CHAPTER II

REVIEW OF RELATED LITERATURE

Theoretical framework of cognitive style and selected non-cognitive variables
Review of related studies
A trend report of the studies.
REVIEW OF RELATED LITERATURE

A scientific approach to a worthwhile study in any field of knowledge requires an adequate understanding of the related work in the area, as it enables the investigator to find out what is known; what methods and approaches have been used and what problems remain to be solved in the field.

The collection of reliable data to examine the relation of cognitive style and selected non-cognitive variables with achievement in Mathematics was the major concern of the investigator while reviewing the related literature of the study. The reviewed literature has been classified and presented under the following sections.

(i). Theoretical framework of the independent variables.

(ii). Review of the related studies

(i) THEORETICAL FRAMEWORK OF COGNITIVE STYLE AND SELECTED NON-COGNITIVE VARIABLES.

This part of the report deals with a brief discussion of cognitive style and the selected non-cognitive variables, namely level of aspiration, attitude towards Mathematics, classroom environment, home environment and home practice.

COGNITIVE STYLE

Cognitive style refers to a person's preferences for certain ways of receiving and processing information from the surroundings and using different strategies to respond to tasks. Cognitive styles are called 'styles' rather than abilities because they refer how people process information and solve problems, not how well they do so.
Since the time of Allport (1937), many investigators have used the term 'Cognitive style' to denote individual differences in modes of cognitive functioning in children and adults. The idea that students differ in terms of behaviour in their mode of cognition came up for serious discussion in early 1950's. It was coined for the first time by R.W Gardner in 1953 (Hussen & Postethwaito 1985). Vernon (1973) traced the idea of cognitive style to an article in 1951 by Klein as the ‘personal world through perception’.

Cognitive preference is one class of Cognitive style. The term cognitive style can be used only to distinguish consistent preferences for a particular mode of thinking among individuals of similar and overall intellectual capacities. In the concerned literature there are considerable degrees of confusion regarding cognitive style due to the usage of many different terms to describe the aspects of cognitive style and an equivalent variety of test materials. Since then many sets of dichotomies have been used to describe cognitive style.

*Dimensions of Cognitive style*

Although researchers may broadly agree on a general definition of cognitive style, they have defined it experimentally in various ways. Consequently, the related literature contains references to a number of dimensions of cognitive style. Williams (1975), summarises them as below:

One of most frequently examined dimensions of cognitive style is that of Field-dependence- independence and much of the work on this dimension stems from Witkin and his co-workers (Witkin 1950, 1954). Whether or not a group or individually administered test has been used, the concept of field-independence has come to be recognised as the ability to select relevant stimuli that are embedded in a larger context and to resist the interfering effects of the contextual stimuli.
A second cognitive style dimension that has been studied by several investigators (Gardner & Others, 1959.) is that of levelling-sharpening dimension which contrasts simplicity of the cognitive field and complexity and differentiation.

Two other dimensions of cognitive style that are similar in nature are known as category width and equivalence range. Studies in this area have examined consistent, individual preferences in modes of categorising judged similarities and differences.

Kagan & others (1963) studied a dimension of cognitive style which they regard as similar to field-dependence-independence. They call this dimension analytic cognitive style and define it as 'the tendency to analyse and to differentiate the stimulus environment in contrast to categorisation that are based on the stimulus as a whole".

Finally, Williams (1975) mentioned the cognitive style dimensions proposed principally by Broverman (1960). The dimensions defined were conceptual versus perceptual motor dominance, and strong versus weak automatization, which were regarded as cognitive subsystems, developmental information and maintained by the force of habit strength associated with them.

Messick (1976) and Kogan (1976) have been trying to classify the meaning of the term 'cognitive style' and have discussed possible overlaps between the different approaches. Messick has described nineteen terms that are frequently used in cognitive style research. These description also implied overlaps. A break of the major categories and styles were compiled by the investigator. It is seen that there is still little empirical evidence between different descriptive categories. The categories are presented below along with the major authors who worked along these lines.
### TABLE I
Details of Categories of Cognitive Style

<table>
<thead>
<tr>
<th>Categories</th>
<th>Style</th>
<th>Author with year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Information processing</td>
<td>Cognitive complexity-cognitive simplicity</td>
<td>Bieri, Atkin, Breur, Leaman, Millar and Tripadi (1966)</td>
</tr>
<tr>
<td>2  Categories and Concepts</td>
<td>Broad- Narrow Relational-analysis</td>
<td>Wallach &amp; Kogan (1965)</td>
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<td>3  Thinking</td>
<td>Divergent-convergent Impulsive-reflective</td>
<td>Hudson (1968)</td>
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<tr>
<td>4  Learning</td>
<td>Holist-serialist</td>
<td>Pask (1976)</td>
</tr>
<tr>
<td>5  Perceiving</td>
<td>Field independence-Field dependence Articulated-global</td>
<td>Witkin (1954)</td>
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Among the different approaches to cognitive style, the Field independent-Field dependent dimensions of Witkin (1954) which comes under the major category of perceiving has been considered in the present research.
Field independent - Field dependent Cognitive Style (FI/FD)

Some of the early experiments on perception have been shown the importance of contextual factors in perception of an item in an embedding field. Field independent person is described as one who experiences his surroundings analytically, with objects seen as discrete from their backgrounds. A field dependent person on the other hand tends to experience his surroundings in a global and non-analytical manner. Thus Field independence-dependence dimension is also described as 'analytical vs. global'.

Characteristics of FI/FD

Witkin et al. (1977) has drawn attention to the fact that some individuals seem less and others more able to separate the given variables from its context or the Field, and are more analytical in the approach to various situations. People who are Field independent tend to be more cognitive in their perceptual orientation (and are not easily distracted by extraneous things than) people who are Field dependants.

Research has established the associated forms of personality characteristics with Field independent - dependent dimension of cognitive style, Tennat, (1988). Older children are more Field independent than younger children. Witkin noted that children show an increase in Field independence up to the age of seventeen. Within any particular age group some children are more Field independent than others. Individuals who showed relative preferences for one cognitive style over the other continue to display this preference well to adulthood. It is a convincing evidence that Field independence-dependence style describes an essential component of a person's cognitive individuality. In contrast to intelligence, there is no high or low
cognitive style and usually these are treated as polar opposites like FI/FD. Each pole is high with a different purpose and describing different aspects of one fundamental process, the mode of perception and thinking.

