CHAPTER Two

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2.1 RELATED LITERATURE: ITS IMPORTANCE

Related literature is the base or foundation on which the structure of further studies is laid. The study of related literature enables the individual not only to gain familiarity with the knowledge of the past achievements and developments in the concerned area but it also enhances the ability of the individual to make his own contribution towards increasing the previous stock of knowledge either by adding something altogether new or developing the old one with a new perspective. With this objective in view, before starting the present investigation a thorough survey of the related literature was done so as to explore the area, for further work that would be meaningfully useful.

Since the aim of the present study was two-fold—first to construct and standardize the achievement test in Mathematics for class V children of age group (9 to 10 years) and then to utilize the test to find out the academic achievement of the students in Mathematics to further study its relation with the Intelligence, Achievement Motivation and Socio-economic Status of the children, the concerned related literature regarding standardized achievement
tests and one that showed the relation of academic achievement of students with their intelligence, achievement motivation and socio-economic status was surveyed by the investigator. The history of standardized tests was given in chapter one.

2.2. RELATION BETWEEN VARIABLES

In the following pages a description of the related literature regarding the independent variables of intelligence, achievement motivation and socio-economic status and their relation with the dependent variable of academic achievement in Mathematics has been given.

2.2.1. INTELLIGENCE AND ACADEMIC ACHIEVEMENT

Many studies have been done in the past which have shown that academic achievement of students in Mathematics and other subjects is related to the intelligence of the children of various grades.

Studies by Terman and others (1925); Hollingworth and Cobb (1923); Carroll (1930); Sanford (1932); Wedemeyer (1933); Geva (1935) and Hammond and Cox (1967) and several others have reported that superior intelligence is associated with high academic achievement. High intelligence accounts for superior problem solving abilities, effective work habits, independent thinking and desirable behavioral characteristics leading to high academic achievement.

Many scientific researchers in the past have shown and given a considerable weight to intelligence as a major influencing factor in the domain of academic achievement. Briggs (1962); Mitchell (1963); Keller and Fowle (1964); Helfield (1966); Harris (1968); Vernon (1970) all have shown that intelligence influences the academic achievement of the children to a great extent.
The relation between intelligence and reading achievement of children was studied by Hilliard (1924); Bell (1942); and Carlson (1949). Gray (1960) reported that correlation between intelligence and reading achievement test tended to cluster between 0.40 and 0.60. The studies conducted by Hage and Shroud (1960) revealed that reading comprehension and rate of reading correlated significantly both with the verbal and non-verbal intelligence scores, but more highly with verbal scores. Using partial and multiple correlation, they found that verbal scores affected reading more than non-verbal scores by reading proficiency.

Rao (1965) studied the relationship of intelligence, study habits, attitude of pupils towards school and socio-economic-status with academic achievement and found that the first three variables jointly contribute sixty-six percent towards the academic achievement. The contribution of socio-economic-status did not come out to be significant towards academic achievement.

In a recent study of the relative importance of some selected factors on reading achievement of primary school children, Anyanyam (1983) found that the general mental ability, which was considered to be a genetic factor, had a high and positive relationship with the reading achievement of children.

On the basis of several research findings Freeman (1942) concluded that the correlation between I.Q. and academic achievement varied from .40 to .60 with a mean value of .51 approximately. Crawford and Burnham (1946) reported the variation in correlation between intelligence and academic achievement scores to be from .60 to .65.

Lennon (1950) in a study with grade IV and above students found a positive correlation between intelligence of children and their academic achievement. It was .11 between I.Q. and arithmetic fundamentals at second grade and .86 between I.Q. and vocabulary score at 8th grade. In a study Dibble (1971) found zero order 'r' of .48 between intelligence and criterion variable of academic achievement.

Coppens (1967) in a study with Dutch high school
subjects found a positive correlation of .20 and .39 between intelligence and 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 significant 'r' of .57 between achievement and progressive matrices. Dewan (1970) found in his study a positive correlation of .51 between Jata's Test of Verbal Mental ability and the annual marks of grade IX students. Pandey and Singh (1970) showed a positive correlation of .46 and Dhillon (1971) found an 'r' of .50 between intelligence and the criterion variable of achievement.

