Chapter III

REVIEW OF RELATED LITERATURE
3.0 INTRODUCTION

Study of the Related Literature implies locating, reading and evaluating reports of research as well as reports of casual observation and opinion that are related to the investigator’s planned research project. “The survey of related literature is a crucial aspect of the planning of the study and the time spent in such survey invariably is a wise investment” (Mouly, 1970).

The Review of Related Literature helps the research worker to find out what is already known, what others have to be attempted to find out, what method of attack have been promising and what problems remain to be solved. For a valuable research work, the research worker needs an adequate familiarity with the literature available in that field of study. Review of Related Literature enables the investigator, to know the means of getting to the frontier in the field of his research.

The identification of a problem, development of research design and determination of the size and scope of the problem, all depend to a great extent on the care and intensity with which a researcher has examined the literature related to the intended research work.

The Review of Related Literature is needed to demonstrate the relationship between the complete research and topic under investigation. It promotes greater understanding of the problem and its crucial aspect and ensures the evidence of unnecessary duplication.

The present study was to examine the interrelationship between Multiple Intelligences and Science Interest among Upper Primary school students. There were many researchers conducted study in the field of Multiple Intelligences. Hence the investigator reviewed various studies connecting problems related with Multiple Intelligences, Science Interest and classified them under appropriate heads. For the ease and flexibility of the study, the investigator classified them into main three heads:
i) Studies related to Multiple Intelligences – This has further divided into five subheads
   a) Studies on Multiple Intelligences Theory (General)
   b) Book reviews on Multiple Intelligences Theory
   c) Studies on components of Multiple intelligences
   d) Studies on upshots of Multiple Intelligences
   e) Studies on criticism about Multiple Intelligences Theory

ii) Studies related to Science Interest.

iii) Studies related to Multiple Intelligences and Science Interest/Science.

3.1 STUDIES RELATED TO MULTIPLE INTELLIGENCES

3.1.1 Studies on Multiple Intelligences Theory (General)

Gardner (1983) has proposed that intelligence is not unitary but rather comprises eight Multiple Intelligences: Bodily-Kinesthetic, Interpersonal, Intrapersonal, Verbal-Linguistic, Logical-Mathematical Intelligence, Spatial, Musical and Naturalistic Intelligences. Each of these Intelligences is a distinct module in the brain and operates more or less independently on others.

Armstrong (1987) described about the Multiple Intelligences and suggested ways of helping children to learn more intelligently. He focused the parents and suggested the various techniques and methods to teach children efficiently based on Multiple Intelligence concepts.

Gardner and Hatch (1989) discussed about the educational implications of the theory of Multiple Intelligences. In this, Gardner opposed the practices of traditional education system that typically place a strong emphasis on the development and use of Verbal and Mathematical intelligences. They proposed that Educators should recognize and teach at a broader range of talents and skills.

Blythe & Gardner (1990) proposed the process of implementation of Multiple Intelligences theory oriented instructional strategies for the schools. They
stressed the urgency and importance of adopting this method in schools and pointed out the discrepancies in the conventional method adopted in the present schools.

Ellison (1992) conducted a study to understand the effect of Multiple Intelligences theory to meet diverse needs of students. The experimental Minneapolis K-8 School began individual goal setting conferences with parents about 10 years ago. He observed that teachers reformatted goal setting that reflect Gardner’s theory of Multiple Intelligences involving Intrapersonal, Interpersonal, World Understanding, Linguistic, Logical-Mathematical, Spatial, Bodily-Kinesthetic and Musical ability.

Armstrong (1993) gave layman’s guide to the Multiple Intelligences, which include practical tests to explore one’s Intelligences and suggest ways of strengthening each one. It contained a simple and systematic way of identifying and developing Intelligences.

McCahill (1994) says that teachers must strive to enhance their power as educational connoisseurs and critics, professional who understand how to use technological learning materials that promote growth across Multiple Intelligences. The case study demonstrates how this demand was met in an ‘Advanced’ Grade 10 English class. The tasks were shaped to suit learning style preferences including Verbal-Linguistic, Logical-Mathematical, Spatial, Bodily-Kinesthetic, Musical, Interpersonal and Interpersonal. The assignment met Gardner’s demands for a responsive, integrated, substantive, co-operative curriculum in which students were called upon to function as active participants in the learning process.

Munro (1994) examines Multiple Intelligences model of individual ways of learning and its implications for mathematics teaching. The alternative ways that students used were mathematical ideas, management or control mechanisms and related models of learning preferences, ways in which students relate and manipulate ideas for the teaching of mathematics.
Radford (1994) studied the impact of Multiple Intelligences theory and flow theory in the school lives of 13 children. Meta cognition and self awareness appeared to play a significant role in the individual student’s success. Challenges were appreciated by students, teachers and present as opportunities for learning or as a provocation to interest, which in turn might stimulate motivation and student ownership of the learning process.

Weber (1994) conducted a study on Multiple Intelligences view of learning at high school level. This study drew upon a constructionist and Gardner’s Multiple Intelligences view of learning, to develop an interactive curriculum development model involving High School students and teachers. The analysis of the findings suggest that change within the curriculum content, consistent with a constructionist and Multiple Intelligences view of learning would enable student to develop further development of their individual differences.

Gardner (1995), in his article ‘Multiple Intelligences as a Catalyst’, explained the distinction between ‘surface’ and ‘deep’ applications of the theory. Surface applications include describing every activity in terms of the putative Intelligences that it entails or every child in terms of his or her alleged intellectual strengths or weaknesses. ‘Deep’ applications of the theory go beyond a reflexive invocation of the categorical scheme and ultimately bring about a different way of thinking about children and their education. Focusing on the child, a ‘Multiple Intelligences Approach’ entails a careful description of what the child is like intellectually and the planning of an education program appropriate for the child.

Layng, et al. (1995) in their report describes a program to improve inappropriate behaviour of targeted Fifth & Sixth Grade classes in an Elementary school. Seventeen percent of the school population is identified as low income. Analysis of probable cause data reveals that students lack initiative, social skills and commitment and that student’s view about school as irrelevant. Parental values and economic conditions may be contributing factors. In analysis instructional strategies and curriculum, failure to engage students in their own learning may also be problematic. Decision was made to select two interventions: i) Design a series
of learning activities addressing Multiple Intelligence theory and ii) Incorporate those activities utilizing co-operative learning.

Rogers, et al. (1995) through their article ‘Intelligences in action’, demonstrate that drama can promote an interactive and dynamic kind of classroom participation. Tired interaction patterns are replaced with lively and engaging dialogues, and students are empowered to question, challenge, interpret and reflect on the themes of literary works. They are allowed to learn and to display these learning in multiple and distinctive ways (Gardner, 1991). Gardner’s work helps us to see that in many classrooms, students are not developing rich understandings because they are limited to traditional forms of linguistic interaction.

Smerechansky (1995) stressed through his article ‘The Quest for Multiple Intelligences’ that Educationists should adopt Gardner’s theory of Multiple Intelligences, into their classrooms to broaden the learning opportunities for all students. He also specified the advantages of the theory in developing the Multiple Intelligences of Gifted children.

Berger and Pollman (1996) compared the whole child approach to Early Childhood Education and Gardner’s concept of Multiple Intelligences. They provide activities and ideas to address each of the seven Intelligences and listed specific suggestions for parent/child experiences, field trip experiences and constructivist experiences.

Campbell (1996) pointed out that a school’s responsible for helping all students to discover and develop their talents or strengths. He also pointed out that some teachers interpret Multiple Intelligences theory as an instructional process that provides numerous entry points into lesson content. He concluded that teachers should apply this theory in the way that they consider most appropriate for their students, school and community.

Christison (1996) pointed out that an understanding of Multiple Intelligences theory broadens teacher’s awareness of their student’s knowledge and skills and enable them to look at each student from the perspective of strengths and potential.
Erb (1996) in his project intended to increase student’s responsibility for their own learning in order to increase academic output and decrease the incidence of inappropriate behaviour. Analysis of probable cause data revealed that these students lacked intrinsic motivation, interest in science, low self esteem and possible family dysfunctions. Large class size may have contributed to this problem. Post-intervention data indicated an increase in student’s responsibility for their own learning through an increase in academic output data and decrease in the incidents of inappropriate behaviour.

Hine (1996) gave detailed characteristics of the seven Multiple Intelligences and promotes a systematic approach to teaching that strives to meet individual need of children. He proposed that by providing teaching tools and strategies including active learning centers to support the development of each intelligence area may expose children to varied ways of learning.

Hoerr (1996) says Multiple Intelligences (MI) theory developed by Gardner, states that there are at least seven different Intelligences. Everyone possesses some degree of each of the seven, but no two individuals have exactly the same configuration. MI theory is not a theory of learning styles or a curriculum in its own right. The implementation of Multiple Intelligences theory in a school is contextual and teacher specific, educating all stakeholders and recognizing teachers.

Jago, et al. (1996) reviewed Gardner’s ‘Theory of Multiple Intelligences’ and strongly haunted by the student’s response and improvements. For progressing the writing ability, the teacher should ask doesn’t worry, your ideas will follow, get the pen moving and surprisingly the students do their writing items well framed. Hence the authors say that “they are forcing a Verbalizer’s method of composing on a Visualizer’s brain”. They assure that they don’t know yet how this information will shape tomorrow’s lessons, but the students know it well.

Jasmine (1996) suggested that the uses of the theory of Multiple Intelligences in education depend on the recognition and respect for each learner’s way or ways of learning as well as special interests and talents.
Albero, et al. (1997) in their research report describes a Multiple Intelligences program for increasing reading test scores. The problem of low reading test scores was documented. The program involved curricula by teaching Multiple Intelligences, creation of portfolios for students and teacher evaluation and the implementation of student reading logs. As a result, it was observed that students spend more time in reading and reflecting on what they had read comprehension and higher level thinking skills increased.