In social situations, Field dependent people are more attentive to and to make use of prevailing social frames of reference. They may be more sensitive to other people and interact more with others. In general, they prefer to be with people in social situations (Witkin et al. 1977). As a result Field dependent people tend to be better liked by others, as they are known to be tactful, considerate and affectionate and be known to more people than field independent people.

**Contributing factors**

Studies in cognitive style have evolved the important factors that contribute to a person’s preferences for his or her cognitive style. External factors are more important in determining the cognitive style of the individual. Witkin viewed that cognitive styles are culturally induced. It develops from socialisation practices, respect for social conventions, child rearing practices and degree of parental authority. Cross-cultural studies conducted by Witkin and his associates have substantiated the effect of such external factors.

**Educational implications of cognitive style**

Witkin et al. (1977) provided the most comprehensive analysis of the educational implications of cognitive style. It highlights the importance of learning process rather than teaching techniques.

Field independent students generally do better in analytic, impersonal academic areas in disciplines such as physical and biological sciences, Mathematics, engineering, technical and mechanical activities. Field dependent students do better in interpersonal areas requiring social skills such
as social sciences and social welfare. They like to choose occupations related to social work, teaching, administration and politics.

Filed independent students are more likely to have self defined goals and respond to intrinsic reinforcement, but Field dependent students may require more extrinsic reinforcement. Field dependent students are more motivated by praise and encouragement than Field independent students who tend to pursue their own goals.

Field dependent teachers are interested primarily in creating and maintaining positive attitudes and good group dynamic where as Field independent teachers perceive them as emphasising application of general principles. The latter inform the students when they are incorrect and tell them why they are incorrect and express displeasure with students who are performing below capacity.

Extreme Field independents have social adjustment problems and extreme Field dependants seem to lack a mind of their own. Field independent students are not likely to respond strongly or even positively to warmth or praise from the teachers.

From the discussion it is clear that the knowledge of the cognitive style is helpful for the teachers to plan their teaching strategies so as to meet the individual differences of the students.

**LEVEL OF ASPIRATION**

Educational performance is very much connected with the motivational aspects. Level of aspiration is one of such motivational aspects, which influences a person's striving to a considerable extent. In some people the drive to be successful at what they undertake is tremendously strong. They have very high level of aspiration while in others it is relatively weak.
Level of aspiration may be defined as a ‘goal setting’ by an individual based upon expectancy of achievement. Goal attainment is perceived as success and inability to do so as failure.

Boyd (1952) defined level of aspiration as an individual’s ambition in a dynamic situation, i.e., it is an individual’s goal or expectation in regard to the goodness of his own future performance for a given task. Backer & Seigal (1957) visualised level of aspiration as an individual's strivings for a particular goal or level of achievement. Hurlock (1967) conceived level of aspiration as a longing to achieve higher level of performance in a task. This aspired level of performance is higher than one's achievement and is of intense personal significance to him. Drever defined level of aspiration as a frame of reference involving one's self esteem. In other words, it is a standard with reference to which an individual experiences the feeling of success or failure. Joshi (1963) opined that an individual’s level of aspiration is with reference to his positive striving towards a goal that is generally in keeping with his assets, where as in wish fulfillment one is lost in his fantasies.

In the opinion of many researchers, the level of aspiration is the expected level of achievement of the individual. Its measurement involves noting the difference between the scores of a person’s actual performance and expected performance in a task (For example, Humphrey and Argle, 1962).

**Level of Aspiration-Degree**

Some people set high goals of accomplishment making high demands on themselves. Some on the other hand are modest with regard to their achievements because they are aware of their limitations. There are also those who have no aspirations at all, they are indifferent to what they may or may not achieve.
In general people set their goals just a little higher than they are sure of attaining and this is healthy. In some people there is a large discrepancy between the level of aspiration and the level of performance, because they have learned to set goals that gain the approval of their parents and associates. In others, the level of aspiration falls considerably below the capacity to achieve. This discrepancy often occurs because individuals have learned to fear failure. They do not set their goals high for fear of not attaining them.

Factors of level of Aspiration

According to Hoppe (1930), level of aspiration is essentially quantitative in nature and an individual’s level of aspiration is to be ascertained with the help of certain experimental procedures. He proposed that level of aspiration is a function of various factors as mentioned below:

(i) The subjective nature of an individual’s goal.

(ii) The occurrence of success and failure as experienced after the goal is achieved.

(iii) The conflicting and decision making experience.

(iv) The influence of immediate past experience on the subsequent level of goal setting behaviours.

Educational Implications

Level of aspiration is an important psychological construct in understanding achievement behavior. Researches indicate that repeated success or failure can influence a student’s goal setting or level of aspiration—the level of performance to which an individual expect to rise on a given task. A student may reveal such information when asked, what he is aiming for in the next test or how many problems he thinks, he will get correct on the next assignment. Success in every trial leads to higher level of aspiration, where as failure tends to lower the aspiration level. Hoppe found that on the given task, if a person’s
performance falls short of his expectations or level of aspiration, he experiences the feeling of 'failure'. But in case his performance meets or exceeds the level of aspiration, he feels success. This may be explained as having a negative feeling and positive feeling respectively.

In the modern world, the concern for excellence in academic performance has increased more than ever before, because of the ever-increasing competitions as well as by the exorbitant demands and pressures put on the individual by modern sociocultural milieu. But most of the children in our schools are unable to show educational performance up to the level that is expected of their age and grade. Sharma (1992) observed that, there is usually the lack of sufficient motivation and incentives from the part of the students, teachers, parents and others involved in the teaching learning process. Every student has to decide about what goal he is to set for himself. He has to decide whether he is to try on tasks or levels of performances that appear very difficult to achieve or to remain satisfied with success at relatively much easier tasks or moderate level of performance. In all such situations, persons concerned with educational process, have to guide the students to fix their level of aspiration before starting the work. Also it is often necessary to motivate, considerably talented persons without ambition, to put in their best efforts to attain what they can achieve.

**ATTITUDE TOWARDS MATHEMATICS**

Attitudes are positive or negative feelings that an individual holds about different objects, persons or ideas and are generally regarded as enduring though modifiable by experience. Attitudes are also seen as pre-dispositional readiness to respond to certain situations, persons or objects in a consistent manner which has been learned and has become one's typical mode of response. The degree of strength of a person's attitude may vary from extremely positive through a gradation to extremely negative. Page *et al.*
(1977) defines attitude as a disposition to perceive, feel or behave towards specific objects or certain people in a particular manner.

