with mathematical ability was found to be 0.805 and with reading ability 0.815. Crano, Messe and Rice (1979) conducted a study on the predictive validity of mental ability for
classrooms performance. The investigation based on correlations between the two abilities yielded a 'strong predictive relationship' between mental ability scores and academic achievement the correlation coefficients ranging from 0.474 to 0.505. Roberge and Flexer (1981) conducted a study on the relationship between intelligence and academic achievement. High positive correlations were obtained between mental ability on the one hand and reading, mathematical concepts and mathematical problems solving on the other. Yule, Lansdown and Urbanowicz (1982) carried out a study on prediction of educational attainment through intelligence. The results showed very high relationship between intelligence scores and achievement scores, the coefficient with different aspects of reading ability and Mathematics ranging from 0.457 to 0.911.

The studies discussed above stand testimony to the fact that the factor of intelligence is very closely associated with academic achievement and as such a very reliable predictor of school performance. But at the same time it also becomes quite evident from the results that the relationship between the two is not perfect. Intelligence as a predictor leaves out certain amount of "residual", a part of the data on achievement lying beyond the prediction through intelligence. This residual phenomenon has very much
affected the attention of the researchers in the field and as discussed earlier, the concomitants of 'the residual' have been explored in the non intellective domains of personality and temperament. However, in their efforts to identify the personality dimensions which could account for the residual part of academic achievement many of the workers in the area have missed the point of "residual" of achievement beyond the level predicted by intelligence and have simply studied the relationship between academic achievement and certain personality factors.

1.3 OPPORTUNITY AND MOTIVATION:

The fundamental purpose of educative process in an institutionalized setting is to enable the pupils to learn effectively and develop certain skills and competencies in various fields of knowledge such as mathematics, science, languages & social studies. The knowledge so acquired by the students is termed as academic achievement. Academic achievement of students has often been regarded as the criterion of the efficiency or success of their teacher. The main reason for this is the belief that teaching and learning bear a high positive relationship and that, very few factors intervene in between these two activities. But, this belief is contradicted by the findings of a number of research studies, which show that the relationship between
teaching & learning is not univocal and depends on many other factors, which are very large in number. Many factors such as pupil's intelligence, interest, level of aspiration, adjustment and other personality characteristics play a significant role in determining learning. Academic achievement is largely a product of the interaction of teaching and these intervening factors. It is therefore, obvious that any approach which only takes into consideration only the academic achievement for evaluating the teaching effectiveness and does not take into account the intervening variables, such as pupil's intelligence aptitudes, interest, level of aspiration, adjustment and the like, is faulty and unsatisfactory.

1.3.1 **Achievement and socioeconomic status:**

Some researchers made attempts to find out the effect of socioeconomic status on academic achievement. Here we are discussing only the latest studies.

Chatterji, Mukherji & Banerjee (1971) studied the effect of certain socioeconomic factors on the achievement of the school children. The main findings of the study were (i) The economic conditions of the family seemed to have no effect upon the scholastic achievement in all the intellectual groups. Similarly, possession of a study room had no favourable effect in increasing the achievement score
in almost all the cases. (ii) The family size and the number of siblings were inversely related to the scholastic achievement specially in the low intellectual level. In some cases, parent's help had significant positive contribution towards higher achievement. (iii) Parent's educational level was directly related to the achievement of their children. (iv) In high ability group children had greater achievement when they had no private tutor than when they prepared their lessons under the guidance of private tutor. (v) Father's occupation was not consistently related to children's achievement. For the high ability group, children and servicemen excelled the children of businessmen but the trend was reversed for the average and low intellectual groups.

Anand (1973) studied the effect of socioeconomic environment and medium of instruction on the Mental abilities and the academic achievement of children in Mysore at secondary school level. The analysis revealed the following (i) the F values of score on all the criteria tests were found significant. (ii) three S.E.S groups differed significantly from one another in their non verbal and verbal intelligence; (iii) high S.E.S. group achieved higher Mean scores than pupils in both low S.E.S. group and middle S.E.S. group, (iv) whereas the mean score difference between middle & low S.E.S. groups were not significant.
(v) the relationship between S.E.S. and academic achievement was found to exist even when the influence of intelligence of non verbal as well as verbal type was partialled out. (vi) the relationship of media of instruction to intelligence was found inconsistent whereas that of S.E. environment remained almost identical; the impact of socioeconomic environment was found to influence mental abilities and academic achievement. (vii) students studying through Kannada medium achieved significantly higher mean score than those studying through English medium.

