

Trend in Researches on Mathematics Achievement

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Abstract: *The quality of teaching and learning mathematics has been one of the major challenges and concerns of educators. If we consider a group of students, a few students are found to be high achievers on the one hand and a few are low achievers on the other. The question arises why such a difference in achievement appears? Is this difference due to certain factors? or Is there any single factor or host of factors which account for all the differences in mathematics achievement ? These questions often appear in the minds of the Educators, Educationists and the Psychologists, but with hardly satisfactory answers. In this paper a comprehensive review of the related literature is done to identify the factors affecting the mathematics achievement of students. Review of the related literature reflect that the most preferential variables is in psychological category are Intelligence, Attitude towards Mathematics, Self-concept, Numerical Ability and Math Anxiety; among Social variables the variables which were considered very widely are Socio-economic Status, Parental Involvement & Parents Education and among Biographical variables most frequently considered variable is Sex.*

I. Introduction

In modern world, mathematics is being increasingly used in sciences, technologies, social science, education etc. With the use of computer and other devices there is a more emphasis in the mathematics. Though the world is more mathematically inclined, the majority of students in school feel it as more abstract. Though the teacher can teach it with the help of modern educational technological devices and more advanced effective methods of teaching, there is a poor performance of the students in the mathematics. Hence, there must be some factors like psychological, social and biographical affecting the learner in learning of mathematics at large.

In a study considering the factors of achievement in mathematics, one possibly ignores those aspects in which individuals differ from one another. The starting point may be achievement in mathematics itself where wide ranging variations occur from the point of non-performance to the point of outstanding achievement in it. If we consider a group of students, a few students are found to be high achievers on the one hand, and a few are low achievers on the other, while a sizable number of students always appear as moderate achievers. The question arises why such a difference in achievement appears when the school provides more or less uniform instructional and environmental facilities? Is this difference due to certain factors? Does this difference depend upon inherent qualities? or Is there any single factor or host of factors which account for all the differences in mathematics achievement ? These questions often appear in the minds of the Educators, Educationists and the Psychologists, but with hardly satisfactory answers. Various investigators have explored numerous factors which are found responsible for success or failure in the mathematics. Such factors seem to come under three general heads, which are shown in the following table –

Table 1: Associated Psychological variables and related research studies in relation to Achievement in Mathematics

S. No	Variables	Researcher's Name by which the variables studied in relation to Mathematics Achievement
1	Attitude towards Mathematics	Watson (1981), Miller, Linda, Herman (1981), Robert (1982), Mckethan (1982), Endsley (1984), Nagialiankin (1988), Pal Ashutosh (1989), Jayraman (1989), Rajyaguru (1991), Nagailiankin (1991), Bhaskaran (1991), Wohlgehager (1992), Rosaly (1992), Rodriguez (1992), Hariharan (1992), Armstrong (1992), Miller (1993), Driver (1993), Bassa (1993), Thampurathy (1994), Chakalisa (1994), Thomous & wangu (1995), Stella & Purushothaman (1995), Segars (1995), Jamison (1995), Hart (1995), Chism (1995), Bragg (1996), Pruett (1997), Hunt (1997), Sumanagala (1998), Srinivasan (1999), Toole (2001), Chen (2001), Ganihar& Wajihar (2009) and Choudhury & Kumar (2009)
2	Intelligence	Bhushan and Sharma (1981), Annamal (1981), Rajput (1984), David and Michal (1984), Singh (1986), Das (1986), Rajyaguru (1991), Kasat (1991), Nagialiankin (1991), Setia Seema (1992), Lalitha (1992), Abdulmajeed (1992), Segars (1995), Whang (1997), Patel (1997), Kaliyan (1997), Sumangala (1998), Arreita (1998), Glutting Joseph (2006) and Fernandez (2011)
3	Math Anxiety	Ashutosh (1989), Rajyguru(1991), Owens (1992), Vance (1993), Lafferty (1996), Maree et al. (1997), Patel (1997), Piearey (1997), Soman (1997), Bruno (1999), Ma (1999), Abu-Hital & Maher (2000), Ho et al. (2000), Cates et al. (2003) and Maree et al. (2005)
4	Self-Concept	Singh (1986), Ashutosh (1989), Rangappa (1993), Sumangala (1998), Robert (1997), Pajares (1999), Abu-Hital & Maher (2000), Natali (2001)
5	Study Habit	Singh (1986), Biswal (1988), Ngialiankin (1988), Patel (1997), Jacobbi (1997), Arrieta, (1998) and Choudhury & Kumar (2009)
6	Mathematical Aptitude	Khatoon(1988), Rajyaguru (1991), Abdulmajeed (1992), Miller (1993), Sumangala (1998) Rajani (2006) and Sethi (2011)