Attitude denotes a person's orientation to some object, or attitude referent. All attitudes have a referent, an 'object of thought'. (Augustinos & Walker, 1995). Thus attitude towards mathematics deals with attitude hold is 'orientation' to the referent - mathematics and that person's evaluation of the referent. When the object of attitude is important to the person, the evaluation of the object produces an affective or emotional reaction in that person.

**Nature of attitudes**

Anderson (1981) has identified five essential features of affective characteristics. They are (1) emotion (2) consistency (3) target (4) intensity. The relationship of these characteristics with attitude will be helpful to understand the nature attitude.

(i) Emotion:

Since attitude is an affective characteristic it involves a person's feeling and emotions. It is a complex of feelings, desires, fears, convictions, prejudices and other tendencies that have given a set or readiness to act a person object or situation because of varied experiences.

(ii) Consistency:

Allport cites consistency as an essential feature of attitudes. A reasonable degree of consistency of response in necessary before it can be inferred that a person possesses attitudes.

(iii) Target:

All emotions and feelings are directed toward some target. Allport identified these targets as objects and situations.
(iv) Direction:

Direction is concerned with the positive or negative orientation of the emotion or feeling towards the target. Allport suggests the appropriate bipolar adjectives for attitudes as favourable and unfavourable.

(v) Intensity:

Intensity refers to the degree or strength of the emotion or feelings. Intensity is related to the level of preparedness and the extent to which attitude predisposes action.

Theories of attitude

The major theories of attitude are the following:

(i) The Postural Response Theory

This is the theory of neuromuscular set, characterised by the behaviouristic approach. This theory implies an organic state of readiness accompanied by neuromuscular adjustments which in turn develops acts of the inter stimulation of the individuals. An attitude includes the stimulus and response, but even more so, the preparation of the response set up in the neuromuscular system. This theory has been supported by Allport(1935).

(ii) The theory of mental set

This theory is based on the 'conscious act' theory of behaviour. The conscious act makes difference to the individuals experiencing it. A conscious act is prospective or intentional. Thus an attitude will determine the general characteristic of the act.

(iii) The general theory

This theory includes the affective and cognitive element of organization. A more comprehensive conception expressed by Guilford is that the attitude of a personal disposition common to individuals, but possessed in different
degrees which impel them to react to objects, situations of persons in favourable or unfavourable ways.

**Levels of attitude**

According to Krathwhol et al. (1964), behavior characterised by valuing in the affective domain is sufficiently consistent stable to have taken on the characteristic of the belief or an attitude. The learner displays this behaviour with sufficient consistency, in appropriate situations that he comes to the perceived, as per his attitude. Thus levels of attitudes can be listed as follows.

(i) Acceptance of value

At this level, people are concerned with the ascribing of worth to a phenomenon, behaviour, object etc. The holding of particular beliefs or attitudes is an evidence of its acceptance.

(ii) Preference for a value

Behaviour at this level implies not just the acceptance of the value, to the point of being willing to be identified with it, but the individual is sufficiently committed to pursue it, to seek it out, to want it.

(iii) Commitment

The person who displays behaviour at this level is clearly perceived as holding the value. He acts to further the thing valued in some way, to extend the possibility of his developing it, to deepen his involvement with it and with the things representing it. He tries to convince others and seeks converts to his cause.

Enduring attitudes develop through many learning experiences related to other people. Allport has suggested four conditions for the formation of attitudes.
i. The accretion and integration of response learned in the course of growing up

ii. The individuation, differentiation, or segregation of experiences: Experiences do not merely accumulate; they become sharpened and patterned, so that some attitudes become more specific as the individual grows up.

iii. The influence of some dramatic experience or trauma. Some times a single experience may have lasting influence, and may generalise to related stimuli.

iv. The adoption of ready-made attitudes:—sometimes attitudes are picked up through imitation of the attitudes of parents or others.

Because attitudes are so inter-woven with affective and highly motivate experiences, they become abiding personality characteristics. On the other hand attitudes as components of personality cannot be separated from the object or events in the social context to which they refer.

**Factors of attitude towards Mathematics**

According to Zanna & Rempel (1988) attitude deals with the categorization of a stimuler object along an evaluative dimension based up on or generated from three general classes of information:

1. Cognitive information
2. Affective/emotional information and
3. Information concerning past behaviors or behavioural intentions.

On the basis of the categorisation of attitude described by Zanna & Rempel (1988), theories of attitude by Krathwohl (1964) and factors attitude towards mathematics by Gronlund & Robert (1990) the investigator selected the following dimensions.

1. Appreciation of the role of mathematics.
4. Active involvement in related problems.
5. Devotion to Mathematical ideas and activities.
6. Commitment.

CLASS ROOM ENVIRONMENT FOR MATHEMATICS

Environment may be defined by saying that all that surrounds an organism and is external to it is environment (sharma, 1992). Psychologist typically treats behaviour as a function of an interaction between the individual and his environment. Members of a group behave differently in different kinds of social and emotional climate. Students actually spend most of their time within classrooms, and thus it is important to directly study these environments. A good deal of work suggests that classroom environments are very important influencing students' attitudes towards school as well as their achievement, and that the classroom environment can mediate between more macro-level influence, such as school and community, and individual student outcomes, (Cohen et al. 1989; Moos, 1979; Mumane, 1975).

Class room Social climate

In classroom situation, where conditions of good climate exist, there is an opportunity for the pupils to express themselves freely. In a good climate, the teacher has skill in helping pupils to become independent rather than dependent entirely up on the teacher (Singhal, 1991). According to Singhal, the dimensions of classroom environment which has strong influence on learning and development of children include nine aspects: (1) involvement (2) affiliation (3) teacher support (4) task orientation (5) competition (6) order and organisation (7) role clarity (8) teacher control and (9) innovation.
Effective classroom environment has been enhanced by Stockard and Mayberry (1992). According to them, much of our knowledge of effective teaching and classrooms comes from the tradition of 'process product' research. This work focuses directly on how the instructional behaviours of teachers affect students' learning and has been instrumental in improving teachers' day-to-day pedagogical practices. (Rosenshine 1971; Centra & Potter; Fraser 1986; Brophy & GOOD 1986).