Coleman, et al. (1997) in their Action Research project evaluated a program for decreasing the gap in achievement levels among primary and secondary level students in the targeted schools based on teaching with the Multiple Intelligences. Along with the MI, incorporation of teaching strategies such as co-operative learning groups, projects and Meta cognitive processing, will determine if discrepancies in achievement levels will be minimized.

Dare, et al. (1997) done an Action Research project to implement and evaluate Multiple Intelligences intervention program to reduce disruptive behaviour interfering with students academic growth. The target population consists of students in four primary classrooms. Analysis of probable cause data revealed that a changing school population, a decline in parental supervision, a lack of sufficient support personnel and a curriculum overload contributed to the problem. Solution strategies related in three major categories of intervention: cooperative learning, Multiple Intelligences strategies, and higher order thinking skills.

Gardner (1997) postulated that there are many forms of Intelligences, many ways by which we know, understand and learn about our world, not just one. Gardner’s view of intelligence is backed by scientific research, which reveals different parts of the brain to be sites of different abilities. Gardner identified that scientific understanding of Intelligences is ever changing and its accumulation in the brain and genetics will only accelerate the process and Multiple Intelligences will be appealing.

Mallonee (1997) researched Gardner’s theory of Multiple Intelligences, suggested that everyone is capable of at least seven ‘ways’ of knowing. Individual differences occur in the relative strengths of intelligence within a person. Multiple
Intelligences theory encourages teachers to expand their repertoire of techniques, tools and strategies beyond the typical Linguistic and Logical ones predominantly used in classrooms.

McGraw (1997) in his study evaluated the effectiveness of reinforcing strategies based on Gardner’s theory of Multiple Intelligences on student’s learning of mathematical concepts. The result of the study revealed that there was no significant difference in student’s learning of the mathematical concepts when reinforced by using the Multiple Intelligences in a non-aligned manner.


Roesch (1997) studied the perspectives of English teachers on the Multiple Intelligences theory in the high school classroom results indicated that half of the English teachers were linguistic learners and that half of the English teachers were non-linguistic learners. These non-linguistic learner teachers were used and addressed the multitude of Intelligences within their English class rooms.

Silver, et al. (1997) pointed out that no individual is universally intelligent; certain fields of knowledge engage or elude everyone. They also pointed out that the educator could build on student’s interests. When students engaged in research either individually or in groups, show them the menus and allow them to choose the product or approach, which appeals them. They should choose the best product for communicating their understanding of the topic or text.

Harms (1998) conducted a study to determine and compare self-perceptions of the dominance of Multiple Intelligences among grade III, grade VII and grade VIII students were randomly selected from South Dakota schools. The result of the study indicated that respondents perceived Naturalistic and Interpersonal Intelligences were their most dominant capacities and Intrapersonal Intelligence was their least dominant capacity. Also there were significantly different perceptions among students at the third grade levels of all Intelligences.
Kuzniewski, et al. (1998) in an Action Research project described a program for expanding Multiple Intelligences to increase reading comprehension in both English and Mathematics probable cause data revealed students living in low economic conditions, high mobility rates natural attrition, and poor attendance. The data also indicated student’s poor social skills and lack of self-discipline. Strategies combined with cooperative learning techniques in English and Mathematics units and the implementation of weekly student observation sheets are anecdotal reflections. Post intervention data indicated an increase in student reading comprehension skills in English and Mathematics and increase in student learning expectations.

Mayer (1998) conducted a study on Naturalistic Intelligence and pointed out that teachers must provide the opportunity for students to practice the Naturalistic Intelligence to grow. One simple way to encourage the Naturalistic Intelligence is to take students outside and explore their school’s community. Teacher must consider all Intelligences while planning and recognizing lessons.

Borrego (1999) conducted a study to examine the application of Multiple Intelligences principles by special education teacher’s interns in classroom environmental adaptations. Results indicated that training provided in the Multiple Strategy enhanced the ability of the special education interns to implement environmental modifications effectively in the classroom.

Cahill (1999) conducted a study on Gardner’s theory of Multiple Intelligences as reflected in Shakespeare’s play. This dissertation argues the extent to which Shakespeare’s universal appeal proceeds from his ability to tap the various aspects of intelligences which afford individuals the greatest sense of joy, accomplishment, stimulation and amusement. Shakespeare allows individuals to utilize their own particular interest and strengths among the various Intelligences as an optional means to approach and appreciate his art; this is because he remains as vital as today as he was four hundred years ago.

Christison (1999) discussed Gardner’s theory of Multiple Intelligences and why it is frequently a topic of discussion among English as second language educators. The eight Intelligences described the theoretical bases for Multiple
Intelligences theory is highlighted and for the development of lesson plans and curricula using it.

Contanzo and Paxton (1999) pointed out that Multiple Intelligences theory could be used in the classroom as a guide to provide a great variety of ways for students to learn and to demonstrate their learning. As learners and teachers work together, Intelligences can emerge naturally through partner interviews, preference grids and need assessments.

Coustan and Rocka (1999) identified that the objective of lesson plans based on Multiple Intelligences or to correlate intelligences with specific activities but rather to allow learner to employ their preferred ways of processing and communicating new information.

Eddy (1999) conducted a study on Multiple Intelligences in adult’s second language learning and teaching. The objective of the study was to make a link between Multiple Intelligences theory and proficiency in second language. This study will increase interest and knowledge in the discussion of Multiple Intelligences and learning styles and to develop applications of these features innovatively and responsibly in proficiency based second language curriculum with a goal towards a self directing autonomous learner.

Elliott and Gintzler (1999) implemented a phenomenological study and evaluated an individualized approach to Multiple Intelligences instruction. The targeted population consists of students of two inner city elementary schools in Indiana. An analysis of the literature led to the understanding that each student has the capabilities to activate all eight Intelligences, but these Intelligences may be developed to different degrees within each individual.

Feency (1999) studied the impact of Gardner’s theory of Multiple Intelligences on change in middle school language- arts curriculum. Four broad domains were the focus of the study: student’s performance, pedagogy, curriculum and assessment. The research studied the effect of implementation of Multiple Intelligences on language arts curriculum in middle schools. The findings of the study were: i) the highest level of change when Multiple Intelligences was implemented and found in the area of student performance, ii) Pedagogy ranked
second in change, iii) Assessment ranked third in change when it is implemented and iv) Curriculum change was lowest in rank.

Hart (1999) reviewed the article, ‘Music and the theory of Multiple Intelligences’ by Kassell (1998). The author has observed that some students who have trouble with Verbal – Linguistic approach responds positively when the same concept put in to music. He tried the same approach of teaching academic concepts through music with a group of Elementary school children. When samples (4000 children in Grades 3 to 5) of students were tested to compare a strict Verbal-Linguistic approach to a strict Music approach (singing the concept), the music group consistently scored 3% higher than the Verbal-linguistic group, has a 9% higher retention rate after two weeks, and had a 6% higher retention rate after four weeks. This provides a strong indication that music is a powerful tool for reaching children and that the more senses children can use in learning, the richer their learning experience will be.

Kallenbach (1999) identified that within a Multiple Intelligences curriculum, students become aware that different students have different strengths and that each person has a substantive contribution to make different realms of intellectual functioning.

Lazear (1999) offered a comprehensive approach to teaching and learning strategies to further the theory of Multiple Intelligences. The creative strategies that address each of the Intelligences identified by Gardner are illustrated with charts and diagrams and many activities that apply to the teaching of all subjects.

Martin (1999) created a Multiple Intelligences Inventory of middle school students by which teachers can identify and assess student’s growth in seven identified Intelligences compatible with a poetry unit in language and arts. The Intelligences addressed in each inventory included Linguistic, Musical-Rhythmic, Logical-Mathematical, Visual-Spatial, Bodily-Kinesthetic, Interpersonal and Intrapersonal.

Miller (1999) conducted a study of the results of a Multiple Intelligences survey among Chamorro and Chuukese students in Guam’s Public Schools, using a nonverbal survey in Gardner’s theorized Multiple Intelligences. The results of this
study show that the Intelligences selected most often by the Chamorro students were Kinesthetic and Spatial. Most selected by the Chuukese students were Interpersonal and Kinesthetic Intelligent.

Stockstill (1999) conducted a study on the relationship between Multiple Intelligences and faith formation during adolescence. The purpose of this study was to determine the relationship between Intelligences recognized by Gardner’s theory of Multiple Intelligences and spiritual maturity during the period of adolescence. Results indicate that a significant correlation exists between the two instruments sorting Intelligences. The Verbal-linguistic Intelligence was a predictor of spiritual maturity among the population selected for this study.

Wilson (1999) investigated the role of Musical Intelligence in Multiple Intelligences focused in Central Florida elementary school. He found that music was not used as an assessment strategy, nor were music abilities assessed at the Elementary school.

Allix (2000) argued through his study that Gardner’s conception of human cognition, characterized by set of multiple and distinct cognitive capabilities, is an advance over the narrow conception of IQ, it runs into fundamental difficulties of methodological kind and is based on a discredited empiricist theory of knowledge which work with artificial neural networks has undercut.

Beam (2000) conducted a study to compare the social studies grades of fifth Grade students involved in two different modes of instruction through the theory of Multiple Intelligences and traditional text book-teacher’s instruction, in a public school setting. Result of the present study indicated that two modes of instruction were effective in teaching social studies concepts.