7	Numerical Ability	Kasat (1991), Nagialankin (1991), Lalitha Bai (1992), Sumangala (1998), Kaliyan (1997) and Toole (2001)
8	Achievement Motivation	Rajput (1984), Bhaskaran (1988), Ashutosh (1989), Sanchez (1995) and Srinivasan (1999)
9	Cognitive Style	Narayan (1995), Hall (1993), Testone (1992), Bragg (1996) and Aseeri (2000)
10	Self-Esteem	Strutchens (1993), Cashin (2001), Natali (2001) and Christon et.al (2001)
11	Interest in Mathematics	Singh (1986), Khatoon (1988), Kasat (1991) and Sitha, (2003)
12	Test Anxiety	Somasundaran (1980), Patel (1997) and Ganihar & Wajiha (2009)
13	Reading Ability	Rangappa (1992), Testone (1992) and Arrieta (1998)
14	Problem Solving Ability	Bure (1999), Arrieta (1998) and Thampurathy (1994)
15	Mathematical Creativity	Biswal (1988), Thampuraty (1994) and Toole (2001)
16	Edu & occu. Aspiration	Nagialiankin (1991), Teague (1995) and Chen (2001)
17	Personal Adjustment	Soman (1977), Singh (1986) and Setia (1992)
18	Locus of Control	Sanchez (1995)
19	Emotional Stability	Singh (1986)
20	Confidence in Maths	Chakalisa (1994)

Table -2 : Associated Social variables and related research studies in relation to scholastic Achievement in Mathematics

S. No	Variables	Researcher's Name by which the variables studied in relation to Mathematics Achievement
1	SES	Sharma & Bhargava (1980), David & Michal (1984), Leach & Tunnechlifle (1984), Rajput (1984), Singh (1986), Deshmukh(1988), Rajyaguru (1991), AbdulMajeed (1992), Kim (1992), Prabha Rashmi (1992), Setia (1992), Leiker (1993), Thampurathy (1994), Segers (1995), Harris (1996), Piearey (1996), Patel (1997), Pruett (1997), Grootenbore & Hemmings (2007), Mustafa (2009) and Engin, Nuri & Hulya (2010)
2	School-Environment	Testone (1992), Kim (1992), Thomous and Wangu (1995), Harris (1996), Well (1996), Pruett (1997), Wong and Watkins (1998), Srinivasan (1999), Yan, Amery & Bruna (2006), Ibrahim, Serpil & Ozer (2009) and Gozde & Giray (2010)
3	Home-Environment	Bonder et.al. (1982), Tsai and Walberg (1983), Marjoribank (1983), Dolan (1983), McGowan et.al. (1984), Medrick and associates (1985), Javonovic (1992), Pruett (1997), Jacobbi (1997) and Chen (2001)
4	Parents Education	Prabha (1992), Strutchens (1993), Santhamma (1996), Wells (1996), Patel (1997), Srinivasan (1999) O,Dwyer (2005) and Mustafa (2009)
5	Parental Involvement	Rajyaguru (1991), Strutchen (1993), Wells (1996), Addington (1996) and Arnold & Judith (1996)
6	Father's Occupation	Rajyaguru(1991), Prabha (1992), Santhamma (1996) and Patel (1997)
7	Income of Father	Rajyaguru (1991), Prabha (1992), Addington (1996) Mustafa (2009)
8	Social Status	Rajyaguru(1991) and Thampurathy & Girija (1999)
9	Social Relations	Somasundaran (1980) and Singh (1986)
10	Type of School	Thomous & Wangu (1995) and Wells (1996)
11	Teacher's Expectation	Turner (1993), Strutchens (1993)
12	Social Maturity	Singh (1986)