Ojha (1979) did a study of correlation between socioeconomic status & achievement of high school boys. The analysis of data revealed a significant positive correlation of 0.34 between achievement and S.E.S. 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 S.E.S. 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.

Khanna (1980) conducted a study of the relationship between students socioeconomic background and their academic
achievement at Junior school level. The findings of the study were (i) socioeconomic status was positively and significantly related with academic achievement. (ii) The student's achievement was related with his S.E.S. irrespective of whether his home town was a village or town or a city. The correlation was more consistent in urban than in rural areas, (iii) The academic achievement of rural and urban students was closely related with their guardian's income. (iv) There was a positive & significant correlation between S.E.S. & academic achievement in the case of boy and girl students of rural and urban areas. (v) The academic achievement of the students of different types of schools was significantly related with the socioeconomic condition of their families. (vi) The academic achievement of the children of educated parents, illiterate parents & educated mothers was significantly correlated with the S.E.S. of the family. (vii) The scholastic achievement of the students of junior high school classes was directly and significantly related with their family S.E.S.

Hansley, Clementine Elizabeth Barber (1982) studied the influence of selected social variables on the achievement of Elementary school children in a Textile Mill Community. The data were analyzed through a series of stepwise multiple regression equations and through a discriminant analysis. The findings did not support the hypotheses. The only
variable found to be significantly related to achievement were sex and grade. Boys consistently scored lower than girls at every grade level and scores of both boys and girls declined as grade increased. Barham, Wilton Albert (1984) studied some psychological, socioeconomic and demographic determinants of academic achievement among students in Jamaican teachers colleges. Results indicated that achievement in English language for males is significantly influenced by precollege education in terms of its total and direct effects. These results must be carefully interpreted because of the small amount of variance that is explained for males (26.27%) and females (3.14%). Motivation has total effects on Maths that are statistically significant for males & females. Family size, age, motivation & expectations have statistically significant direct effects on Maths for females & not for males. The amount of variance explained for males is 12.29% & 7.03% for females when Maths is the dependent variable. Precollege education has statistically significant direct & total effects on General Science for male & female students respectively. Meanwhile age, anxiety, motivation have significant negative direct effects on General Science for females, but not for males. The amount of variance that is explained by model is 14% for males & 14.03% for females. Additionally, there were only negligible indirect effects indicated for all the variables of interest.
David, Elizabeth Lindley (1984) studied instructional management, environmental Variables & student achievement. Results of this study suggest that teacher education, teacher knowledge, student grade, classroom complexity & classroom mobility account for a large proportion of the total variance in the path model. Master's level teachers significantly effect both the teacher's knowledge of the instructional content mastered by the student and the student's achievement. The grade level of the student significantly affects the student's achievement. The teacher's knowledge affects student achievement at the p < .001 level.

Deshpande (1986) studied the interactive effects of intelligence and socioeconomic status of students and homework on the achievement of students. The findings were: 1. Students, parents, teachers, girl students and students of middle and upper socioeconomic status had a more favourable attitude towards homework. 2. No significant differences in their attitudes towards homework were found when teachers were classified under the four variables of marital status, sex, age and teaching experience. 3. Parents with an only child had significantly less favourable attitude towards homework than parents with two or more children. 4. The amount of homework and delay in evaluation of homework were not significantly related to achievement of
students. 5. Intelligence was significantly related to achievement at the 10 percent level. 6. Intelligence was significantly related to achievement at the 1 percent level. 7. The trend of the relationship between homework and achievement indicated that students who were given homework performed better.

1.3.2 Achievement & familial variables:

Not only the socioeconomic status but parents involvement and home environment also affects the achievement as proved by some researchers. A few studies are being discussed here in this regard.