Goodnough (2000) conducted a study on exploring Multiple Intelligences theory in the context of science education. This research study was designed to explore Gardner’s theory of Multiple Intelligences and its merit for making science teaching and learning more meaningful to explain the process of Action Research in the context of science education and to describe the effectiveness of collaborative Action Research as a frame work for teacher development and curriculum development.
Hennigan (2000) studied the educational implications of computers for learning interacting with Multiple Intelligences. This study notes apparent correlational developments in the field of brain studies, education and personal computing. Tests seeking on actual correlation between brain studies and personal computing were conducted and the results and implications of any such correlation for educators were discussed.

Holliday (2000) indicated the responsibilities of teachers in understanding the student learning process and focuses on some tools that identify student learning styles such as quizzes, the Myers Briggs Type Indicator and Multiple Intelligences.

Muehlbaner (2000) studied the effects of an arts-infused Multiple Intelligences program in mathematical achievement. The results of the study show that there are no statistically significant effects of the arts-infused, Multiple Intelligences program on student’s mathematical achievement.

Neville (2000) conducted a study to examine and compare Native American student’s self perceptions regarding Gardner’s Multiple Intelligences theory. The result of the study indicated, that the respondents perceived Naturalist and Visual/Spatial intelligences to be their most predominant Intelligences and Musical/Rhythmic intelligence to be their least predominant intelligence.

Nguyen (2000) conducted a study of the differential effects of a Multiple Intelligences based curriculum on student performance. The study aimed at examining two of the ten objectives of the first school and Teacher Program Great and other to improve student achievement on standardized tests by using Multiple Intelligences instruments. The results of the California Achievement Test/5 (CAT/5) given at Grade 5 tended to show no difference between students in Multiple Intelligences and traditional school program.

Teele (2000) pointed out the practical applications of exploring Multiple Intelligences in the classroom to make each student express their own personal learning rainbow. Author included seven complete lesson plans ready to be adapted to any Grade level; objective, activities and application that meet U.S and
California standards, a new learning model that elaborates Gardner’s seven Intelligences and exploration of Gender difference in Multiple Intelligences.

Halm (2001) conducted a study on the distribution of Gardner’s Multiple Intelligences among students and faculty in associate degree career programs. The purpose of this study was to assess the distribution of Gardner’s Multiple Intelligences among students and faculty in associate degree, college credit career/occupational programmers at a community college. The data indicated that the subjects rated themselves highest in Interpersonal and Intrapersonal Intelligences and lowest in Musical and Naturalistic intelligence.

Kallenbach and Viens (2001) conducted a study and the document contains nine papers from a systematic classroom based study of Multiple Intelligences theory in different adult learning contexts. It discusses how Multiple Intelligences theory can support instruction and assessment in adult basic education, adult secondary education and English for speakers of other languages.

Manner (2001) outlined the types of learning styles and Multiple Intelligences as well as instructional techniques that work best with student’s respective learning traits.

Snider (2001) conducted a study on Multiple Intelligences theory and foreign language reading. The study shows that the texts typically use a limited range of activity types in presenting material to students. Curricular suggestions are offered for using Multiple Intelligences theory as a paradigm for modifying foreign language learning activities to engage all of the Intelligences in each individual during classroom instruction.

Vivona (2001) studied about the teacher perception of motivation, curriculum and academic achievement of gifted education programs. The result of the study revealed that there are no significant differences in the perception of teachers on the impact of Multiple Intelligences classes Versus Gifted Education on the motivation curriculum and academic achievement of gifted students.

Weiner (2001) investigated commonalities among elementary schools that have implemented the theory of Multiple Intelligences. The commonalities led to the development of a set of guidelines that contain effective strategies for
implementing the theory of Multiple Intelligences in an educational setting. Among the most prevalent guidelines found were the following:- Monthly in service days for teacher collaboration on Multiple Intelligences curricular ideas, usage of self-selected student projects, encouragement of students to recognize and identify their difference Intelligences and incorporation of the eight Intelligences with understanding and depth.

Chandra (2002) studies the relationship between Multiple Intelligences and Achievement in mathematics of secondary school pupils. The major findings of the study are as follows; all components of Multiple Intelligence are positively and significantly related to mathematics achievement. Certain components of Multiple Intelligence could not discriminate the sub samples grouped in pairs on the basis of sex, locale of the school and nature of the school management.

Martinez (2002) discovered that babies and young children learn through extensive experimenting and by being encouraged, unknowingly by parents to use their Multiple Intelligences. By using Multiple Intelligences, pupil can access a greater portion of the brain and learning becomes easier.

Meers and Wisemen (2002) suggested that further exploration into alternative ways of presenting content and achieving required learning sets is needed. They pointed out that current research in human cognition and Multiple Intelligences can set the stage for enhanced learning opportunities for students.

Robin (2002) made a study on an investigation on Multiple Intelligences and self efficiency in the university. He found that 14.7% of the variance in speaking self efficiency can be explained by the negative interaction between Musical intelligence scores. 90% of the teachers in the study tend to stress Mathematical- Logical, Linguistic and Interpersonal intelligence. 75% of the variance in mean self efficiency scores can be explained by the interaction between Interpersonal score.

Ruggieri (2002) expresses a reflection on Multiple Intelligences and transcendentalism. Many students hate math and love other subjects. Most people can’t love and excel in every subject, because some classes become torturous to them, which have gone from absolutely loving the subject to dreading causing
slipping of Grades. This is due to scarcity of variety in capturing meaningful connections and method of instruction. The author suggest that MI theory provide provision to the educator and students to enlighten and enrich their knowledge through capturing meaningful connections through comics, making meaning through social commentaries, making meaning through music, making meaning with free reading, making meaning through Multiple Intelligences.

Jeniffer (2003) conducted a study on the effect of Multiple Intelligences teaching strategies on the cognitive academic language proficiency in English for subtractive bilingual students. The students in the study have varying levels of proficiency in English and their home or ancestral language.

Anand (2004) conducted a study on Multiple Intelligences and certain selected variables of secondary school pupils. The major objectives of the study were, to compare Multiple Intelligences of groups in pairs classified on the basis of sex, locale and nature of the school management and to compare Multiple Intelligences of groups in pairs classified on the basis of parental education level, parental occupational group and parental income. The major findings were concluded as boys and girls are significantly differing in Bodily-Kinesthetic intelligence, rural and urban differ in Linguistic intelligence and type of institutions varies in Inter-Intra personal intelligences. And parental education and income also affect Multiple Intelligences markedly.

Benette (2004) pointed out the effectiveness and suitability of strategies involving Multiple Intelligence on the achievement of physics by using complete lesson plans ready to be adapted to secondary level. The objective, activities and applications are as per the principles of Multiple Intelligences and found that these strategies are more effective than traditional ways.

David (2004) conducted a study of Multiple Intelligences of Chinese gifted students in Hong-Kong: Perceptive from students, parents, teachers and peers. The result of the study was that across different perspective, Logical-Mathematical intelligences received the highest ratings whereas Bodily-Kinesthetic and Naturalistic intelligences received lowest ratings.
Krishna (2004) indicated through the study that the strategies involving Multiple Intelligence theory are more effective on the achievement in mathematics at secondary level.

Bauerlein (2005) reviewed the theory of Multiple Intelligences and suggested a full support for Gardner’s argument. The author says that “the best he can offer is the fact that this theory has had enormous influence on educational thinking and practice throughout the world. The first reason he gives is precisely the fudge that has led researchers in other fields to reject Multiple Intelligences: Educators know that individuals have different intellectual strengths and profiles”. But to call these differences evidence of Multiple Intelligences is another thing. None of the people in fields he cites earlier assert as much. As yet, all we have in favour of different talents being independent mental aptitudes not reducible to a more General intelligence (g) is Gardner’s ever-more-defensive insistence that this is so.

Gershkoff (2005) chose to draw from both Gardner’s Theory of Multiple Intelligences and applications of the Myers-Briggs Personality Type Indicator (MBTI) in developing the “Multiple Methods, More Success” paradigm two reasons. First, each theory offers a very different view of how students learn. Second, these theories are complimentary; Silver, Strong and Perini (2000) have shown that both theories can be implemented jointly and successfully. Gardner’s theory (1983) of Multiple Intelligences was a major departure from the idea that a single number, IQ, could adequately describe all types of intelligence. Gardner defines seven major types of intelligences: Linguistic, Musical, Logical-Mathematical, Spatial, Bodily-Kinesthetic, Interpersonal and Intrapersonal. The type of intelligences that best describes a student has implications for how he or she will master new material.

Lekshmi (2006) conducted a study about preparation and testing of Multiple Intelligences Model for enhancing spoken English at secondary level. The result of the study was that the Multiple Intelligences model is more effective than the conventional model for enhancing spoken English at secondary level.

Asha (2007) conducted a study on interrelationship of different dimensions of Multiple Intelligences among secondary school students. The purpose of the
study was to determine how the different dimensions of the Multiple Intelligences are interrelated based on gender, locality and socio-economic status. The investigator found that there were no differences among the dimensions of Multiple Intelligences based on gender except for Linguistic intelligence and Musical intelligences. However, it also found that there were differences among different dimensions of Multiple Intelligences based on locality and Socio-Economic Status.

Cadwalader (2008) conducted a study on ‘Are teachers always right?: A study of the accuracy of teachers’ recognition of students Multiple Intelligences. Teachers make instructional decisions based on their students learning needs. This study sought to determine the accuracy of teachers’ recognition of their students’ strengths and weaknesses based on Gardner’s theory of Multiple Intelligences. It was found that teachers are less than 50% accurate when asked to recognize student’s too strongest and too weakest Intelligences.

Kaplan (2008) conducted a study on ancient Buddhist, Vedic and Multiple Intelligences pedagogues - “A paradigm for development of home schooling and distance learning environments”. This study urges that the integration of Buddhist, Vedic and Multiple Intelligences pedagogues will become a paradigm for the development of home schooling and learning environments, which is best done through the insides of practices derived from meditation practices.