Table-3 : Associated Biographical & Instructional Variables and related research studies in relation to Achievement in Mathematics

S.No	Variables	Researcher's Name by which the variables studied in relation to Mathematics Achievement
1	Gender	Houston (1980), Ann Marle (1981), Becker (1981), Rule (1981), Sathiyagirirajan (1981), Soundararaja Rao (1981), Heimann Vtefreyja (1982), Holland & Sandler (1982), Jensen (1982), Endsley (1984), Carmichall (1986), Koehler (1986), Metcaff (1986), Khatoon (1988), Rajyaguru (1991), Abdulmajeed (1992), Sucin (1992), Testone (1992), Wohlgehager (1992), Bassa (1993), Driver (1993), Leiker (1993), Miller (1993), Chakalisa (1994), Harvath (1995), Narayan (1995), Segars (1995), Thomous & Wangu (1995), Arnold & Judith (1996), Cyrus (1996), Paria Debasis (1996), Patel (1996), Piearey (1996), Prakash & Pandey (1996), Wells (1996), Jacobi (1997), Kaliyan (1997), Pruett (1997), Marsh (1998), Matpass (1999), Srinivasan (1999), Toole (2001), Wang (2001), Singh & Singh (2007), Choudhury & Kumar (2009), Ganihar & Wajiha (2009), Khatoon & Mahmood (2010)
2	Locality	Sharma (1979), Rajyaguru (1991), Rangappa (1993), Well (1996), Srinivasan (1999) and Singh & Singh (2007)
3	Method of Instruction	Prabha (1992), Testone (1992), Segars (1995) and Galddert (2001)
4	Caste	Prabha (1992), Prakash & Pandey (1996)
5	Birth Order	Rajyaguru (1991)
6	Teacher Effectiveness	Brodney (1991)
7	Home-tutoring	Sumangala (1998)

Aforesaid discussion advocates that achievement in mathematics is accounted for by number of psycho-socio-biographic variables of the students. The investigator reviewed the literature and found the voluminous studies on Mathematics Achievements in which Psychological, Social, Biographical and Instructional variables were studied simultaneously.

Further the tables 1, 2 and 3 respectively reflect that the most preferential variables of the investigation is in psychological category are Intelligence, Attitude towards Mathematics, Self-concept, Numerical Ability and Math Anxiety; among Social variables the variables which were considered very widely are Socio-economic Status, Parental Involvement & Parents Education and among Biographical variables most frequently considered variable is Sex.

The studies reviewed lead to the following types of trends -

1. Achievements in Mathematics in Relation to Variables Studied.
2. Tools Used for the Measurement of Mathematics Achievement and other Related Variables.
3. Methodology Adopted for Studying the Phenomenon of Mathematics Achievement.

II. Achievement In Mathematics In Relation To Variables Studied

It has been firmly established by now that Mathematics Achievement is influenced by psychological variables, social variables, biographical variables, instructional variables, and so on. Sufficient data are available which indicate relationship between these variables and Achievement in Mathematics. There are quite a few well-planned, well-designed multivariate studies which reveal many variables influence Achievement in Mathematics. But there is need to subdivide complex variables and find out how each of the sub-variables is related to the success in the Mathematics. To make a case, it may be noticed that SES which is a composite of sub-variables like parents income, father's educational level, mother's educational level, educational facilities available at home etc. has been found to fluctuate under different conditions in its relationship with pupils' success in the Mathematics.

Though an attempt has been made by a few researchers to consider a number of such sub-variables, it is felt that a greater emphasis should be laid on undertaking in-depth studies to analyze the relationship of Achievement in Mathematics to their interactive effects.