The other major source of work in this area comes from the 'socio ecological' studies of classroom climate, which examine the relationship of students' achievement to the perception of their classrooms. This research is rapidly expanding and is far from conclusive. However, it has been found that the achievement-related expectations and values of students and teachers, the role of the teacher as an effective instructor, an orderly atmosphere conducive to learning and high student and teacher morale influence the student achievement.

The classroom climate involves both structural and affective dimensions. The structural dimension refers to the organisation of student roles within the class, role expectations, and shared group sanctioned behaviour or norms. The affective dimension refers to the unique ways in which individual personality needs are satisfied. Some research also indicate that the congruence between students preferred classroom environment and their actual classroom environment may be just as important as the actual nature of the classroom environment.

**Factors of classroom environment for Mathematics**

A large number of studies demonstrate that schools in which both students and staff value academic excellence tends to have higher levels of academic achievement. For instance, from their extensive work with secondary students, Edward McDill and his associates (McDill et al. 1967; Mc Dill And
Rigsby, 1973) suggest that schools that teachers and students, see as emphasizing intellectualism, subject matter competency, and commitment to academic excellence are more likely to have higher levels of Mathematics achievement and higher levels of educational aspirations.

Such environmental variables significantly influence students even when individuals attributes, such as there when individual attributes, such as their socio-economic background, ability, academic values, and socioeconomic context of theirs schools are controlled.

Even though, nearly four decades of researches have contributed to the current portrait of effective learning environment in general, researches on effective learning environment of Mathematics are very few. Based on the available literature, five components of classroom environment for the investigator selected mathematics: They are presented below.

(i) Conceptual approach
(ii) Pedagogical approach
(iii) Classroom facilities
(iv) Innovative Practices
(v) Interpersonal relationship

**HOME ENVIRONMENT FOR MATHEMATICS**

Much of the research on home environment has assessed learning environment in terms of such global social status indicators as occupation of the father, income of the family and birth order. Gross variables however accounted for only small percentages of variables in measures of affective characteristics and they have only low to moderate concurrent validities in relation to cognitive and academic performance at the same time global classificatory environmental variables have failed to effect: the dynamics of learning environment that families create for their children. Hence family
environment has to be examined in terms of proximal socio-psychological variables that can be manipulated in parent teacher programme, in an effort to make family learning context more stimulating for students.

Learning in school can be made easier for children if the continuities between development at home and development in school are recognised and built upon. The needs of the children are many and varied. Most obviously they require physical care, comfort and protection both for their physical well being and the adequate development of motor abilities. Relative success or failure in school is not just the responsibility of individual pupils. They may encounter a number of problems when support from the family and from wider community is not forthcoming, such problems are readily evident in parts of so called third world countries, which have no long tradition of formal education such as westernised countries have, and which are beset with a range of problems; including poverty.

Moos & Moos (1982), categorised the dimensions of home environment as follows:

i. Cohesion - the degree of commitment, help and support family members provide.

ii. Expressiveness - in most of our families youngsters are not allowed to express their feelings openly, especially girls. It also seems that girls are trained not to express their aggression and anger openly in the family since social desirability is greater in girls.

iii. Conflict- ideological or behavioural.

iv. Independence- Training to take one's own decision and lesser complaints expected.

v. Achievement-creating academic orientation in children. Emphasis on the achievements give rise to the feeling of competition.
vi. Intellectual-cultural activities: Encouragement from the part of the family members to take part in political, social, intellectual and cultural activities.

vii. Recreational orientation

viii. Moral, religious emphasis: Leads to the enforcement of greater discipline.

ix. Organisation: structural and organised environment provided can be exhibited through controls, rules and procedures to be followed.

x. Orientation.

**Effect of home environment**

According to Srivastvs (1991), the home environment will be more effective if the educational environment of the student is such that it permits certain modes of behaviour such as: 1) habit of reading, library consultation, planned study. 2) emphasis on being goal oriented, hardworking and realistics (3) support from, the family members to responded effectively to outward activities and (4) help to develop a capacity to decide about the future.

A large amount of evidence now supports the view that parental involvement is an important ingredient in improving individual children’s achievement and in enhancing school effectiveness. According to Henderson (1988), Bench (1988), Collins *et al.* 1972, students whose parents are actively involved in the school, tend to have higher achievement and better attendance, behaviour and grades as well as higher self confidence, regardless of their ethnicity or social class.

**Factors for home environment for Mathematics**

If the parents monitor school work and help with school plans, child’s attitude about school will improve in a way that improves grades in school. (Hellmaneollar, 1992). Weissberg & Hempton (1995) explain how school achievement is influenced by parent-child interactions, how early adolescents are affected by the overlapping spheres of influences of school family,
community and peer group: and how family environment influences educational attainment. Based on the available literature, the following main dimensions of home environment for the learning of Mathematics were selected:

i) Physical facilities
ii) Cohesion
iii) Parental behaviour
iv) Achievement orientation
v) Intellectual and cultural orientation

**HOME PRACTICE FOR MATHEMATICS**

The home is the first socialising agency of the children in our society that they view the world through the eyes of its family. It is therefore very possible that many of the values latter transmitted by the school were first included in the child at home. Parents as well as other members of the family should therefore, pay special attention to the intellectual, social and emotional development of their children.

Home provides an important educational foundation on which the child’s formal learning will be built. From birth to the age of fifteen children are in school only for 14 percent of the time. The rest of the time they are under the influence of the family. The educational practices that the members of the family provide during these critical years at home is virally important.

Parents, tutors or other adults involved in providing home practice may merely provide more practice of certain skill that is feasible or seems justified in the class room or may involve a group of related activities which require careful planning and apply principles and techniques already learned to solving problems of personal, family or community life.
Factors of home practice

(i) Interaction.

Family interaction patterns, norms and values have are important influences on ability and student attitudes and beliefs. These variables are largely beyond the control of school officials and policy makers.

(ii) Academic orientation.

Parents who insist their children to follow a time schedule for tasks such as doing homework, reading newspapers, magazines, Periodicals, library consultations, receiving help from parents etc. influence the practice of learning.

(iii) Parental cultural contact and social participation

A culture is the way of life of group of people, the configuration of all the more or less stereotyped pattern of learned behavior that are handed down from generation to the next through the means of language and mutation. A person is destined to learn a pattern of behaviour prevalent in the society in which he grows up.