Kraskey (2008) conducted a study on effective methods of teaching and learning adult south east English learners in an Asian school of manicuring / nail technology. This study provided insight to student learning and positive results as the student began to succeed and passing the state examination to obtain license to work in this profession.

Smith (2008) conducted the study on integrating Multiple Intelligences and andragogical principle into a pre-service teacher education program. The result of this study found that the treatment group performed significantly better than the control group. The social implication of this study is that by providing alternative methods that apply Multiple Intelligences and andragogical model to accommodate adult learners to improve both learning outcomes and students’ satisfaction of the adults in the classroom.
Vedapriya (2008) conducted a study about age and sex of school students makes significant differences in their Multiple Intelligences. The present study was carried out the difference in Multiple Intelligences between male and female and different age groups among school students by employing survey method. The result of the study was that the variables- age and sex of the selected students thus make significant difference, except some core Intelligences.

Gault (2009) conducted a study on implementing Differentiated Instructions (DI) in third Grade math classroom. Based on the conclusions that DI appeared successful for max instruction, the recommendation was extended that educators should more generally implement DI in order to improve students’ achievements. Implication for positive social changes are that this study may encourage educators to implement DI across content areas of instructions to more effectively serve student learning, early academic achievements and increase chance for success later in life.

Saban (2009) argues that there has been a significant increase in the number of Multiple Intelligences (MI) studies in Turkey. In this research, studies of the Multiple Intelligences (MI) theory between the years of 1999 and 2007 were analyzed. The studies that were included in this research (i.e. 71 Master’s Thesis, 8 Doctoral Dissertations, and 18 Research Articles) were analyzed based on 25 themes. According to the results, most studies were conducted in the form of Master’s Thesis (73.2%) during the year of 2006 (44.3%) in Ankara (28.9%) by female researchers (60.8%) empirically (63.9%) with the aim of finding out the effect of the MI theory on Elementary student’s (56.7%) academic achievement in and attitudes towards science (25.8%).

3.1.2 Studies Related to Book Reviews on Multiple Intelligences

Anastasiow (1984) reviewed Gardner’s famous book “Frames of mind: A Theory of Multiple Intelligences”; in which Gardner discusses the impact of experience on the brain’s genetic program, the plasticity of the young brain, and the low and continuous growth of the brain, with the higher mental functions maturing later. Gardner finds Piagetian theory too narrow, because the insights from the theory do not generalize other Intelligences and Intelligences developed in other cultures. Gardner’s rich research background with normal and gifted
children and his work with brain damaged individuals uniquely lifted him to synthesize the realms of material contained in this volume. Gardner has sensibly placed his references in a section at the end of the book, so that the flow of the text is uninterrupted.

Gardner (1984) throws glimpses of light over his book ‘Frames of Mind: The Theory of Multiple Intelligences’. He expresses, over the millennia, human beings have evolved as a species to deal competently with at least seven separate kinds of content or information. We may vary in our potential in seven domains, and we certainly vary in our achievements. But as a species we are all capable of attaining considerable sophistication in each of these several realms. Moreover, the organization of the standard psychological facilities- and, in fact, the organization of the nervous system, respects this division into Intelligences. There is no single ‘horizontal’ capacity, such as memory perception, problem solving, learning or originality that cuts across diverse contents.

Klitgood (1984) reviewed Gardner’s book “Frames of Mind: The theory of Multiple Intelligences”. He says that the book raises expectations about policy implications in the first chapter, but these hopes are disappointed in its conclusion where it is sadly noted that “matching students with appropriate teaching techniques based on their differing, multiple abilities has not met with much success”.

Obler (1984) reviewed Gardner’s theory of Multiple Intelligences and realized that admitting the previous theories of dissociable intelligence have relied on overly limited sources of evidence. Gardner in his book argument these sources by drawing up on developmental psychology, neuropsychology, animal behaviour and anthropology to provide converging evidence for his theory. Particularly compelling to the author, is Gardner use data from brain- damaged patients and individuals with special skills, to argue the notion that the various Intelligences can be dissociated. It is also possible that women and men are predisposed to develop somewhat different form of intelligence.

Humphreys (1985) reviewed Gardner’s ‘Frames of Mind’- the theory of Multiple Intelligences. These areas of competence are identified as Linguistic, Logical- Mathematical, Spatial, Musical, Bodily-kinesthetic, Interpersonal and
Intrapersonal. The subtitle is arrogant in that there have been many theories of Multiple Intelligences at least as strongly research – based at this one. Some of these date back half a century and more. There is also a good deal of overlap between the present list and earlier ones. Only the first three above represent classic intellectual abilities. Social intelligence as a candidate for inclusion in the cognitive domain has been discussed. There has been a great deal of research done on physical abilities, but these are outside the cognitive domain. The unique components of musical ability such as pitch and rhythm discrimination are also not considered intellectually. Intrapersonal intelligence is closely related to the much discussed and researched concept of self.

Snow (1985) reviewed the book of Gardner ‘Frames of Mind: The theory of Multiple Intelligences’ and seeks to provide ‘a new theory of human intellectual competencies’ challenges the classical view of intelligence that most of us have absorbed explicitly or implicitly. Apparently, this classical view is that intelligence is a single rank order based on the verbal and reasoning abilities reflected by standardized IQ tests. The new view, which Gardner admits is not really new, is that distinct kinds of intellectual competencies ought to be thought of a different ‘Intelligences’. The new contribution will be to reach a new foundation for this view in the confluence of evidence coming from the widely disparate, recent advances in biology, cognitive psychology and cultural research, new bases for the improvement of psychological assessment and educational practice is thus envisioned.

Rosemary (1993) reviewed the collection of essays by developmental psychologist Gardner explicates and illustrates his theory of Multiple Intelligences, especially as it applies to education in the United State today. This theory undermines the concept of intelligence as unitary and its associated testing programs. Actually, says Gardner, there are seven Intelligences, and it is the educators’ task to nurture in order to achieve the full development of each human being in whom these Intelligences exist in unique combinations. At times one hears old tunes with new words, and one suspects that the new distinctions may be more semantic than substantive, but no doubt there is merit in the argument for such a change of venue.
Miller and Pierpoint (1996) responded to Osburg’s (1995) opinion piece, ‘Multiple Intelligences: A New Category of Losers’, appeared in English Journal (1995). This much more to Multiple Intelligences theory than its application to assessment, but even looking at that connection, assessment, but even looking at that connection, assessment as a form of sorting and ranking students is only one small piece of the puzzle, results in ‘winners and losers’ as Osburg points out. Miller and Pierpoint opposed this argument. In class practices, homework, group and individual projects, peer coaching, journaling, discussions conferencing, portfolio building, self evaluation, peer evaluation, parent evaluation – these are the real stuff of assessment. Using these assessments, it never becomes a question of who fares better and who fares worse. Instead, it becomes a matter of everyone working together to promote growth for everyone. Multiple Intelligences and related learning theories are suggesting the possibility of alternative, individualized pathways, which can be followed during the course of learning. Hence it is more beneficial.

Altan (1999) made a comprehensive appraisal on Gardner’s new book “Intelligence Reframed : Multiple Intelligences for the 21st Century” and marked that the theory of Multiple Intelligences is very useful for language teachers as it allows them to examine their classroom techniques and assessments in light of individual learner differences. The manner in which language learners approach learning varies with individual intelligence profiles; therefore, the educator’s understanding of Multiple Intelligences may enhance curriculum design and daily lesson planning. In addition to the 7 original Intelligences, Gardner uses the book to introduce 3 new Intelligences- Naturalistic, Existential and Moral. However, beyond the canonization of three new Intelligences and some refinements, the book is mainly a review of Gardner’s previous work and scholarly formulation of a commonsense message that to know each of us is very special.

Feiler (2000) reviewed Gardner’s latest book ‘Intelligence Reframed: Multiple Intelligences for the 21st Century’ which is the revisits of his earlier theory of Multiple Intelligences. Through this, Gardner discussed whether new topics of intelligence might be added, comments and criticisms on the theory, addresses links between Intelligence, creativity and leadership, and discusses
applications of the theory of Multiple Intelligences to schools and business. Gardner added three new Intelligences, with his original seven Intelligences. They are Spiritual/Moral, Existential and Naturalistic. In this age when the Government is demanding that primary age children are grouped for literacy and numeracy teaching according to an ill-defined, crude attribute termed ‘ability’ and when considerable efforts are aimed at measuring and testing children’s performance in a reductionist and simplistic fashion, it is thoroughly exhilarating to read Gardner’s book, and be reminded of the sheer wonder and complexity of children’s ‘Intelligence’. There are welcome signs that some of Gardner’s ideas are beginning to influence policy – making in this country.

Dean (2002) reviewed Dunn’s (2002) book “taking, sketching, and moving: Multiple literacy in the teaching of writing”. The book purely indicates that the purpose is to encourage teachers to “use whatever intellectual pathways that can be helped writers to generate, organize, re-conceptualize and revise thoughts and texts”. The book is both defense and a guide for, using what Dunn calls multiple literacy, but what other writers have called Multimodal approaches or Multiple Intelligences. Although the intended audience is college teachers, Dunn describes strategies that can be used in or adapted for secondary classrooms. The books fully provides a rationale for using the approach in writing classes, responds to texts, deal with generating and organizing texts, revising and deals with professional issues related to this expanded view of teaching writing.

3.1.3 Studies Related with Components of Multiple Intelligences

Gardner (1983), in his article ‘Artistic Intelligences’ argued that human beings are capable of developing capacities in an acquisitively high order in at least seven semi autonomous intellectual realms. Some individuals are endowed with talents in the arts, and, if so blessed, they simply wait until inspiration strikes. No realm of experience seems further away from formal schooling, rationality and scientific progress. To attain competency in the arts, it is necessary to gain literacy with the symbol systems. And so artistically – competent individual is one who is able to ‘read’ and to ‘write’ symbols in such realms as literature, music or sculpture. He continued the implication pertains to the theory is to early detection of an individual’s intellectual profile. Individuals differ in their potentials in
various domains and that an individual’s strength and weakness can be identified through assessing his intellectual profile.