1. Gender and Scholastic Achievement in Mathematics -

Many research studies conducted in India and Abroad suggest the boys superiority over girls in educational Achievement in general and numerical ability in particular. Generally, it has been observed that male students have more knowledge and understanding of the Mathematical concepts and thinking in comparison to the females. In the Indian situation, it was found that boys' score in the Mathematics is higher than that of girls. The result of research studies conducted by *Sathiyagirirajan (1981)*, *Holland & Sandler (1982)*, *Khatoon (1988)*, *Sucin (1992)*, *Driver (1993)*, *Bassa (1993)*, *Leiker (1993)*, *Chakalisa (1994)*, *Thomous & Wangu (1995)*, *Narayan (1995)*, *Matpass (1999)*, *Patel (1996)*, *Piearey (1996)*, *Arnold & Judith (1996)*, *Paria Debasis (1996)*, *Wells (1996)*, *Pruett (1997)*, *Kaliyan (1997)*, *Jacobi (1997)*, *Marsh (1998)*, *Singh & Singh (2007)* and *Khatoon & Mahmood (2010)* result support the conventional expectation of the boys superiority over the girls in learning outcomes of the Mathematics. *Cyrus (1996)* (boys have more ability in Mathematics), *Narayan (1995)* (boys scored higher on Numerical Ability), *Becker (1981)* also found the same result.

On the other hand, some researches reveal that the girls' superiority over boys' in the Mathematics Achievement viz; *Kulkarni, Lal and Naidu (1970)* in their survey found that girls belonged to Delhi and Mysore get more marks in comparison to boys. *Endsley (1984)*, *Wohlgehager (1992)*, *Wang (2001)* and *Ganihar & Wajiha (2009)* found that girls achieved significantly higher score in the Mathematics than that of boys'.

There are some studies which reveal sex factor is non-effective eg. *Rule (1981)*, *Koehler (1986)*, *Carmichall (1986)*, *Rajyaguru (1991)*, *Teston (1992)*, *Abdulmajeed (1992)*, *Miller (1993)*, *Harvath (1995)*, *Segars (1995)*, *Sriniwasan (1999)*, *Toole (2001)* and *Choudhury & Kumar (2009)* found in their studies that sex factor did not have an effect on the learning outcomes in the Mathematics.

Besides it, *Houston (1980)*, *Jensen (1982)*, *Heimann Vtefreyja (1982)*, *Carmichall (1986)*, *Metcaff (1986)* and *Prakash & Pandey (1996)* found that males and females have significant difference on the Mathematics Achievement.

2. Socio-Economic Status and Scholastic Achievement in Mathematics

Among several sociological factors, S.E.S. of the child is one of the factor which requires constant examination. One of the intriguing aspects of students Mathematics Achievement is the S.E.S. of their parents.

It has become customary of educational research to treat S.E.S. as one of the effective factors of the Mathematics Achievement. Numbers of studies have clearly established a definite relationship between the S.E.S and learning outcomes in Mathematics. *David and Michal (1984)*, *Leach & Tunnechifle (1984)*, *Rajput (1984)*, *Singh (1986)*, *Deshmukh(1988)*, *Prabha Rashmi (1992)*, *Setia (1992)*, *Kim(1992)*, *Leiker(1993)*, *Pruett (1997)*, *Segers (1995)*, *Piearey (1996)* and *Patel (1997)* have focused the positive contribution of the S.E.S. to the

Achievement in Mathematics. *Grootenbore & Hemmings (2007), Mustafa (2009) and Engin, Nuri & Hulya (2010)* found that students from the higher S.E.S. groups scored more marks than the low SES groups.

On the contrary, many studies do not show any relationship between these two variables. *Rajyaguru (1991), Abdulmajeed (1992), Thampurathy (1994)* (Social Position), found low and negligible correlation between the S.E.S. and the Mathematics Achievement. They found that below a certain level, the marginal differences in socio-economic conditions as such couldn't contribute to Mathematics and Educational Achievement of the children. In the same way *Bhargava (1980)* did find very little rather negligible impact of the S.E.S. on the Mathematics Achievement.