(iv) Behavioural control

The practice of exercising controls and following a set of rules and procedures at home has important influence on child's attitudes and performances.

(v) Participation in co-curricular activities.

(vi) Effective use of free time.

(vii) The exposure to mass media and provision for making use of learning materials.

(viii) Regular parental support.
Educational and vocational plans of individuals strengthen the drive for achievement which often leads to the development of better study habits. Effective study habits and attitudes intern will lead to better academic performance.

Draper (1990) explains how certain habits acquired by practice at home through the influence of the parents of and other family members determined the future success of and an individual.

Based on the variable literature the main dimensions of home practice for Mathematics, selected by the investigator are:

(i) Programme orientation  
(ii) Pattern of behaviour  
(iii) Approach to learning of Mathematics and  
(iv) Interaction and exposure.

ii REVIEW OF RELATED STUDIES

The various studies conducted in India and abroad in the field of achievement in relation to cognitive style and selected non-cognitive variables are collected and arranged in the chronological order under the major heads:

2. Level aspiration and achievement in Mathematics.  
3. Attitude towards achievement in Mathematics.  
4. Class room environment for achievement in Mathematics.  
5. Home environment and achievement in Mathematics.  

COGNITIVE STYLE AND ACHIEVEMENT IN MATHEMATICS

Over the last four decades extensive research has been conducted on cognitive style. Diggary (1972) reported that in field dependent students, the
ability to retain digest information is lacking since this abilities require a moderate degree of analytical thinking or Field independence.

Witkin, Moore, Goodenough and Cox (1975) presented an excellent review of the research on cognitive style. In their opinion, there is no high correspondence between field independence and overall scholastic achievement, but specifically field-independent subjects, would achieve very high grade in these domains, which require cognitive restricting skills and scientific analytic skills. A study conducted by Ogunyemi (1973) in Nigeria found a significant relationship between science achievement and cognitive style for boys but not the girls.

Span (1973) Starkly (1976) Chatterjea & Paul (1982) have demonstrated that performances on various version of Embedded Figure Test (EFT) is related to various non-social types of scientific achievement like Mathematics, Natural Sciences, Geometry etc.

Pascal (1977) in his study found that success on many of the Piagetian concrete operational task was significantly restricted by Field-dependence. Dembo (1977) observed significant differences between field independent and Field-dependent people in internalising, organising and learning materials when unstructured and showed superiority of field-dependent individuals.

A study conducted by Lawson and Wollman (1977) on students of sixth grade classes found high correlation between Field-independence and success on problems of functional fixity and value judgement. Buriel (1978) investigated school groups in different culture and have shown over-all high scholastic achievement among Field-dependent subjects even after the variance attributable to intelligence.
Bachman (1979) from his study on the relationship between cognitive style and concept attainment and success revealed low correlation between cognitive style and concept attainment.

Studies by Vaidya & Chamsky (1980). Watkin & Astilla (1980) and Sharma Ahuja (1982) on school groups in different cultures have shown overall higher scholastic achievement among Field-independent subjects.

Watkin & Astilla (1980) studied the relationship between Field-dependence and school achievement of Filipine girls and found a positive relationship between Field-independence, intelligence and school achievement.

Ritchey and Lashier (1981) investigated a significant relationship between cognitive style and instructional mode to achievement of college science students. Significant positive relationship was observed from the study conducted by Sharma & Ahuja (1982) between cognitive style and school achievement.

In a study Onyejiaku (1982) examined academic performance of the selected schools of Ibadan and Nigeria and reported a significant relation between the student's cognitive style and perforunace of mathematics tasks.

Lamka (1983) studied whether cognitive style is a predictor of student performance. in secondary classes. The results indicated that Field-independent students were superior to Field-dependent students in most of the factors under study and concluded that cognitive style is considered as a predictor of student performance. Harmon (1983) obtained a contradictory result when he examined the academic success in college freshmen calculus. He found a weak correlation between cognitive style and achievement in calculus.
A study designed by Saracho (1984) to examine the effort of Field-dependence or field-independence on levels of academic achievement observed that students cognitive style and door grade level are related to one another.

Gobriyal (1984) studied the interactive relationship between cognitive style and recognition memory of university studies and no significant difference between Field-independent Field-dependent cognitive style on pictorial recognition memory test was noted.

Chatterjea & Paul (1984) observed Field-dependent students significantly superior since achievement proficiency in both intelligence uncontrolled and controlled condition.

Brennan (1984) studied the effect of hemispheric preference, cognitive style and method of instruction upon Mathematics achievement of tenth grade students and reported that there was no significant difference between cognitive style and Mathematics achievement. But Hadfield et al. (1992) investigated that Field-independent persons generally score significantly higher on total Mathematics concepts and on problem solving.

The relationship between self perception, cognitive style and learning was studied by Das (1985) and found that cognitive styles were significant and positively correlated to school achievement.

Effect of cognitive style and adjunct question on learning from connect discourse have been examined by Panda (1985) in a study on school students and found that Field-independent students' learn and retain prose significantly more often than Field-dependents. A significant correlation between Field-independence and achievement scores in language and second language proficiency level was observed by Ballard (1985).

Husen & Postieithwaite (1985) reported that Field-independence tests correlated highly with performance on intelligent tests. At the same time
Globerson *et al.* (1985) found that there is no association between cognitive style and cognitive development.

Arrington (1987) studied the relationship between Field-independent and Field-dependent visualisation and problem solving in adolescents and found a positive correlation between cognitive style and problem solving. Field-independents are superior to Field-dependents in these abilities.

Harcker (1989) found a significant relation between cognitive style and achievement. Field-independent students had better performance than Field-dependent students irrespectively of instructional conditions.

Paramo & Tinajiro (1990) measured school performance by mean grade in mathematics, natural science and Spanish and over all grades. It was found that Field-independent, students performed better in all subjects, especially boys.

Nah *et al.* (1990) administered a multi-diamentional measure of cognitive style and an achievement test in Korean sample and found a significant relationship between cognitive style and achievement.

Verma & Swain (1991) reported close relationship between cognitive style and school achievement of students taken as a whole and in independent subjects. A significant positive, correlation was obtained between Field-independence and academic achievement by Moore & Dwyer (1991)

Riding & Mathias (1991) conducted a study of 11-years old children's learning mode preferences; reading attainment, and cognitive ability and highest achievement was predicted for wholistic, varbalizers.