Gardner (1983) has proposed that Multiple Intelligences are not unitary but rather comprises components of six Multiple Intelligences. He gave details of components of Multiple Intelligences and its activities: (i) Verbal/Linguistic-Vocabulary & Grammar learning new words, Listening, Formal & Informal speaking, Humour or Jokes, Storytelling, Reading, Writing and Creative Writing; (ii) Logical/Mathematical- Logic pattern games, Logical/sequential Presentation, Number sequences/ pattern, Problem solving, Forming relationship and Syllogisms; (iii) Spatial- Visual aids making, Active imagination, Mind mapping and Environment arranging/ decorating; (iv) Musical- Music/song listening, Singing/Humming, expert in Musical Instruments, Music composition/ Creation, Jazzchants/Rapping and Vocal sounds/tones; (v) Bodily-Kinesthetic- Physical actions, Body language, Role Playing/mime, Dramatic Enactment, Sports/Games and Field trips; and (vi) Intrapersonal- Independent studies/ independently projects.

Sullivan (1989) in his paper ‘Curriculum in Art Education: The Uncertainty Principle’, identifies curriculum as the pivotal link between theory and practice and assets that all stages of curriculum research and development are characterized by elements of uncertainty. Particular curriculum projects which took their methodological impetus from research in the field are briefly reviewed and areas of indeterminacy highlighted. Further it is suggested that the entire conceptual and operational structure of curriculum needs to allow for multiple areas and variable paths for movement and development and would be variable and involve Multiple Intelligences and institution.

Fowler (1990) published an article on the role of Artistic intelligence. She seeks answer for the question why people seek encounters with the arts and why education in the arts is essential. She says the arts provide ‘inexhaustible insights’ that helps us to understand life’s mysteries. The arts release students, allowing them room for feelings and intuitions that are repressed. The arts can provide an educational ‘way through for many students, Gardner suggests an assessment vehicle called a portfolio’ which contains pivotal pieces of the child’s work that
reveal development Musical intelligence is a human capacity, another dimension of the wondrous power of the human being.

Woolsey and Johnson (1991) define Naturalistic Intelligence, a good military operations research analysis and well damned the latest hot dog technical hardware or software gadget. Expert systems and Artificial intelligence and their purveyors and lackeys and treated with the amusement they deserve. Even worse let’s not be so caught up in the debate that certain TTs are meaningless that we cease to be concerned with things, and instead become concerned only with the way to speak about things, allowing science to be degraded from a quest for truth to a verbal exercise.

Poplin & Phillips (1993) studied on Socio-Cultural aspects of language and literacy with reference to learning disabilities. This article explores differences in language development, experience and its use by various cultures. The authors proposed that some of the characteristics we identified as disabilities were actually language differences. A lack of understanding of multiple views and the characteristics of various languages can result in both misdiagnosis and in appropriate instruction for many individuals; we call “learning disabled”. The authors also suggest that our cultures itself conscious assumptions about oral and written language and its preference to written language, intelligence has imparted and created the category of learning disabilities as a handicapped condition.

Bainbridge, et al. (1994) correlated the two extremes of Social intelligence and Artificial intelligence as Artificial-Social Intelligence. Sociologists have begun to explore the gains for theory and research that might be achieved by Artificial intelligence technology, Symbolic processors, expert system, neutral networks, genetic algorithms and classifier systems. The first major accomplishments of Artificial-Social Intelligence (ASI) have been in the realm of theory, where these techniques have inspired new theories as well as helping to render existing theories more rigorous. Two application areas for which ASI holds great promise are the sociological analysis of written tests and data retrieval from the forthcoming Global Information Infrastructure. ASI has already been applied to some kinds of statistical analysis, but how competitive it will be with more conventional techniques remains unclear.
Bresler (1994) explains three distinct orientations in Visual Arts curricula: i) the rote, teacher-centered orientation, ii) the open ended student centered orientation and iii) the higher-order cognitive orientation. Each stares different views of teaching and learning, implying its own set of goals, contents, pedagogies, and evaluation practices. The first orientation is imitative, perpetuating the general academic curriculum in its goals and structures, the second is complementary, trying to compensate the teacher’s perceptions of an imbalanced academic curriculum, the third is expansive, aiming to enhance the curriculum in ways that are advocated in the scholarly literature, and incorporate into it a variety of Intelligences and modes of thinking.

Bradford (1995) in his article describes an experimental computer program that applies the technique of Artificial intelligence to the creation of dance. The rules are applied non-deterministically by a ‘rule driver’ program. The rules themselves are similar to those that form the knowledge base of expert systems. The rule driver embodies a heuristic algorithm of the type found in many artificial intelligence programs.

Glasgow and Bush (1995) studied on active learning and collaborative writing through a Marketing Project. In the English classroom, active learning experiences, such as the LEGO marketing project, help us to achieve the goals. The heterogeneous team in the classroom becomes a positive model of how society can cope with the demographic and economic shifts. The team serves to optimize community intelligence since students are encouraged to express themselves through multiple talents and expressions. Students in this active learning experience were resourceful in collecting authentic materials, in creating meaning from them, and in applying what they learned to their own project.

Simeone (1995) through his journal offers activities for the Kineasthetic learners ‘learn by doing’ and many language art activities are passive. The challenge lies in providing these learners with bridges to conceptual awareness. Obviously they cannot realistically provide this with every class work or homework activity, nor should they. Kineasthetic learners need to develop their paper and pen skills. This realization has led him to offer more picture alternatives. Every term he assigned at least one ‘free write’ on open topic without proper
guidelines, which foster a love for language and literature in all of his athlete students.

Smagorinsky (1995) through his study accepts that the introduction of Multiple Intelligences activities must be accompanied by large changes in the values of the classroom. The introduction of Multiple Intelligences revealed that although everyone probably has each of these Intelligences to some degree, most people have strengths in a few areas but not all. The Multiple Intelligences theory suggested that students who would draw or dance an interpretation of literature engaging in many of the same developmental processes they would experience when writing, and perhaps engage in other important processes as well that were not available through writing.

As local teachers, Glasgow and Bush (1996) participated in the workplace literacy summer workshop, collaborate and share ideas for curriculum development, student’s educational needs and goals are met. To prepare for a high performance work place that demands advanced skills, all students need to engage in educational projects in which they apply academic knowledge, meet employer’s standards, learn in a variety of setting, understand how to match career and educational goals, communicate effectively, learn to balance work and family and learn to appreciate individual differences. Developing promotional magazines for local business in one such project in which students experience business operations and develop social skills while researching a product since students express themselves though their Multiple Intelligences, communication is more effective.

Glynn (1996) in her article explains the relationship between individual and organizational Intelligences to innovation keeping in mind of Multiple Intelligences. In this article, organizational innovation is viewed as fundamentally cognitive, and the concept of organizational Intelligences were developed and related to innovation. Individual and organizational Intelligences are conceptualized as being functionally similar (i.e. as purposeful information processing that enables adaptation to environmental demands). Organizational intelligence, however, is a social outcome and is related to individual intelligence by mechanisms of aggregation; cross-level transference, and distribution.
Cornish (1997) conducted a study on product innovation and the spatial dynamics of Market Intelligence. The implication is that firms in peripheral locations and countries with small domestic markets may have difficulty generating sufficient. The findings of this exploratory study were not definitive; however, this analysis suggests that while Multiple Intelligences is a crucial input to product innovation, proximity between producers and markets plays a limited role in effective product innovation.

Patricia (1997) in her article ‘Learning Artistic Creativity: A Case Study’ aimed for a case study on a student, a non-art major, as she learned to make art in an introductory sculpture class in a University. Multiple factors such as instruction, domain knowledge, personal knowledge, materials and social interactions provided constraints and opportunities for the student to learn to formulate and solve Artistic problems. Descriptive samples of classroom interactions show ways that the sculpture class was an open system that modeled and encouraged Artistic Creativity and provided constraints and opportunities for the student to construct knowledge through multiple ways of knowing and process based aspects of engaging in Artistic Creativity.

Kassell (1998) explores the link between Music and the theory of Multiple Intelligences through her article. She argues that Music educators need to stop and reflect critically before applying the Multiple Intelligences theory and consider the integrity of music and learning in general. However, it is possible to integrate music with educational and musical integrity in ways that can lead students to a deeper involvement with the basics of music literacy and can provide what Gardner had originally intended – “a Multiple Entry point”.

Juslin and Madison (1999) in their article, they explore whether listeners can use timing patterns to decode the intended emotional expression of Musical performances. This study finds implications for the research on timing performance and it criticized on the grounds that the emotion categories used are crude compared to the subtle intentions performers have in real life.

Morand (2001) conducted a research study which undertook to develop and test the construct validity of a measure on one particular facet of manager’s ‘Socio-Emotional competence’ or ‘Emotional competence’. The research specifically
focused upon individual differences in the ability to recognize facial displays of emotions in others. The correlation between scores on the faces measure and empathy was 0.33 (p<0.05, one tailed), between the faces measure and leader consideration 0.20, between the faces measure and the Meyers Briggs feeling/thinking score 0.36 (p<0.05, one tailed). A t-test indicated that females were more likely than males to score high on the faces test (CR = 2.3, p< 0.05, one tailed). The mean scores for females on this measure was 14.17 (SD = 1.95), for males 12.348 (SD = 2.34). Thus the results supported 3 out of 4 predicted relations, and as well supporting the reliability of the measure of facial recognition itself. These preliminary results indicate positive support for the overall validity and reliability of the proposed instrument. The lack of a significant relation between leader consideration and the faces measure are discussed in this.