In this connection, remark of *Harris (1996)* cannot be ignored. He found that the students of lower socio-economic status have more knowledge, understanding and application of the Mathematics in comparison with those students who have high socio-economic status because the students of the low socio-economic status get more opportunity of calculation in their day to day life. They have to go to market and they make transactions and hence they become experts in the mathematical calculations and applications.

3. Intelligence and Scholastic Achievement in Mathematics

Intelligence occupies a peculiar position in the study of school performance of Mathematics. A vast essay of research literature in Education and Psychology has brought it to common knowledge that intelligence as general ability, is an important contributory factor in the school Achievement. The level of intelligence truly makes a dominant difference in school's Achievement.

The Intelligence as an inherent unified and stable characteristic unequally found among the individuals. It is supposed that difference in learning outcomes in the Mathematics can be easily accounted for. It has been argued that more intelligent pupil is inherently capable of performing better in the examination and earns higher grades than less intelligent pupils. It is a common notion that students of high intelligence obtain better score in the Mathematics' test. *Bhushan and Sharma (1981), Annamal (1981) and David and Michal (1984)*, found that the high intelligence group performs better than the low intelligence group in the Mathematics Achievement, specially in the area of computational skill. *Materlis (1970)* found that high intelligence made statistically significant gains in Mathematical Understanding than lower Intelligence groups. *Kaliyan (1997)* [Abstract Reasoning, Numerical Ability, Space Relation, Substitution of Symbols], *Rajput (1984) and Nagialiankin (1991)* [Numerical Ability, Abstract Reasoning, Space Relation], *Rajyaguru (1991), Lalitha (1992)* [Numerical Ability, Abstract Reasoning, Non-language Reasoning], *Setia Seema (1992), Sumangala (1998)* [Numerical Ability, Numerical Reasoning, Ability to use Symbols, Spatial Symbols and Abstract Reasoning], *Patel (1997), Whang (1997)* [Reasoning Ability], *Arrieta (1998), Segars (1995)* [Student Ability] *Glutting Joseph (2006)* [Verbal Comprehension, Perceptual Reasoning, Working Memory and Processing Memory], *Fernandez (2011)* [Brain Hemisphericity] found positive relationship between the Intelligence and specific areas of the Mathematics Achievement. Similarly, *Das (1986), Patel (1997), Kasat (1991) and Abdulmajeed (1992)* found positive relationship between the Intelligence and the Mathematics Achievement.

But the long trail of consistent evidence found only a moderate correlation between measured Intelligence and Scholastic Achievement in Mathematics, gradually led to the acceptance of intelligence, as one of the several determinants. The fact is borne out in our everyday experience which shows that some pupils who impress us as fairly intelligent out of class situations, secure poor marks in the school and college examinations and some who appear dull in such situations, score high in the examinations. Thus although intelligence is a prominent and promising factor for the Achievement, but sometime it may be found that low intelligent or normal intelligent student can secure more marks than the high intelligence students due to some other reasons. Because learning outcome is affected by so many factors e.g. Study habit, home Environment etc. *Wilson's (1978)* study found that intelligence has no effect on the Mathematics Achievement of the boys and the girls.

It has also been observed that the high intelligence students sometimes fail to recall the formulas of the subject matter and hence they fail in the examination. Although such students have a very good understanding of the principles and they can apply those principles very effectively. On the contrary, it has also been observed that a student having low intelligence can crammed most of the principles of the Mathematics but he cannot apply those principles properly.

4. Attitude towards Mathematics and Scholastic Achievement in Mathematics

Attitude is surely a forceful determinant of the learning outcomes. Every student with similar abilities, differs in school attainment due to his attitude towards the subject. Several efforts have been made from time to time to satisfy the query of finding out the effect of Attitude toward Mathematics on learning outcomes in this subject.