From the above studies it is evident that there is a positive and significant relationship between the two variables of intelligence and academic achievement. But these studies at the same time, also reveal that there is a great variation in 'r' between these two variables. On the basis of summary of review of various studies, Super (1949) found that coefficient of correlation 'r' between intelligence and academic achievement ranged from .30 to .50 at school level, whereas at college level the range was found from .20 to .70 which was lower. A greater variation of .10 to .20 in the value of the coefficient of correlation 'r' between intelligence and achievement was found by Stephens (1960). Green and Marquhar (1965) in one of the studies, found a negative and low coefficient of correlation 'r' of -.01 between verbal aptitude and academic achievement of Negro Males. In the same study they found a highly significant 'r' of .62 while working with white males and making use of the same instruments.

On the other hand based on the findings of a study, Pellechere (1972) revealed that intelligence was not systematically related to academic performance. Thorndike (1963) pointed out that there was no 'a priori' justification for expecting an exact, one to one correspondence of academic achievement with scholastic measure which justified the fact that there were also other significant determinants, such as, non-intellective environmental determinants as

A definite and significant relationship was found by Milberman (1961), in a study, between measures of intelligence and the amount of learning when high school students were taught logical relationship with an item programme using multiple choice items. Sahay (1961) found a positive and significant relationship at .01 level of significance between intelligence and post-test scores of students when taught through programmed learning. Gagne (1962) found no significant effect of ability upon success in the learning task.

In a study Lambert, Miller and Willey (1962) observed that intelligence was significantly associated with immediate acquisition.

Coulson and others (1962) found no significant correlation between ability and performance either for linear or for branching programmes in logic. The study also revealed that the more closely a programme resembled a text book, the higher would be correlation with intelligence.

Feldman (1965) found in a study that on transfer test subject s of high ability did better than those of low ability, but subjects of low ability did better from study by text than study by programme.

Woodruff, Felzt and Wagner (1966) reported significant correlations for grade IX children between their ability measures and number of frames correct, on a programme in electricity.

Barton and others (1972) studied personality and I.Q. measures as predictors of school achievement. They found that the personality factor "Conscientiousness" and I.Q. predicted achievement in all areas namely Social Studies, Science, Mathematics and reading. The study also showed that in Mathematics adventurousness was related to achievement at .01 level.
Porter (1959) found that in teaching spelling there was no significant relationship between intelligence scores and achievement of the groups taught with machines, though there was a significant positive relationship between these two factors when a conventional method of teaching was used.

Intelligence and achievement are correlated positively has been shown by Chancey (1929) in a study of grade IX students. He found a positive correlation of +0.393. Nesi (1961) revealed that no other characteristics of children were more related to intelligence than achievement. Nescheh (1965), Klebanoff and Weir (1964) and Edwards and Tyler (1965) also found that there was a high correlation (about +0.70) between I.Q. and achievement. In a study on secondary school pupils in Kerala, Nair (1969) revealed a significant correlation between Progressive Matrices and achievement test scores (r=0.528).

The relationships of school marks with intelligence was studied by Shivaranyya (1947), Richarda (1952), Sirivastava (1955), Bhargava (1957) and Neneji Am (1977). All except Sirivastava (1955) found the correlation to be positively significant. Sirivastava (1955) found the correlation to be low.

In a study, Mundal (1972) found that the correlation between the two measures of achievement and intelligence test scores was positive and moderately high. Mohan (1979) reported that intelligence, as measured by progressive matrices scale, was positively related with total educational attainment. In the study of B.S.C. passed students, Contractor (1977) found that I.Q. was positively related with educational attainment. According to Russel (1943) intelligence came to be the best predictor of the achievement.

Sodhi (1976) in a study of programmed learning in chemistry in relation to taxonomy of educational objectives, intelligence and personality found that intelligence was related to academic achievement of students,
Malk (1975) found that there is positive though low, but statistically significant relationship between intelligence and academic achievement (r = .33). The study of Sanand Raj and Krishnam (1980) has indicated that academic achievement has positive and substantial correlation with intelligence. Sinha (1966) carried out a psychological analysis of some factors associated with success and failure in university education. He found that the intellectual level of low achievers is poor.