Tupper (2002), in this article assesses and further develops the possibility of an Existential intelligence as postulated by Gardner (1999). He used Gardner’s (1999) revised Multiple Intelligences theory and his postulations of an ‘Existential’ intelligence as a theoretical lens through which to account for the cognitive possibilities of Entheogens and explore potential ramifications for education.

Wright (2002) conducted a study on market place Meta cognition and Social intelligence. Consumers develop over their life span a pragmatic expertise in market place Meta cognition and market place interactions. Market place meta cognition and Social intelligence refer to people’s beliefs about their own mental states and mental status, strategies and intentions of others as these directly pertain to the social domain of market place interactions. Drawing from the recent study of evolutionary psychology, theory of mind, Multiple life-span Intelligences, and every day persuasion knowledge, the author discuss the importance to our field of studying market place Meta cognition and Social intelligence and of research based consumer education programs on those topics.

Bennett (2004) through his paper argued upon the work of geographers that considers the significance of emotions in their research. It acknowledges the importance of exposing emotions that field work can incite in researchers; the significance of these emotions not only for the individuals concerned, but also for the course of their field work, and for their benefit of others who can draw upon
and learn from their experiences. The paper supports attempts to imbue researcher’s analysis, texts, and ethno graphics with a sense of emotionality experienced in field work.

Elias (2004) explained that majority of students with learning disabilities have difficulties with social relationships. In this article, three key skill areas in Social-Emotional learning is identified as the main source of these difficulties: recognizing emotions in self and others, regulating and managing strong emotions (positive and negative) and recognizing strengths and areas of need. Researches supporting their connection with learning difficulties are reviewed. In addition, three examples of interventions that are comprehensive and link academic and Social-Emotional Learning are presented.

McMahon, et al. (2004) conducted a research to identify the relationship of Multiple Intelligences and Reading achievement with the help of Teele Inventory of Multiple Intelligences. This study was designed to evaluate the reliability of the Teele Inventory of Multiple Intelligences (TIMI) and the relationship between intellectual preferences and reading achievement. The TIMI was administered to 288 urban 4th grade students. Results suggest that the TIMI subscales, which examine preferences for Linguistic, Logical-Mathematical, Interpersonal, Intrapersonal, Musical, Spatial and Bodily-Kinesthetic intelligences, were found to have poor to moderate reliability. Students with higher scores on Logical-Mathematical Intelligence were more likely to demonstrate at or above grade level reading comprehension scores compared with students who scored lower on Logical-Mathematical Intelligence, but none of the other Multiple Intelligences scales were predictive of student achievement.

Gamwell (2005) conducted an Action Research study with intermediate level Language and Literature students, examining meaning making as adolescents engaged in developmental writing and performance project. The study was guided by theory and research highlighting the valuable role of overt student reflection to improve engagement in learning. Data collection methods included interviews, teacher observations, reflective journals and Audio-Visual taped performance. The findings suggest that learning through the arts provides a vehicle for students to become actively engaged in the construction of their own learning. Hence the
research envisages an interesting window in the world of the students who were strongly usage and should provide the opportunity to compare and contrast the findings emerging from this investigation.

Abdollah (2008) sheds some light on the history of Multiple Intelligences theory and the traditional IQ tests to clarify the rationale underlying of the new theory. It goes on to highlight the educational applications and implications of Multiple Intelligences theory in English Language Teaching, with special focus on what have come to be called Multiple Intelligences based instruction and how it tackles communications skills in English in the communication process. Learning styles and strategies as a learner- centered approach which is closely related with Multiple Intelligences theory was also tackled.

Clarken (2009) presented a paper, on ‘Moral intelligence’, refers to the ability to apply ethical principles, goals, values and actions. It consists of four competencies related to integrity, three to responsibility, two to forgiveness and one to compassion. The four competencies of integrity are 1) acting consistently with principles, values and beliefs, 2) telling the truth, 3) standing up for what is right and 4) keeping promise. Responsibility’s three components are 1) taking personal responsibility, 2) admitting mistakes and failures and 3) embracing responsibility for serving others. Two of forgiveness involves 1) letting go of one’s own mistakes and 2) letting go of other’s mistakes and compassion is actively caring about others. Moral intelligence refers to the ability to apply ethical principles to personal goals, values and actions. By developing greater Moral intelligence, benefits to the schools and the society will result in organizations that are more positive, improved relationships and students who are both smart and good and value universal human principles and rights.

Owolabi and Okebukola (2009) conducted a study to investigate the reading ability of science students through study groups and Multiple Intelligences. This explored the effects of appropriate pedagogical skills on student’s efficiencies in reading skills. A sample of 90 science students choosing from three in fact classes were involved in the study. Findings revealed the significant difference in performance of the groups taught using Study groups and Multiple Intelligences
Review of Related Literature

methods. Science is an activity oriented discipline, it is imperative to involve students more in doing through student- student interactions.

Saricaoglu and Arikan (2009) conducted a study on the relationship between types of Intelligences and Foreign language skills and aspects of grammar, writing and listening. The aim of this study was to investigate the relationship between student’s Gender and Intelligence types, the relationship between particular Intelligence types and student’s success in grammar, listening and writing in English as a foreign language and the relationship between parental education and student’s type of Intelligences. Analysis of the data revealed that Gender differences and Linguistic Intelligence has positive significant. Negative but significant relationships were found between success in student’s test scores in grammar and Bodily- Kinesthetic, Spatial and Intra personal Intelligences where as the relationship between Musical intelligence and writing was found to be significant and positive. Finally, no significant relationship was found between parental education and student’s intelligence types.

3.1.4 Studies related with the Upshots of Multiple Intelligences

Sewell and Shah (1967) randomly selected Cohort of Wisconsin high school seniors, the relative influences of Socio Economic Status and measured Multiple Intelligences are examined at successive stages in higher education by use of cross-tabular analysis, effect parameters and path analysis. However, for females the relative effect of Socio- Economic Status on college plans, college attendance and college graduation was greater than the effect of intelligence, while for males the relative effect of intelligence, at each of these stages was greater than the effect of Socio- Economic Status.

Lohnes and Gray (1972) conducted a study on intellectual development and the co-operative reading studies. The reports multivariate correlational analysis of the relation of treatment to achievement in the USOE co-operative reading studies second-grade phase data. It is argued that this multivariate re-analysis has a particular elegance and fidelity to the design philosophy of the studies. It is also argued that the lack of differential effectiveness of the treatments should not be allowed to mask the fact that all the instructional systems were effective.
McClaskey (1995) gives practical examples of Multiple Intelligences in the classroom and assessing student learning. Educators have often attempted to account for the discrepancies between abilities we see in students and end results such as grades or standardized test scores. Student’s strengths can be used to develop other Intelligences in which they may show less promise. It is toward this end that we as educators must work, using our classroom to pose interesting questions and to aid students in knowing their own Intelligences well enough to pose their own.

Sehulster (1995) made a study on the notion of a person’s memory style was investigated as it relates to the presentation of self. A memory style is defined as a combination of a subject’s ability in verbal memory, auto-biographical memory, and prospective memory, as measured by the memory scale. The range of abilities and experiences was drawn loosely from Gardner’s (1985) notion of Multiple Intelligences. Distinct patterns of self-report were observed for different memory styles. The results suggest broad individual differences are discussed in relation to memory styles.

Smagorinsky (1995) suggested for the re-conceptualizing the curriculum on the basis of Multiple Intelligences. He emphasized the re-conceptualization of writing across the curriculum. This article ultimately argues that educators ought to question the privileged status of the textual forms that they allow students to produce and consider the potential of other acts of composing the enabling students to develop thought.

Glasgow (1996) proposed to motivate the Tech Prep reader through learning styles and Adolescent literatures. Tech Prep themes that bolster self esteem and foster workplace competencies emerge in various genres of adolescent literature. The annotated bibliography provided in the sidebar suggests a starting place for teachers and librarians interested in encouraging and motivating the Tech Prep reader and writer.

Mettetal, et al. (1997) studied the impact of a Multiple Intelligences (MI) curriculum in a large suburban elementary school. Students, teachers, parents and administrators were interviewed. Qualitative techniques were used in analyzing the data derived from the study. Three themes emerged from the data: a) students,
teachers and parents were very positive about the concept of Multiple Intelligences; b) they were positive about school wide implementation, including flow time, activity room and enrichment clusters and c) classroom implementation of Multiple Intelligences concepts was uneven across classrooms. The importance of the Multiple Intelligences concept in changing teacher and student attitudes is highlighted.

Cousin, et al. (1998) conducted a study on multiple sign systems and reading. Sign systems like art, music, drama, mathematics and language are communication systems. They use them to construct and express meaning. These systems resemble language in that each comprises forms of representation and conventions. Each is also uniquely different from language. When readers develop sensitivity to the full range of human meaning, they find more reasons to read and to understand in any text. Learners like to see reading in a different way.

Fogarty (1998) provides guidelines that serve as a bridge between theory and practice in the intelligence friendly classroom. Intelligence-friendly classrooms are classes that celebrate the joy of the learner’s emotional and intellectual world, not through rhetoric and repetition, but through richness and relationships. The major educational implications: (i) Set Safe emotional climate, (ii) Create a rich learning environment, (iii) Teach the mind-tools and skills of life, (iv) Develop the skillfulness of the learners, (v) Challenge through the experience of doing, (vi) Target Multiple dimensions of Intelligences, (vii) Transfer learning through reflection and (viii) Balance assessment measures. The intelligence friendly classroom is part of the noble vision of schooling that led many of us into the field.