O' Brien (1991) compared cognitive style preferences of male and female college Students associated with major area of study. The findings reveal distinctive differences in cognitive styles between males and females as
systematic differences associated with major area of study, level of academic achievement and educational level.

Russel (1992) studied to identify the differential effects on learning of subjects with Field- dependent and Field- independent between GEFT and achievement.

Fenton (1992) conducted a study to find out how individual difference in cognitive style interact with student performance and reported weak relationship between cognitive style and academic, achievement.

Studies conducted by Hadfield et al (1992) revealed that field independent persons generally score significantly higher on total Mathematics concepts and problem solving.

Sudheeshkumar (1993) investigated on interaction effect of intelligence cognitive style and approach to studying on achievement in Biology on secondary school pupils and found that cognitive style has significant main effect on total achievement in Biology only for girls.

Riding and Douglas (1993) revealed that both cognitive styles (Field independence and Field-dependence) had interaction with learning performance depending on how the task is presented.

Demick & Koebu (1993) investigated that the degree of Field-dependence- independence was the best predictor of children’s reading readiness. Also cognitive style works to enhance a student’s ability to learn.

Santhoshkumar (1995) studied the effect of cognitive style and the classroom environment on achievement in social science of X standard and found that the relationship between cognitive style and achievement is positively significant.
LEVEL OF ASPIRATION AND ACHIEVEMENT IN THE MATHEMATICS

Hoppe (1930) performed the first experimental analysis of operational phenomena. The experimental results stimulated other researches to investigate into the factors that influence goal-setting behaviour. Joshi (1963) opened that an individual’s level of aspiration is with reference to his positive striving towards a goal that is generally in keeping with his assets. Later a number of studies were done to show the relationship between achievement, motivation and level of aspiration which in turn affects the academic performance.

Muthayya (1960) in his study of “Level of aspiration and its relation to modes of reaction to frustration among adolescents” found a slight correlation between level of aspiration and school achievement.

Bhargava (1972) in his study of level of aspiration and need for achievement observed that these variables are not related.

In another study Bisht (1972) obtained a positive relationship between educational attainment and the level of educational aspiration. Mohanty (1972) studied the level of aspiration as a function of sex, socio-economic status and class performance. The findings of the study were indicative of the positive relationship between level of aspiration and academic success.

Hussain (1977) in his study of academic attainment in relation to level of aspiration and anxiety, reported that academic performance of the group which showed a moderate goal discrepancy was better than that of the groups showing either high or low goal discrepancy which implied a curvilinear relationship between the level of aspiration and academic performance.

Sharma (1979) in his study, observed that level of aspiration did not influence academic achievement and that the difference on academic achievement influenced the levels of aspiration.
Sivappa (1980) in his study of the factors affecting achievement in high school pupils revealed that the intelligence, n-achievement, manifest, anxiety, educational aspiration and study habits are the factors that contributed in predicting academic achievement.

A study of need achievement in relation to creativity, values, level of aspiration and anxiety, was conducted by Sexena (1981) and found relationship between achievement motivation and level of aspiration.

Nowaczyk (1982) found a considerably higher correlation with academic standing for aspiration level and for rearing environment.

Sharma (1992) examined the effect of reinforcement in educational performance and aspirations of adolescents and concluded that the reinforced group was better in the level of aspiration as compared to the non-reinforced group. Also he observed that reinforcements are effective in improving the students educational performances and in bringing about desirable changes in their level of aspiration.

**ATTITUDE TOWARDS MATHEMATICS AND ACHIEVEMENT**

The study conducted by Aiken (1970) on elementary, high school and college levels revealed that even though there exists a positive correlation between attitudes and achievement, they did not always reach the level of statistical significance.

Behr (1973) found that correlation between attitude and achievement in mathematics varies not only with grade level but also with the sex of the student. The study also found that girls' Mathematics marks were more predictable from their attitudes than boys' marks.

Zacharia (1977) in his study on the impact of attitudes and interest on achievement of secondary pupils in social studies found that there is high
positive correlation between achievement and their attitude regarding social studies.

Joseph (1979) in his study found that attitude towards science has a significant correlation with achievement in chemistry at the pre-degree level. Jain (1979) identified the major factors which influenced attainment of Mathematics at high school stage. Attitude towards Mathematics was found to be one of such factors that played vital role in the learning of Mathematics.

The study conducted by Pillai (1981) and Nair (1984) obtained the result that for each of the sex group, there is significant relation between science achievement and attitude towards problem solving.

Schofield (1982) studied the relationship between attitude and achievement in connection with sex of students grade level, type of achievement test and time during school year at which the measurements were taken. Findings indicated that observed relationship between attitudes and achievement were significantly stranger in boys than girls.

Patel (1984) and Budhev (1990) found that pupils possessing a favourable attitude towards Mathematics were better in mathematical ability than those with less favourable towards science were higher achievers is physical and life sciences.

Baby (1987) and Madhavan (1990) found that attitude towards education and achievement in Malayalam are significantly related.

A study by Pillai (1987) found that subjects of the three levels of attitude towards science differ significantly in their Biology achievement, where as Sujatha (1987) contradicted this.

Kaaya (1987) indicated that there were significant differences in Mathematics attitude between achievers and under achievers, but no significant
differences in between the two sub groups of female achievers and female under achievers.

Indira (1989) reported that the relation between attitude towards science and achievement in physics is significant for low, average and high intelligent groups.

Noushad (1989) and Varghese (1989) obtained a significant positive relationship between attitude towards problem solving and process outcomes in Biology.

Padmakumari (1990) revealed in her study that socially advanced and disadvantaged groups differ in their mean score of achievement in mathematics and attitude towards Mathematics. It was also found that both variables, achievement in Mathematics and attitude towards Mathematics have significant relation with each of socio-economic status, caste, locale and family size.

Jayasree (1991) obtained a positive correlation between attitude towards science and Biology achievement. Thorndike (1991) showed that attitude toward Mathematics was predictive of final Mathematics course grade and the intention to continue to participate in Mathematics courses once enrolment becomes optional.

Tocci & Engelhard (1991) investigated the relationship of attitude towards Mathematics with Mathematics achievement and gender using samples from US and Thailand. In both countries achievement was significantly correlated with attitude towards Mathematics.