Seo and Verma (1977) found in a study of students of age level (5 to 10 years) that the coefficient of correlation between number concept test scores and intelligence is high (+.84) pointing out the significant and high positive relationship between these two variables. Malk (1977) found that intelligence and academic achievement were highly correlated (r = .435).

Sharman and Aggarwal (1980) found in a study that (i) the performance of students on different test scores of cognitive tasks varied directly with intelligence. (ii) The interaction between intelligence and school achievement had significant impact on the performance in cognitive tasks in algebra at knowledge level only and not at the comprehensive and application levels.

Hoban (1972) noted the imperfect nature of correlation between academic achievement and intelligence, ranging between .20 and .60. On the other hand, Contractor (1977) in a study with third year B.A. students found that there was no relationship between intelligence and educational attainment in English.

3.2.2

On a review of the related literature showing relationship between achievement and academic achievement, it has been found that the findings of the various researchers in the field are contradictory, which is evident from the following studies:

A number of investigators had shown that academic
achievement was significantly related to need achievement. Sinha(1970) on the basis of McClelland's tool attempted to investigate the relationship between achievement motivation and academic achievement of school going children. He found that the achievement motivation was positively and significantly related to academic achievement and thus two groups of high achievers and low achievers could be significantly differentiated. Mehta(1969), Desai(1970), Sinha(1970), Patel(1972), (1971), Rawal(1971), Desai(1972), Mehta(1973), Patel(1975) and Dave(1976), found positive correlation between scores of achievement motivation and academic performance.

Rhosen(1955) in a study with the entire male population of secondaries in two large public schools in the New Haven area, found a significant relationship between achievement motivation and grades (performance) i.e. academic achievement and between values and educational aspiration.

An early investigation by Clark and McClelland(1956) and one by Lowell(1952) showed that individual differences in achievement motivation scores obtained from stories were positively related to performance on simple laboratory tasks. But McClelland, Atkinson, Clark and Lowell (1953) soon made it apparent in many experiments reviewed in the book "The Achievement Motive" that factors in the situation at the time of performance strongly influence the relationship between strength of motive and performance. Atkinson(1953) showed that recall of interrupted tasks, which was conventionally viewed as indicative of strength of motivation, was positively related to the strength of achievement motivation in individuals only when tasks were presented as tests on which it was important to do well. This suggested that the achievement motive should be thought of as a latent disposition which is aroused and manifested in overt goal striving only when the cues of a situation clearly indicate that performance is instrumental to accomplishment.

French(1955) in an independent measure of motivation and a performance test which were given under three different verbally created conditions of achievement motivation viz: relaxed, task motivated, and extrinsically motivated, showed
that (i) increase in achievement motivation score was a function of both previous motivational level and the experimental conditions; (ii) performance scores were more closely related to motivation scores than to experimental conditions; (iii) performance scores in one situation tended to be most closely related to motivation scores than in another when the situations presented similar motivational cues; (iv) in addition, when affiliation cues were more prominent in the situation than achievement cues, performance was related to affiliation motivation scores rather than achievement motivation scores. She showed that when an incentive unrelated to achievement motivation is offered, no systematic relationship is found between performance and achievement motivation.

Studies of Lowell(1952), French(1955), Atkinson(1955), Wendt(1955), and Atkinson and Rachelson(1956), showed a positive relationship between performance and achievement motivation scores obtained from thematic apperceptive stories when the cues of the performance situation arouse the expectancy that a feeling of personal accomplishment will accompany a good performance. On the other hand, when the cues for performance are deliberately manipulated so that the subjects were given no reason to expect that they would experience pride in accomplishment, there was no relationship between performance and achievement motivation scores.

Atkinson and Reitman(1956) showed that in the achievement-orientation condition, the performance level of the high achievement motivation groups was significantly higher than that of the low achievement motivation group on both i.e. the number of solutions attempted and number correct. In the multi-incentive conditions there was no significant difference between the performance levels of the two motivation groups. They further contended that the relationship between achievement motive and arithmetic performance was eliminated by systematically engaging other motives (affiliation and money) in the same performance.