Soares (1998) comments on the structure, content and process in Teacher Training on the basis of the various plans of instruction like Copernicus, Gardner and Dewey. A unique combination of content is (1) the Copernican plan for block scheduling; (2) the application of Gardner’s theory of Multiple Intelligences, and (3) John Dewey’s basic ideas, about process creates a different configuration in teacher preparation of the present system. The program provides the interns with the opportunities to integrate models for teacher education that ensures: (i) the opportunity to work collateral in the schools while the interns verify and validate their observations and actions in their university classes,(ii) an immersion in
classroom experiences and academic studies, connected to a curriculum that is arranged in common clusters of knowledge and (iii) an opportunity to process of workable knowledge and effective practice under the supervision of experienced, professional educators. In such a program of structure (Copernican plan), content (Gardner’s concept) and process (Dewey’s principle), Mastery is an achievable goal in the preparation of the next generation of teachers.

Walker (1998) correlated the Gardner’s theory of Multiple Intelligences and the World Wide Web to teaching about the war. Involvement of diverse learning types within a classroom setting is as much of a challenge as difficult content. In contrast to the idea that one method can serve all students, Gardner’s method of intelligences postulates that a learner could favour a Rhythmic/Musical, Verbal/Linguistic, Interpersonal, Intrapersonal, Bodily/Kinesthetic, Mathematical, Spatial/Visual style of learning. The objectives of the study are; 1) to identify the historical milestones of the war, 2) to construct a purely student generated unit. By using the Multiple Intelligences constructivist teaching approach engagement of the different types of approach engagement of the different types of learners can be achieved with in the social studies classroom simply by involving the students in every aspect of discovery.

Bornstein, et al. (1999) conducted an investigation on two representational abilities (expressive and receptive language and symbolic play) and hearing status of child. They assessed in multiple formats in hearing and deaf two years old children of hearing and deaf mothers. Based on maternal report, hearing children of hearing and deaf mothers produced more words than deaf children of hearing mothers, and hearing children of hearing mothers more words than deaf children of deaf mothers, and deaf children of deaf mothers more words than deaf children of hearing mothers. Based on experiments assessments, hearing children in both groups produced and comprehended more words than deaf children in both groups. These findings are placed in the context of a proposed developing modularity of verbal and nonverbal symbol systems, and the implications of hearing status in communicative exchanges between children and their mothers in diverse hearing and deaf dyads are explored.
Dansereau, et al. (1999) conducted a study to understanding Multiple levels of analysis from a longitudinal perspective. They have developed and used one approach that allows for the specification of levels changes over time; other views about how to specify and assess levels of analysis and change are possible. They discussed examples and implications of the approach for theory building.

Glasgow (1999) collected and recognized student’s Multiple Intelligences especially in the field of literary nature of the students. This article is the student’s reflective paper described her experiences from a semester filled with writing, projects and dialogue between students enrolled in a college survey of young adult literature class and student in a high school communications III class. The project also led to a strong collegial relationship between two teachers built in respect for one another’s commitment to teaching and common goals that students enjoy reading and writing about literature.

Mjagkij and Cantu (1999) studied on the thematic and Multiple Intelligences Approach to teaching the Gilded age. In this study they compared Gilded Age with Multiple Intelligences. The themes discussed in Gilded Age: Urbanization, Rise of Jim Crow, Population, Politics, Immigration, Westward Expansion, Industrialization and Imperialism. The themes discussed in Multiple Intelligences: Logical/Mathematical, Verbal/Linguistic, Visual/Spatial, Musical/Rhythmic, Bodily/Kinesthetic, Naturalistic, Interpersonal and Intrapersonal. They proposed that the thematic and Multiple Intelligences Approach to teaching the Gilded age are almost similar.

Goodnough (2001) conducted a case study on Elementary teachers about the enhancing professional knowledge. He reported on the teacher development that resulted when an elementary teacher explored Multiple Intelligences theory and used it as a guide to make decisions about their curriculum planning and classroom practice. This study contributes to a greater understanding of teacher development and how teachers can enhance their professional knowledge. Multiple Intelligences theory provided a means for the teacher to reflect on many aspects of their professional knowledge and critically examine their teaching habits and classroom practices and to make pedagogical decisions about how to structure learning for students.
Prescott (2001) conducted a study to suggest ways for teachers to help students take control of their own learning. He believed that through reflective writing in the target language, students could become more independent learners. The theoretical framework for their research was based on Multiple Intelligences theory and learning style theory. The samples for his research were tenth grade students in a survey English literature course at Escuela Americana in San Salvador. The major finding was; language learners who know and can state their different Intelligences and learning styles are more likely to become independent learners, identifying appropriate strategies for improving their performance in language study.

Sims (2001) made an interview with Gardner on arts education and its importance, uses of the new technologies in art education and Visual Thinking Curriculum (VTC). Gardner replied as many of the most important and precious human ideas, sentiments and feelings cannot be expressed in words or mathematical symbols. Art often provide most powerful ways of capturing or critiquing what is happening or what is about to happen in a society. Some of the educational powers used are internet, video conferencing, and the like VTC a theory based arts educational approach and it gives educators a precise way of thinking about student’s current approaches to an understanding of art works.

Engle and Conant (2002) suggests that productive disciplinary engagement can be fostered by designing learning MI environments that supports; (a) problematizing subject matter, (b) giving students’ authority to address such problems, (c) holding students accountable to others and to share disciplinary norms and (d) providing students with relevant resources. To provide empirical support for this suggestion, they used these 4 guiding principles to explain a case of productive disciplinary engagement from fostering communities of learner’s classroom. They used the principles to understand one group of student’s emergent and sustained controversy over a species classification. The article closes by reflecting on the generality of the principles, showing how they can be used to understand other of productive disciplinary engagement from the literature on reform programs in science and mathematics.
For the past several years, Merrill (2002) has been reviewing instructional design theories in an attempt to identify prescriptive principles that are common to the various theories. This paper is a preliminary report of the principles that have been identified by this research. Five first principles are elaborated: a) Learning is promoted when learners are engaged in solving real-world problems, b) Learning is promoted when existing knowledge is activate as a foundation for new knowledge, c) Learning is promoted when new knowledge is demonstrated to the learner, d) Learning is promoted when new knowledge is applied by the learner and e) Learning is promoted when new knowledge is integrated into the learner’s world. Gardner organized his theory around phases he identified as entry points, telling analogies and approaching the core.

Sokolove, et al. (2003) describes a pilot study in which undergraduates in an active introductory biology class used online, virtual study rooms to study together outside of class in small groups. The results indicated that 47 students used their online study rooms to study for the final exam together with other members of their in-class teams. More than half of the students who provided written comments were positive about their online experience.

Gardner & Robertson (2004) made a discussion session on ‘g’ factor to recognize a multitude of intellectual capacities, each entailing its own processes and its own neural representation. The theory of Multiple Intelligences (MI) attempts to incorporate findings from these and other disciplines. It posits a set of eight or more separate intellectual capacities, each of which has at least some independence from the others. The degree of autonomy is difficult to establish because we lack ‘intelligence – fair’ measures: so long as all intelligences are accessed via identical paper and pencil formats, there may be an inflated correlation among them. ‘g’ is unitary, it does not admit of multiple intelligences, it works in mysterious and it sits atop a hierarchy of mental abilities. Clearly ‘g’ is the intelligence researcher’s God.

Bigelow and Vokoun (2005) express the flying colours of Multiple Intelligences. In this article, they celebrate classroom successes as well as challenges by inviting you to share best ideas while giving the students choice allows for students to shine within their Intelligence, sometimes requiring students
to complete a specific type of assignment is beneficial as well. This type of assignment enables some students to shine if the requirements come naturally to them, but more importantly it can allow students to stretch their Intelligences, improving on an area where they need an opportunity to grow.

Tracey and Richey (2007) submitted a report of a developmental research study that aimed to construct and validate an Instructional Design (ID) model that incorporates the theory and practice of Multiple Intelligences (MI). The result was a revised and validated Multiple Intelligences Design model. This paper presents the decision making processes and procedures used in model development, and provides a frame-work for the internal validation of ID models using expert review procedures.

Lyons (2008) studied on the integration of music with reading concepts to improve academic scores of elementary students. The purpose of this research was to investigate the effect of an integrated music curriculum on human learning, focusing on reading achievement. The researcher believes that this holistic music intervention contains many of the elements of brain-compatible learning and positively affected the outcome of reading achievement scores. Bringing music into the classroom enabled students to connect ideas being introduced in the music lessons, with concepts taught in their other classes. Through integrated lessons studies develop active skills, phonemic awareness, language and laughing skills.

Gibson (2008) conducted the study on the effect of adding drill and practice, using Spatial, Kinesthetic and Musical intelligences with Connected Math Project on mathematical achievement of sixth grade students. The purpose of this controlled study was to determine how to best teach mathematics by providing drill and skill exercise to enhance the effectiveness of Connected Mathematics Project (CMP). Result showed that 5/7 dominant intelligence groups improved more when using CMP + drill and skill (Multiple Intelligences) is a potentially effective way to teach mathematics. The current findings have potentially significant implications or social change in light of the unique learning needs of the twenty first century students.
3.1.5 Studies related with the criticisms on Multiple Intelligences

Klein (1997) criticizes the theory of Multiple Intelligences by Gardner. He argued that Gardner has theorized that the mind comprises eight Intelligences. The author contended that Gardner is on the horns of a dilemma. A ‘weak’ version of Multiple Intelligences theory would be uninteresting, whereas a ‘strong’ version is not adequately supported by the evidence Gardner presents. Pedagogically, Multiple Intelligences theory has inspired diverse practices, including balanced programming, matching instruction of learning styles and student specialization. However, the theory shares the limitations of general intelligence theory it is too broad to be useful for planning curriculum, and as a theory of ability, it presents a static view of student competence. Research on the knowledge and strategies that learners use in specific activities, and on how they construct this knowledge, may prove more relevant to classroom practice.