It is a general observation that students having positive Attitude towards Mathematics get more marks in it in comparison with those students who have negative Attitude towards Mathematics. Much of the work has been done, based on the assumption that attitude affect Achievement recently - *Miller (1993), Endsley (1984), Ashutosh (1989), Jayraman (1989), Nagailiankin (1991), Rajyaguru (1991), Wohlgehager (1992), Hariharan (1992), Rodriquez (1992), Armstrong (1992), Driver (1993), Bassa (1993), Segars (1995), Thomous & Wangu*

(1995), Hart (1995), Stella & Purushothaman (1995), Srinivasan (1999), Choudhury & Kumar (2009) and Ganihar & Wajihar (2009) found in their studies that students' positive Attitude towards Mathematics is significantly related to Achievement in the Mathematics. *Suydam and Weaver (1975)* in their review of affective factors of Mathematics' learning mention that continued attention should be directed towards developing positive Attitude towards Mathematics. *Miller, Linda, Herman (1981)* found a significant correlation between positive Attitude towards Mathematics and Mathematics computational skill.

But sometimes, it has been observed that students, who have no positive Attitude in Mathematics, are able to get good marks in the Mathematics. In other words, it may be stated that attitude has no effect on the learning outcomes in the Mathematics. (*Ngailiankin, 1988*). *Aiken (1976)* in reviewing studies, examining the relationship between attitude and Achievement in Mathematics usually found low correlation which did not always reach the level of statistical significance. *Watson (1981), Robert (1982) and Mckethan (1982)* have conducted studies and found that attitude had no effect on the outcomes of the Mathematics.

With the help of above-mentioned studies it is clear that the relationship between Attitude and Mathematics Achievement, however, is not clearly defined. At present, no bodywork to support such a relationship, it is necessary to find out the relationship on the scientific basis.

5. Home Environment and Scholastic Achievement in Mathematics

Today, we find an immense increase in the number of problem children. Indiscipline, no compliance, delinquency and character disorders and failure in academic Achievement are increasing by leaps and bounds. The parents do not know how to treat their children so that they may develop themselves adequately. Therefore, what is the most required thing, today, is that parents should be aware of the influence of the Home Environment on academic development of the children.

A glance through the review of related literature reveals that students Achievement in Mathematics and Home Environment are linked together. This has been supported by psychological theories of cognitive development, learning theory of development of Robert Seers and many others. This rationale provides a basis for finding out relationship between the Achievement in Mathematics and Home Environment. Some evidence of this is already available in the research literature. A few researchers have shown that the lack of parental care, lack of control lead to maladjustment and ultimately lead to poor Achievement in Mathematics, while other researches have shown that the rejection might lead to good social adjustment outside the Home and ultimately lead to good Achievement in Mathematics. According to findings of some researchers physical and verbal control lead to maladjustment and non-compliance which lead to greater degree of anxiety and this anxiety ultimately effects the Achievement in Mathematics. The studies largely demonstrate that Achievement in Mathematics is linked with the Home Environment in various ways. *Dolan (1983), McGowan and associates (1984), Medrick and associates (1985), Bonder & his associates (1982), Marjoribank (1983) and Tsai & Walberg (1983)* have found in their studies that the academic Achievement of the children is definitely influenced by the Home Environment, particularly the educational Environment of the Home. *Pruett (1997), Jacobbi (1997) and Chen (2001)* found that the Achievement in Mathematics is significantly influenced by Home physical and educational Environment.

In India, so far the investigator knows, not a single study has, however, been conducted which would have shown, which characteristics of Home Environment are related to Achievement in Mathematics and in what manner. Several researches in many other countries have used this rationale. But their findings are not conclusive.

6. Locale and Scholastic Achievement in Mathematics

India is predominantly an agricultural nation with the majority of the population living in rural areas. On the whole, people in urban areas enjoy more educational facilities than those in the rural areas. Apart from this, it is generally felt that parents, in the urban areas because of their occupational status and education, are likely to take more interest in the education of their children than their counter parts in the rural areas. As such, it is hypothesized that the urban school students are superior to the rural children in Mathematics Achievement.