In a joint effect of achievement motivation and of
aptitude on arithmetic performance, Lovell (1952) found no relationship between achievement motivation and quantitative aptitude among college students.

Atkinson (1958) in a study showed that very little difference between performance levels of high and low achievement motivation groups existed when the monetary incentive is high ($2.50). But there is a suggestive difference between the performance levels of high and low achievement motivation groups when the monetary incentive is low ($1.25) and the probability of winning is also low. The mean of the high achievement motivation group (N=13) was 50.85 and the mean of the low achievement motivation group (N=11) was 46.13.

Pottharst (1955) found that students who are high in achievement motivation tend to state higher levels of expectation for performance of a task at which they have had no previous experience than the students who were low in achievement motivation. Her finding confirm an earlier one of McClelland, Atkinson, Clark and Lowell (1955), which showed that when cues which define a person's past level of performance were ambiguous or in conflict, the students who were high in achievement motivation set their level of expectation higher than the students/were low in achievement motivation. Further according to them it was found that students who were high in achievement motivation tend to overestimate their previous grade point averages in college. Together, these findings suggest that a person who is high in achievement motivation when faced with a novel task and stated odds concerning his chances of winning, might feel subjectively that his chances are a little better.

Moulton, Atkinson, Raphaelson and Kristofferson (1952) showed that a difference could be shown to exist between recognition thresholds for success and failure words of high and low achievement motivation groups following experimental arousal of the motive but not when the motive has not been experimentally aroused before the determination of thresholds. In the case of failure words, the difference between recognition thresholds of high and low achievement motivation groups following motive arousal is significantly larger than in the neutral condition.
In some of the findings it was found that the individual with high achievement motivation exhibits a tendency to achieve success on particular task, whereas those with low achievement motive show a tendency to avoid failure. Shatnagar (1967), found that the ever achievers were characterised by comparatively higher degree of achievement motivation, non-dominance.

Lakshmi(1967) tried a new theme and experimentally established relationship between the rate of learning and achievement motive in High school boys. She showed that fast learners had higher achievement motivation than slow learners. Aronson (1966) found a positive correlation between academic improvement on the Lovekl Scrambled Words test (performance) and the discrete-fuzzy variable (n-Ach) \( r = .30, p < .05 \). He also found a correlation between improvement in Scrambled Words performance and total quartile score for all measures to be 0.33 \( p < .05 \). The correlation between improvement in Scrambled Words Performance and TAT measure of achievement motivation is .46 \( p < .05 \).

Malik(1977) found achievement motivation to be slightly related to achievement in Chemistry. Achievement motivation is to a little extent helpful in academic achievement in Chemistry. He also found that intelligence is related to achievement motivation very slightly. Patel(1977) in a study with class X students found a significant relationship between academic achievement and HOS/FOF of pupils. Pupils with HOS have achieved 22.2 more than FOF pupils. The performance of FOF level pupils is weak in Mathematics \( N = 19, 40 \) below the passing percentage of 40.

Christian(1980) in a study with 500 girl students of Sardh Patel University from pre-university to post-graduate classes in all streams: Arts, Science, Commerce, Engineering, Home science and Education found that high achievement motivation has no effect on students' performance. In the same study he found that the mean scores of Ist class and failures were more or less the same and that of third class was highest. He concluded that there is no relationship between achievement motivation and academic performance. He also concluded that anxiety had no effect on performance. Verma(1977) showed that Reading comprehension and n-Ach have positive relationship.
The effect of anxiety on educational performance had been very extensively studied, as part of a larger scheme; most of the studies show that anxiety is negatively associated with educational achievement. Studies by Sarason(1952), McKeehan (1953), Cartwood(1956), Feldhusen and Klausmaier(1962), Spielberger(1962), Frost(1968), Caspeau(1968) and Golbin(1974) all indicate the existence of such negative influence on human performance. Many of the parallel studies conducted in India namely the studies by Samuel(1972), Nijwani(1972), Sinha(1972), Sacharia(1974), Umanayu and Khairwall(1974), Mathew(1975), Iyer(1977), Soman(1977) and Thomas(1979) all support the findings obtained by researchers in western countries.