Hillman, Elizabeth Moss (1982) studied the relationship between the variables of family climate as perceived by child and student achievement. The purpose of this study was to determine if there was a relationship between a child's perception of total family climate (those children living with both parents), and a child's scholastic achievement and to determine if there was a significant statistical relationship between a child's perception of family climate (mother) and family climate (father) and a child's scholastic achievement. It was concluded that there was an interaction between family members. It was measured and labeled family climate. The relationship between family climate & scholastic achievement was subject specific.
Herbin Kemp, Mary Ellen (1983) did a study of parental involvement and selected family background variables as each relates to the child's achievement. Stepwise multiple regression models were computed in which ability family background variables and parental involvement were the independent variables & S.R.A. and grades were the dependent variables of interest. These results indicated that ability is the best predictor of both S.R.A. & grades accounting for 44% of the variance in both. Parental involvement accounted for another 3% of the variance for S.R.A., while none of the family background variables predicted S.R.A. Grades were predicted by father's education & the length of time the family has lived in the area, accounting for 3% of the variance. The results were substantiated when stepwise multiple regression models were computed using the 3 factors identified with the questionnaire ability and family background variables to predict S.R.A. & grades. Again ability was the best predictor for both. Factor-2 of the scale predicted S.R.A. while father's education & length of time the family has lived in the area predicted grades.

Sarkar (1983) studied the contribution of some home factors on children's scholastic achievement. The major findings were: 1. The home variables such as educational environment, income spatial environment, social background,
provision of facilities and parent child relationship showed a significant difference between the high achievers and low achievers at .01 level. 2. The child rearing attitude of the mothers of the two groups showed a significant difference between the mothers of the high achievers and the low achievers at .01 level, indicating thereby that the mothers of the two groups possessed different attitudes regarding child rearing practices. 3. The multiple correlation coefficient was 0.546. 4. The multiple regression equation revealed that the contribution of parent child relationship to academic achievement was about 17 percent, of social background about 7 percent and of educational environment about 4 percent. The remaining five factors-income, spatial environment, rejection of home making role, harsh punitive control and intelligence, explained about 2 percent of the variance of the criterion scores.

Singh (1984) explored the relationship of home environment, need for achievement and academic motivation with academic achievement.

The major findings were: (1) Aggregate marks were significantly and positively related to average marks and self concept of academic ability. (2) Self-concept of academic ability was significantly and positively related to academic motivation. (3) Need for n-Ach as an operant was
not related to any of the respondent's measures. (4) Sex differences were statistically effective in all the four areas of 'home environment'. Males had significantly higher mean score on school, economic recreation & home problems. There were sex differences in respect of permissive, loving, protecting and rejecting behaviours in father, whereas girls perceived permissive, loving, neglecting and rejecting behaviours in their mothers. Sex differences were unrelated to self concept of academic ability and need for achievement motivation. 5. School differences were significant in the area of school, economic and home problems of 'home environment', restrictive, permissive, loving, protecting and rejecting behaviours of father; and restrictive behaviour of mother.

Shukla (1984) studied achievement of primary school children in relation to their socioeconomic status & family size. The following conclusions were drawn.1. There were no significant sex and rural – urban differences in the academic achievement of primary school children.2. S.E.S. was positively and significantly related to academic achievement. 3. At class III level, children belonging to the large family size category had significantly better academic achievement than those of average and small family
size categories. 4. At class V level, the positive impact of large family size had been completely nullified. There was a tendency of better achievement among the children belonging to the small family size category. 5. The structure of family, whether joint or unitary, had no significant differential impact on academic achievement. 7. The Adult child ratio of (1:1) had shown significantly greater relationship with academic achievement.

1.3.3 **Achievement & Personality Variables:**

Some researchers made attempts to find out the effect of non intellectual variables on academic achievement.