Wheat et al. (1991) noticed a relationship between students attitude towards Mathematics and their success in college Algebra. Tocci & Engelhard (1991) in their study in United States and Thailand also found that achievement is an effective predictor of attitude towards Mathematics.
Madsen *et al.* (1992) observed that conceptual understanding enhanced students' computational competence and promoted more positive attitude toward Mathematics. Reynolds & Walberg (1992) tested a structural model of Mathematics achievement and attitude with a probability sample of 3,116 adolescents from the longitudinal study of American youth. It was concluded that prior achievement and home environment influenced subsequent achievement and previous attitude had the most powerful influence on subsequent attitude.

McLeod (1992) revealed that attitude towards Mathematics have an important influence on the development of Mathematical skills and on the emotional reaction of children associated with Mathematics.

Wong (1992) investigated the relationships among Mathematics achievement affect and home background for Hong Kong students in grades 7-13. Achievement was most closely related to academic and non-academic self concepts and attitude toward Mathematics.

Sundararajan & Rajasekar (1993) investigated that effective teacher behaviour perceived by the students influences their attitude towards the subjects. The sex of the students and the locality of the school do not effect any significant difference in their attitude towards the study of Mathematics. But Singh (1993) observed that the students residing in industrial and urban localities have a more favourable attitude towards Mathematics in comparison with the students residing in rural localities.

Randhawa *et al.* (1993) observed Mathematics self efficiency as a mediator between mathematics attitude and achievement. Rech (1994) found that higher achieving black eighth grades have poorer attitudes towards Mathematics than other students.
Patel (1995) reported that students possessing high attitude towards Mathematics were found better in Mathematical ability than students possessing low attitude towards Mathematics. Krap (1991) had found that the attitude of teachers towards Mathematics have bearing on the Mathematical performance of students.

Malini (1995) studied the gender differences in certain psychological variables of Mathematics domain at secondary school level. The findings showed that the attitude towards Mathematics is significantly selected to achievement for girls but not for boys.

Stage & Kloosterman (1995) found that previous Mathematics skills were significantly related to beliefs about Mathematics, but beliefs were unrelated to final course grade for males. Conversely beliefs about Mathematics were significantly related to final course grade for females.

House (1995) investigated the predictive relationship between initial student attitudes, college admission test scores, years of High School Mathematics taken and subsequent achievement in introductory college chemistry. Results also indicated that initial attitudes were significant predictors of student performance, possibly better than traditional measures.

CLASS ROOM ENVIRONMENT FOR MATHEMATICS AND ACHIEVEMENT

Silbergeld & Koeing (1975) conducted studies, to evaluate the classroom psycho social environment for student behaviour and achievement. It was found that science classes were moderately effective in personal development than English classes. Classroom environment was significantly related to science achievement and personal development.

Puri (1977) investigated the relationship between classroom climate and achievement motivation on sample of Gujarati medium schools of Baroda and
significant relationship between classroom climate and achievement was observed.

Sandeep (1977) found that poor, school environment affected adversely the attainment of perceptual and cognitive skills of the subject.

A study of classroom climate in secondary schools by Desai (1979) investigated that the level of classroom climate was positively related to pupils motivation and their academic achievement.

Fry & Coe (1980) reported distinct association between classrooms characterised by teacher support and involvement, with pupil motivations of enjoyment of learning.

Fraser & Fisher (1980) studied the effect of classroom psycho-social environment on student learning. The investigators revealed that there is significant association between student learning outcome and their classroom environment perception. Fraser & Rentoul (1980) investigated a significant amount of achievement variance between actual and preferred classroom interactions.

Mintzes (1982) revealed that achievement is related to students perceptions of the frequency of information. Students would judge a teacher only on the basis of what they see in the classroom.

Christian (1984) conducted a study on Group Dynamics, Academic Motivation, Classroom Climate and academic performance among the higher secondary students. It was observed that pupils in urban classrooms had shown higher mean scores on Academic Motivation as well as classroom climate but an average score on Academic performance.

The study by Docter (1984) indicated a significant relationship between classroom climate and academic achievement. Upadhyaya (1984) conducted a similar study on tribal population of Bastar District in Madhya Pradesh. It was
found that each of three aspects of classroom environment (inter personal relationships, goal orientation and system maintenance and change) was significantly related to academic achievement.

Fraser & Brien (1985) explored the association between classroom environment and elementary school students’ achievement.

Byrne _et al._ (1986) studied the relationship between student achievement and classroom environment perception. Higher achievement scores were found in schools perceived as happy places with many opportunities.

In an investigation of the classroom environment for learning science in secondary schools of (the classroom) Kerala, Sivaprasad (1988) observed that most of the learning in the class rooms did not have provision for extra learning which narrows the learning circumference.

Singhal (1991) observed that academic achievement had significant positive correlation to academic motivation, affiliation, teacher support task orientation, competition and innovation-dimensions of classroom social climate. Cooper & Robinsen (1991) found that perceived support from parents and teachers had positive but weak relationship with Mathematics self efficacy. Padhi (1992) observed that the creative ability and psycho-social characteristic of classroom environment of the students are significantly related to their academic self concept and achievement in school subjects.

In a study on preferred and actual classroom environment and the approach to learning Watkins & Akande (1993) found that Nigerian students prefer more teacher control a less competitive atmosphere and less emphasis on student friendships. Strykowski (1993) provided empirical evidence that instructional and classroom environment as well as home environment influence educational outcomes.
Lee's findings (1993) reported that class room guidance can positively influence students' academic achievement in Mathematics. Puthenpurayil (1994) observed that there is only a low relationship between achievement in basic concepts of biological science and class room climate. Santhoshkumar (1995) found that the effect of class room environment on achievement in social science was not significant.

**HOME ENVIRONMENT FOR MATHEMATICS AND ACHIEVEMENT**

Wolf (1964) examined the important potential areas of the environment, leading to academic achievement. These included parental pressure for achievement motivation, their aspiration for the child and the kinds of rewards they gave.

Studies by Pillai (1965), Warrier (1966) and Joseph (1975) all showed that home environment and socio-economic level of the family have a significant influence on the achievement of pupils.

Dayer (1967) and Kellaghan (1977) found significant relationship between family environment and measures of academic achievement and intelligence.

Keeves (1972) found that structural variables of the home background are not significantly associated with final achievement in Mathematics or science, but home attitudes are found to be associated with final achievement in these subjects.