Rangappa (1993), Well (1996) and Singh & Singh (2007) made an investigation and found that urban students are better than rural students in Mathematics Achievement. But this fact is not always true as *Sharma (1979) and Srinivasan (1999)* found that rural urban population has no significant difference in Mathematics Achievement. There are also some studies in which no particular results can be drawn, because the findings indicate that both groups are good in different case. In some cases rural students performed better whereas in some cases urban students did well.

Thus, the results show all the possible combination and hence one cannot make any categorical statement regarding the urban students superiority or otherwise in vis-à-vis Mathematics Achievement for the students.

7. Institutional Climate and Scholastic Achievement in Mathematics

One of the important variables which may have some bearing on the students' Achievement is the Institutional Climate or School Environment. In India school types vary from state to state considerably viz-

government schools and non-government schools, private managed schools, government-aided schools etc. But for the present research the schools have been divided into two broad categories- good schools, having good institutional climate and bad school, having bad institutional climate.

It is a general observation that students, having good institutional climate, get more marks in comparison with those students who have bad institutional climate. Much of the work has been done, based on the assumption that institutional climate affects Mathematics Achievement. Recently- *Thomous and Wangu (1995), Pruett (1997), Testone (1992), Kim (1992), Harris (1996), Well (1996), Wong and Watkins (1998), Ibrahim, Serpil & Ozer (2009) and Gozde & Giray (2010)* found in their studies that the Institutional Climate is significantly related to the Achievement in Mathematics. But sometimes it has been observed that students, who have bad institutional climate, are able to get good marks in the Mathematics. In other words, it may be stated that the institutional climate has no effect on the learning outcomes in this subject. *Srinivasan (1999)* in his study found that institutional climate have no effect on the outcomes of Mathematics. *Yan, Amery & Bruna (2006)* found that Mathematics Achievement was highly related to outside of the school factors than that of the school associated factors.

With the help of above-mentioned studies it is clear that the relationship between the institutional climate and the Mathematics Achievement, however, is not clearly defined. But as there was, at present nobody works to support such a relationship, it is necessary to find out the relationship on the scientific basis.

8. Math Anxiety and Scholastic Achievement in Mathematics

As far as empirical evidence of the relationship between mathematics anxiety and achievement is concerned, correlations have been found to be negative (the higher the anxiety, the lower achievement tends to be). (*Cates et al., 2003; Ho et al., 2000; Ma, 1999; Maree et al., 1997; Maree et al., 2005 Ashutosh (1989), Rajyaguru (1991), Vance (1993), Lafferty (1996), Soman (1997), Piearey (1996) Bruno (1999)*). The consistency of the magnitude of the relationship between the two constructs has been addressed by Hembree (cited in Ma, 1999) in a meta-analysis who found the average correlation between the mathematics' anxiety and the achievement of mathematics to be in the order of -0.3. *Ma (1999)*, in his meta-analysis of 26 studies related to learners (at school) found the common population correlation to be -0.27. Contradictory results have however, also been reported, e.g. a positive relationship between anxiety and performance, i.e. as performance increases, so does anxiety and vice versa (*Ma, 1999*). On the contrary, many studies (*Patel, 1997; Owens 1992; Abut-Hital & Maher, 2000*) do not show any relationship between these two variables.