Nair(1980) concluded that the coefficient of correlation revealed a considerable negative association between the two anxiety variables and cognitive mathematics achievement. He concluded that other factors remaining the same any increase in anxiety will tend to decrease cognitive performance in Mathematics and Vice-Versa.

2.2.3. A review of the related literature has also been done in order to find out if there existed any kind of relationship between the third independent variable of socio-economic-status and the dependent variable of academic achievement of students. There is a general feeling that the students with better socio-economic-status show better academic achievement when compared with students of lower socio-economic-status.

Curry(1962) and Anand(1973) contend that it is well documented that the low socio-economic-status children perform less successfully than middle socio-economic-status children in many kinds of academic and experimental situations. Pointing to the importance of socio-economic-status, Lalithama (1975) observed that the achievement of high school children in Mathematics was positively related to socio-economic-status of the children, Vijaya Lakshmi(1980) also concluded that high creatives were found iron high socio-economic-status group.
Miller (1970) concluded that factors associated with achievement of children are generally less associated with social class. Besides, the finding of Bansal (1977) revealed that socio-economic-status was not significantly related to achievement in any subject or group of subjects.

"Conceptual understanding of Mathematics at each developmental stage is likely to be influenced by family environment," Hildebrand and Patricio (1979).

Gakhar (1983) concluded that high socio-economic-status accounts for higher achievement in mathematical concepts and low socio-economic-status accounts for low achievement in them. Hence, he showed that achievement of children in mathematics was positively related to socio-economic-status of the parents.

Mathur (1963), Chandra (1964), Srivastava (1967), Anand (1973) and Menon (1973), all found high relationship between socio-economic-status and academic achievement of children.

The difference in language competence of different socio-economic classes is also shown by Deutsch (1964).

Kao (1965) studied relationship between socio-economic-status and academic achievement and found that the contribution of socio-economic-status towards academic achievement did not come out to be significant.

In the study of Chandra (1964) it was found that the students who belonged to the higher qualitative group on the basis of parents' education, occupation, family income, type of loading, size of the family and cultural level of home, showed significantly higher achievement than the students who belonged to lower qualitative groups. Sharma (1967) found in the context of caste of students that in the case of the higher level of caste, there was better achievement. The study of Dube and Dube (1971) also showed similar results.

Jha (1970) and Nundy (1975) found no significant relationship between socio-economic-status and achievement of children.

Singh (1965) found high relationship between reading ability of children and the education and healthy adjustment of their parents. Jain (1965), Dukhin (1966) also found the
similar results in their respective studies. Subrahmanyam (1979) established high correlation between reading achievement and home environment of children.

In recent study of the relative importance of some selected factors on reading achievement of primary school children, Subrahmanyam (1983) concluded that (i) the conducive home environment is contributing much to the reading achievement of children irrespective of their socio-economic status which is composed of caste, occupation and income of parent, (ii) the socio-economic status of the family is contributing less to the reading achievement of primary school children when compared to other variables.

Miner (1966) found that there was some definite relationship between socio-economic status of high school pupils and their scholastic achievement. He said that socio-economic status was positively related to performance. Gupta (1968) found that there was significant relationship between parents' income and occupation and children's academic achievement.

Pavitran and Beroj (1968) found that there was high relationship between the occupational status of parents and scholastic achievement of pupils. Rao (1968) found a significant correlation between socio-economic status of parents and academic achievement of pupils. Bennur (1961) showed that pupils of different socio-economic status differed significantly from each other in their academic achievement, children from upper socio-economic status were better achievers in the school subjects. Rao (1977) found that the socio-economic status of pupils was the most important single predictor of academic achievement. Naidu and Aaron (1969) concluded that academic achievement depended to a large extent on heredity. Even then, they found that environmental factors (SES) had also influenced the academic performance. Aaron, Narahal and Balatesha (1960) found that it was the basic difference in the socio-economic status that influenced the motives and attitudes of pupils and not the location of one's home—rural or urban. They concluded that rural—urban dichotomy was secondary to the economic and social forces.
that were in operation in these societies.