Reddy (1973) found that home environment was prominent as a potential predictor of academic achievement after intelligence. The study was mainly intended to find out the relationship between academic achievement in a subject or group of subjects at the first year degree examination and intelligence, need for achievement, personality and home environment of the students.
James & Hesselbrock (1976) in their study on perceived family environment and school adjustment of children reported that competent children are reared at homes that encourage cognitive and social initiative. It was supported by Tortman (1976) when he examined the question whether socio-economic status indicators, sufficiently represent those aspects of the home environment relevant to IQ and found that family’s environment predicted academic achievement as well as did the child’s IQ.

Salunke (1979) made an attempt to study the home environment, educational climate in the home, emotional climate in the home, SES, economic management and academic achievement and found that (i) the academic achievement of the students was related to their home environment. (ii) educational facilities and emotional happiness in the home contributed positively to the academic achievement of students.

Hildebrand & Patraci (1979) found that conceptual understanding of Mathematics at each developmental stage was influenced significantly by family environment of the subject. Grover (1979) indicated some influence of aspirations of father and mother over children’s academic achievement. White (1982) and Subrahmaniyam (1983) found that home environment is one of the factors which influence the academic achievement of a child.

In the study on affective correlates of the gifted under achievers, Maitra (1985) found that home environment is an important variable which could cause under achievement among gifted. In another study Jaganadhan (1985) indicated a significant effect of home environment on academic achievement.

Agarwal (1986) conducted a study on the effect of parental encouragement upon the educational development of the students and recorded that the high achieving group had been getting higher parental encouragement.
Trivedi (1987) observed that parental attitude was significantly related to academic achievement. Later, Diaz (1989) found that home environment differed from the higher and lower achievers’ family with parental aspirations higher for higher achievers.

In a study Feldman & Wentzel (1990) reported significant relationship between achievement and parent-child interactions. Also it was observed that mother-father hostility is an indirect predictor’s son’s academic achievement.

Wong (1992) conducted a study on the Relationship among Mathematic achievement, Affective variables and Home Background and obtained a positive relation between achievement in Mathematics and home background. But Kloosterman & Cougan (1994) found that students who enjoyed Mathematics were also confident of their Mathematic abilities and that there was little correlation between parental support and student achievement.

Keith et al. (1995) examined the influence of parental involvement on the academic achievement of 8th grade Mexican-American children. The most salient findings was that, parental involvement influenced over all academic achievement, as well as promoting gains in the specific subject areas of reading, Mathematics, science and social studies.

Chaudhury & Basu (1998) in the study parent child relationship school achievement and adjustment of adolescent boys, concluded that parenting had significant association with school adjustment and school achievement. School achievement was most significantly associated with the parenting dimensions.

Leenadevi (1996) obtained a positively significant correlation between home environment and achievement in English.

**HOME PRACTICE FOR MATHEMATICS AND ACHIEVEMENT**

Weighened (1957) in his study on Adaptiveness and role of parents in academic success observed that parental reinforcement positively related to
academic achievement. Hudson (1966) opined that the difference between convergent and divergent thinkers is due to early experience in the environment.

Backer (1971) found that parents influenced their children’s educational performances directly or indirectly. Pillai (1974) in his study revealed that the factors like coaching and practice have a considerable influence on intelligence test scores.

Grover (1979) conducted a study on parental aspiration as related to personality and school achievement of children and reported significant differences between school achievement of children of low aspiring parents and middle aspiring parents. In his study Mehra (1980) proved the influence of parental visit to school and teaching the child at home on achievement.

Agarwal (1986) examined the effect of parental encouragement up on educational development of secondary school students. He found that high achieving group had been getting parental encouragement.

Despande (1986) investigated the relationship between home work and achievement. According to the study there is an indication that students who are given regular home work perform better.

Yadev (1986) in an study found that time advocate by pupils to do home task, reading newspaper and magazine, receiving help from parents or father at home and time engaged in co-curricular activities outside the school hours are positively related to their academic achievement.

Basavayya & Patnaik (1989) conducted a study to investigate the factors related to student’s liking Mathematics at secondary school levels. They found that the education of brothers and sisters of the students has got positive effect towards the student liking mathematics, as they get help in solving their mathematical problems from them.
Portes (1991) in his study on assessing children’s cognitive environment through parent-child interactions observed that material verbal guidance was a significant predictor of academic achievement particularly for Mathematics and references skills.

The relationship between family ethnicity and scholastic achievement was examined by Ferguson et al. (1991) and found that ethnicity was not related to measure of performance. They suggested that family ethnicity and test results can be adequately explained by variations on socio-economic status.

Shrivastava (1991) observed that families of high achievers were more structured and exercised more controls than those of law achievers.

O’connell (1992) reported that students working with parental partners displayed higher problem solving ability than those not working with partners.

Reynolds (1992) compared parental involvement and their effects on academic achievement and reported that teachers rating of parental involvement in children’s education exhibited high correlation with reading and Mathematics.

Mumthas (1993) conducted a study on standard VIII pupils of Kerala on the effect of practice of tutoring at home on achievement in Mathematics, and found that tutoring at home has a significant effect on the achievement of Mathematics.

Georges and Elliot (1995) investigated the influence of the students home work time and parental time and involvement in helping activities on the academic performance of students in grade III and V. Basheer (1995) found that significant and positive correlation existed between the variables home practice in achievement in Chemistry.
A TREND REPORT OF THE STUDIES

While attempting to review the researches in the country and abroad with respect to the problem area of the study, it is seen that several attempts have been made to study the effect of cognitive and non-cognitive variables on achievement.

It becomes obvious from the review that some of the studies yielded positive results, some negative results and some other studies came up with inconclusive results. There are more studies showing positive and significant relationship than those showing no relationship and negative results.

There are several studies in the area which have attempted in replicating earlier studies, taking different samples or by including different school subjects at various levels and by adding or eliminating one or the other factors in the study.

Another point that becomes obvious is that the studies probe into multiplicity of variables in a single research, using a large number of tools, whether standardised or adopted or constructed, and using various statistical techniques for analyzing the data.

The survey also indicated some agreements but some inconsistencies in the findings. In this context the investigator decided to take up a study to know how important and consistent is each cognitive and non-cognitive variables selected in influencing achievement in Mathematics. The present study is an area in which very little work has been done and the investigator hopes that the findings of the study will be a significant addition to the knowledge in this field.