9. Other Factors and Scholastic Achievement in Mathematics

Scholastic Achievement in Mathematics is affected by a number of factors. Among them some factors can be identified very clearly such as SES, Sex, Attitude Towards Mathematics, Intelligence etc. But some other factors like **Numerical Ability** (*Kasat, 1991; Nagialiankin, 1991; Lalitha Bai, 1992; Sumangala, 1998; Kaliyan, 1997 and Toole, 2001*), **Achievement Motivation** (*Rajput, 1984; Bhaskaran, 1991; Ashutosh, 1989; Srinivasan, 1999 and Sanchez, 1995*), **Study Habit** (*Singh, 1986; Biswal, 1988; Nagialiankin (1988); Patel, 1997; Jacobi, 1997; Arrieta, 1998 and Choudhury & Kumar 2009*), **Self-Concept** (*Singh, 1986; Ashutosh, 1989; Rangappa, 1993; Sumangala, 1998; Robert, 1997; Marsh, 1998; Pajares, 1999; Abu-Hilal & Maher, 2000 and Natali, 2000*), **Self-esteem** (*Strutchens, 1993; Cashin, 2001; Natali 2001 and Christon et.al. 2001*), **Locus of Control** (*Sanchez, 1995*), **Cognitive Style** (*Narayan, 1995; Hall, 1993; Testone, 1992; Bragg, 1996 and Aseeri, 2000*), **Reading Ability** (*Rangappa, 1992; Testone, 1992 and Arrieta 1998*), **Mathematical creativity** (*Biswal, 1988; Thampurathy, 1994 and Toole, 2001*) **Mathematical Aptitude** (*Khatoon, 1988; Rajyaguru, 1991; Abdulmajeed, 1992; Miller, 1993; Sumangla, 1998; Rajani, 2006 and Sethi, 2011*), **Emotional stability** (*Singh, 1986*), **Interest in Mathematics** (*Singh, 1986; Khatoon, 1988; Kasat, 1991 and Sitha, 2003*), **Educational & occupational Aspiration** (*Nagialiankin, 1991; Teague, 1995 and Chen, 2001*), **Personal adjustment** (*Soman, 1977; Singh, 1986 and Setia, 1992*), **Social Maturity** (*Singh, 1986*), **Teacher's Expectation** (*Turner, 1993 and Strutchens, 1993*), **Caste** (*Prabha, 1992; Prakash & Pandey, 1996*), **Birth order** (*Rajyaguru, 1991*), **Method of Instruction** (*Prabha, 1992; Testone, 1992; Segars, 1995 and Galddert, 2001*), **Teacher Effectiveness** (*Brodney, 1991*), **Family Income** (*Mustafa, 2009*), **Parents Educational Level** (*Mustafa, 2009; O,Dwyer, 2005; Well, 1996 and Srinivasan, 1999*), **Problem Solving Ability** (*Choi Bure, 1999; Arrieta, 1998 and Thampurathy, 1994*), **Text-anxiety** (*Patel, 1997; Ganihar & Wajiha, 2009*) and **Parental Involvement** (*Rajyaguru, 1991; Strutchen, 1993; Wells, 1996; Addington, 1996 and Arnold & Judith, 1996*) can not be recognized clearly.

III. Tools Used For The Measurement Of Achievement In Mathematics And Other Related Variables

Except for a few well-known foreign tools which continue to be used, the researchers in India have increasingly started using tools developed by them. This is, of course, quite encouraging. But a note of caution has to strike when a researcher develops a tool for his study by merely pooling some items and does not subject it to the sophisticated techniques of tools construction, the result would then be obviously of poor quality research.

IV. Methodology Adopted For Studying The Phenomenon Of Achievement In Mathematics

A particular trend that emerges in this aspect of research is that a large number of researches have used descriptive research methodology. The research studies reviewed in this chapter indicate that most of the researchers select some variables to study their relation with Achievement in Mathematics, select suitable tools, administer them to some available sample and collect the required data. Collected data have been mostly subjected to correlation techniques or at least to analysis of variance. Even the sophisticated techniques of factor analysis and co-variance have rarely been used by them so far so good, but structural equation modeling has not been used by any researcher in India. In some researches, even the tools used, are not standardized ones. The investigators have developed one or more tools for collecting data whether or not this is one of the objectives of their studies.

Current trend on the phenomenon of Achievement in Mathematics has been to use Post-Facto Research Methodology. The phenomenon of the Achievement in Mathematics will acquire more clarity of experimental method is also used for this purpose. The findings of the descriptive research would provide a sound base to select the most effective variable and frame hypothesis accordingly.

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