Fraser (1999) pointed out that the educational level of the parents, their reading habits, income, occupation and living space were related significantly with the I.Q. and the academic performance of the child. A significant relationship between the socio-economic-status of the students and their academic achievement was found by Singh (1962), Chabra (1970), Mehta (1972) and Saini (1973).

Nishra, Das and Pach (1966) found that students coming from high socio-economic-conditions were found to achieve better. Positive relationship between academic achievement and socio-economic-status was observed by Coleman (1960), Amos (1943), Gough (1946), Hollingshead (1949), Campbell (1952), Fraser (1959), Kajal and Sridhar (1959), Caste (1959), Douglas (1964), Wiseman (1964), Marri (1966), Lynn (1973) and Silver (1973). Ramji Rao (1977) found in a study that socio-economically disadvantaged children were poor in academic achievement.

George and Tharakan (1977) found a significantly favourable influence of economic status on achievement. Higher economic groups scored more than lower economic groups. Chickermose (1967) found in a study that a high relationship existed between reading ability of children and the education and healthy adjustment of their parents.

Fraser (1958), Miner (1968), Swift (1967) observed that the better the socioeconomic-status of the child, the higher will be its academic achievement.Katech (1962), Argyle (1965), Swift (1967) and Saini (1973) observed that the parents' educational level had a positive influence upon the academic achievement of their children. Kohl (1956) and Katech (1962) had shown that the higher the income of the parents, the better was the academic achievement of the child.

Katech (1962), Miner (1968), Saini (1973) showed that positive relationship existed between the educational level and the academic achievement of the child, between the parents.
Mishra (1980) studied students from both rural and urban schools and found a correlation of 0.59 between home environment indices and school achievement scores, whereas intelligence test scores and school achievement test scores correlated only to the extent of 0.31. Manik (1975) found that there was positive and statistically significant relationship between achievement and socio-economic-status (r = .33) and intelligence and socio-economic-status (r = .33) and intelligence and achievement (r = .32).

The study of Sananda Raj and Krishnan (1980) indicated that achievement had positive and substantial correlation with both intelligence and socio-economic-status, while it had negative and low correlation with family size. Sharma and Santosh (1980) in a study found that there was a significant and positive correlation between high socio-economic-status, the education of the family and the academic achievement of the students.

Venkataiah (1980) found in his study that the socio-economic-status was positively related to the academic performance of both arts and science students. On the other hand Christian (1980) found that the coefficient of correlation between the mean score of performance and socio-economic-status was negative and non-significant (-0.019).

There are marked individual differences that arise due to personal and environmental factors. Among environmental factors socio-economic-status has been considered very important for academic achievement of the children. Teachers, educationists and researchers have all commented on the poor performance in language of the lower class children. Bisnet (1961) thought that part of the negative relationship between family size and I.Q. was the result of the type of speech model made available to the child. Bernstein's (1966) systematic observation highlighted the sharp contrast between what he labelled the "restricted language of lower class" and the elaborate codeword messages of the upper class. McCarthy (1954) pointed out that children from a
higher socio-economic-status group talked more spontaneously than those from a lower socio-economic-status group. Hess and Shipman (1965) conducted a study on verbal abilities of children of four social classes. Children from middle class homes ranked above the children from the lower class in sorting and verbal skills. Mohite (1979) in a study revealed that there was significant difference between the performance of the students of lower and middle classes in both vocabulary and comprehension. The middle class children were more advanced in their vocabulary and comprehension performance as compared to lower class children. It was also revealed in the same study that middle class children had more perfect, clear and correct articulation as compared to that of lower class children.

Thus, it is evident from the investigations, which were conducted with the objective to find relationship between the socio-economic-status of the students and their academic achievement, that no consensus was reached among the researchers and the results reported by them were contradictory.

In the third chapter the work of development and standardization of achievement test in Mathematics is taken up. It includes the various guide lines for the construction and standardization of the test suggested by different writers in the past.