Chopra (1982) made a study of some non intellectual correlates of academic achievement at high school level. The study was designed to find out the relative importance of intelligence and various non intellectual variables in determining academic achievement. The major findings of the study were (i) socioeconomic background was a very important determinant for contribution of education. Significantly a larger number of students from the lower socioeconomic classes failed in the X exam. and significantly a larger number of I class students belonged to higher socioeconomic classes. Parents from higher socioeconomic classes gave
greater help and encouragement to their children for studies. (ii) Study habits were positively related to academic achievement. (iii) Students from higher socio-economic classes had higher educational and occupational aspirations. (iv) A larger number of students from higher socioeconomic classes did some planning for a future career in life. (v) Home adjustment was more closely related to academic achievement than emotional health & social adjustment. (vi) Attitude towards education had very high positive correlation with academic achievement. (vii) As regards relative importance of different variables, the coefficient of multiple correlation between academic achievement & intelligence, S.E.S., study habits, home adjustment, health adjustment, social adjustment, emotional adjustment & attitude towards education was 0.874. The coefficient of multiple determination was 0.764. To determine the importance of different variables for the prediction of academic achievement. Beta coefficient were calculated and the variables in order of magnitude of the coefficient were attitude towards education, S.E.S., intelligence, study habits, home adjustment and social adjustment. Health & emotional adjustment did not appear to add to predictive value when these variables were taken together.
Mehna (1986) did an investigation into some factors affecting academic achievement in science of standard IX students of Greater Bombay. The major findings of the study were: Six variables, viz. verbal intelligence, motivation for learning general science, scientific knowledge and aptitude, numerical ability, liking for teachers of science and interest in medicine were significant predictors of achievement of class IX students in general science. The significant predictor variables for boys were scientific knowledge and aptitudes motivation for general science, verbal intelligence, interest in commerce, numerical ability and liking for science teachers. The significant predictors of achievement in general science for girls were verbal intelligence, motivation for general science, scientific knowledge and aptitude, liking for teachers of general science and numerical ability.

1.4 CONCLUDING REMARKS:

The discussion given in the previous sections alongwith a comprehensive review of related research leads to certain meaningful conclusions regarding the relationship of academic achievement with cognitive and non-cognitive factors. It was found that most of the studies relating achievement and intelligence have correlated IQ scores and
such variables as highest grade completed, examination marks, grade point average and teachers' ratings. Since correlations do not necessarily indicate causal relationships, one can only demonstrate the extent to which these variables are associated with one another. One cannot be certain that high IQ causes students to achieve high marks, continue their education, or that education or high achievement enhances IQ. Making causal inferences on the basis of correlation is misleading.

However, substantial degree of correlations have been reported level of education received and IQ scores and those who continue their studies from primary school through middle and high school to college level are brighter than those who drop out. Some evidence supports the hypothesis that continuing education raises IQ test scores. Studies generally agree that those who initially score low on IQ tests tend to score even lower on subsequent tests when they are no longer attending school. For those who continue to attend school, IQ scores tend to increase significantly.

Examination marks also have been found to correlate substantially with IQ scores. The degree of these correlations depends on: (i) nature of achievement and intelligence tests, (ii) the nature of the subject matter, and (iii) the nature of the students. In general group tests of IQ correlate higher with school marks than individual
tests. The main intervening variable is perhaps reading ability which is instrumental in both achievement and IQ group tests. It has been found that IQ tests tend to correlate more highly with standardized achievement tests than they do with school marks. Some of the correlations of standard achievement tests with IQ tests are as high as .90. In such situations the distinction between achievement and intelligence is all but eliminated. Whatever certain achievement tests measure is also measured by IQ tests. The correlations are highest when achievement tests emphasize verbal reasoning skills.

The IQ scores tend to be better predictors of achievement at school level than at college level. This is due to narrow range of ability in college population. Intelligence has very high correlation with reading ability at the lower grades.

The role of non-intellectual variables in determining achievement in academic subjects is also worth noting. The review of researches has shown that certain 'opportunity' and 'motivational' variables play a vital role in performance in school examinations. Substantial degree of correlations have been reported between achievement test scores and family background variables such as socioeconomic status, family income, parent education, family size home
environment, parent involvement, previous schooling, and relationship with parents. Similarly, the variables associated with motivation are also significant determinants of academic achievement. These include, interests, attitudes, study habits, aspirations, family values and certain personality variables.