Williams (2000) reviewed John White’s (1998) opinions and Critiques on Multiple Intelligences. Gardner’s theory asserts the existence of a number of definable categories of human intelligence. These are Linguistic, Logical-Mathematics, Musical, Spatial, Bodily-Kinesthetic, Intrapersonal, and Interpersonal. More recently Gardener has added to the list the classificatory Intelligence of the Naturalistic and Spiritual intelligence. His theory seemed to the author to be a combination of the insights of Ryle on intelligent action and a welcome revision of Thirt’s account of the different domains of knowledge or understanding under the more politically attractive designation ‘Intelligences’. White does acknowledge the liberating influence of Gardner’s theory in school improvement projects and on the self-image of children who had previously been perceived as intellectually challenged in terms of the traditional versions of human intelligence and he also argues that Multiple Intelligences theory is seriously deficient because the grounds for the inclusion of areas of intelligence are too subjective and arbitrary. He is further concerned at the predominance in Gardner’s theory of Intelligences which involve manipulation of systems of symbols. Mastery of symbols is, he feels, very close to conventional versions of Intelligences.
3.2 STUDIES RELATED TO SCIENCE INTEREST

Science interest is an area in which studies are yet to be conducted. Only interested and creative pupils can contribute to the betterment of the society. Mastery of subject matter and high achievement is an educational aim. Development of Science interest and creativity in the young pupils should be specially taken care of in education. Provisions for the presuppose mental discipline through mastery of subject matter.

Strong (1927) developed a test for the measurement of interests by having the subjects choose among like indifferences and dislike for each of 420 items, the weighted scores furnishing a basis for comparisons with persons who are successful in various occupations.

Study of Science Interest was done by Fitzpatrick (1936) on a group of students of difference ages, checked list of words at spaced intervals in which a particular science topic was expressed in several equivalent ways. The findings showed interests in human anatomy, disease and astronomy. There was permanence of interest and specific preference in the stronger interests of the pupils tested.

Drill (1945) made a study of children’s interest in science, which probed into the reasons for interest in certain topics. He concluded that boys showed great interest in science than girls.

Manuel (1947) conducted an analysis of the questions posed by high school pupils and of topics liked and disliked by them as a part of a study conducted on the science syllabus of Madras Secondary Schools. He found that boys were more interested in science than girls. Among the branches of science, boys revealed a greater amount of interest in Physics and Chemistry where as girls excelled in the interest in Botany, Human Physiology and Zoology.

Sex difference in Science interest was studied by Blane (1951), Thomas (1971), Clarke (1972) and concluded that boys have more interest in Science than girls.

Bose, et al. (1970) developed a typical interest patterns for science, humanities and commerce streams at the Higher Secondary level. Chatterji’s Non
Language preference record was used for measuring the interest of the students. The sample included 628 students studying in class XI of the selected schools. The study concluded with the following finding that interest patterns for all groups were not identical and the pair wise comparison indicated that there was a wide variation between the groups in this respect the dissimilarities and similarities in the interest patterns for different groups could provide adequate aid in a guidance situation.

Thomas (1971) constructed and standardized a Science Interest Inventory for secondary school students of Kerala. The main objectives of this study were to plan, construct and standardize a Science Interest Inventory for secondary school students. The reliability of the test was established by test-retest method was high (0.73). The validity of the test was found by using Teachers ratings as external criteria. The obtained coefficient was 0.63, so the test is valid.

Clarke and Nelson (1972) conducted a study on the commonalities of Science interest held by intermediate grade children. The objectives of the study were (i) to determine the relationship between stated interests in particular science areas and performance on a standardized science test, (ii) to determine the relationship between Intelligence Quotient and particular interest in Science and (iii) to determine the relationship between sex difference and particular interest in science. The results of the investigation revealed the following findings: (i) Intelligence Quotient differences did not produce any significant shifts in interests and (ii) Interests in particular areas of science were significantly related to sex differences.

Chatterji, et al. (1978) studied the higher secondary science achievement as related to Science interest and Aptitude. These investigations aimed at finding out the effect of scientific interests at different levels of potential ability with respect to science and to study the predictive values of interests in Science. The major finding of the study was, there is a positive relationship between science interest and probabilities of success in science at different aptitude level except in the highest aptitude level.

Bhasin (1980) developed an Analytical study of Inventoried interests. The specific objectives of the investigation were: i) to construct new keys on empirical
basis from normative data, ii) to determine the most efficient measure, iii) to determine the profile reliability, iv) to study the nature of vocational interests and v) to provide a classificatory procedure. The study pointed out that the range of reliability coefficients and some of the values found to be negative too.

Senapathy (1980) compared the interest and ability of the secondary school students in science. The objectives of the study were: i) to determine the exact nature of relationship between interest and ability ii) to suggest some dependable criteria for guiding students in the science stream of the present school education. The findings that emerged from the study was that intelligence and interest taken together were a better predictor of achievement in science than interest or intelligence alone.

Srivastava (1980) constructed a Scientific Attitude Scale and its measurements. The 36 item attitude scale in Hindi was selected by the method of Thurstone’s equal appearing interval. The reliability and validity of the scale were 0.94 respectively. The test was administered on a random sample of 40 science teachers, 40 non-science teachers, 100 science students and 100 non-science students from the population of Madhya Pradesh. The findings were the amount of scientific knowledge to science courses made impact on scientific attitude positively and boys and girls differed in respect of scientific attitudes.

Sharma (1982) constructed and standardized a Vocational Interest Inventory in Hindi for the secondary school pupils of Haryana. The first form of the inventory was prepared with the help of Interest inventories of Kuder and Strong as well as keeping the view of the job requirements in Haryana. The split half reliability of the inventory was from 0.90 to 0.94. The coefficient of correlation between the scores of criterion was between 0.70 and 0.90. The final form of the Interest Inventory was found to be a reliable and valid tool for knowing the interests of secondary school students in Haryana.

Raveendranathan’s (1983) study revealed that the science achievement, science interest and mental health of pupils in the English medium classes are better than those in the Malayalam medium classes and there is positive and significant relationship between medium of instruction and science achievement, science interest and mental health of pupils in secondary schools. He also
concluded that attending English medium classes in better than attending Malayalam medium classes of girl pupils in rural, urban, government, private and pupils belonging to forward and backward communities.

Harty, Anderson and Enochs (1984) studied exploring relationships among elementary school students, interest in science attitude towards science and reactive curiosity. The statistical analysis results that the elementary school student’s interest in science is fairly high.

Anderson, et al. (1989) assessed the Science interests of urban VII Grade students. The objectives of the study were to determine: (i) whether students were interested in exploring science issues, (ii) How much input students had in determining what they studied or did in science, (iii) the most interesting science activities and (iv) what the students most generally interested in science. The major findings were: (i) students expressed an interest in studying science and exploring science issues, (ii) topics such as the human body, astronomy, animals, heredity and electricity were the most popular, (iii) two-third of the students in the study reported seldom or never had any input into the selection of class projects or topics, (iv) Students liked field trips and (v) Experiments, doing group projects, making observations, engaging in discussion and drawing. The least popular activity was reading book about science and scientists.

The science interest of sixth Grade students was explored by Abdi (1989). He explored favourite topics, the effect of teachers on student interests, gender differences and the relationship of interest to achievement. He found that students were generally interested in sixth Grade science programmers. But that the level of interest was low. Students responded to a Likert scale and indicated that they had some interest rather than a definite interest. This was in sharp contrast to the teacher’s perception of the students. Teachers thought that all of the science topics in the curriculum were of definite or greater interest to students. Teachers had an effect on student interest in 5 broad categories of topics found in the curriculum, classifying animal without backbones, elements and compound, sources of energy, atmosphere and climate of the world, and natural cycles. Gender differences had no educational significance. Interest was correlated to achievement on some topics but not others.
Malviya (1990) conducted a study of attitude towards science and interest in science of school going adolescents. The study compared all the dimensions of interest and attitudes in science of adolescent school pupils by using Attitude Scale and Interest Inventory by Reghu Rajpal Singh.

Ampily (1991) conducted a study on the relationship of process outcomes in Science to science interest and found out that there was very close and significant correlation between science processes out comes and science interest.

Moore (1991) developed an Inventory to measure the scientific attitude. The study describes the development of a revised Scientific Attitude Inventory. The revised instrument is a significant improvement over the original.

Kumar (1992) conducted a study on the relationship between Scientific reasoning, Scientific attitude, Science interest and Creatively of Higher secondary students of Kerala. The main objective of the study was to find out the relationship among the select experimental variable Scientific reasoning, Scientific attitude, Science interest and Creativity. The major finding of the study was, there is no close and considerable relationship between Scientific reasoning and Scientific interest.

Gibson and Francis (1993) studied the relationship between Television viewing preferences and Interest in science among 11-15 years old. After controlling for age, sex, and social class differences, the data demonstrate a negative relationship between attitude towards science and watching soap operas, a positive relationship with current awareness programs and no relationship with either sport or light entertainment programs.

Asmali (1994) conducted a study on the relationship between science achievement, Science interest, scientific attitude, process out comes in Science and Scientific creativity of secondary school pupils. The main objective of the study was to assess the possible relationship of scientific creativity to science achievement, Science interest, scientific attitude and process outcomes in Science of the total sample and relevant sub-samples thereof. The findings of the study were: i) there is significant difference between the Science interest and fluency, ii) there is significant difference between Science interest and flexibility.
and iii) there is significant difference between Science interest and scientific creativity.

Shaw, et al. (1994) studied the impact of Administrator’s interest in Science teaching upon Teacher’s perceptions of the importance of teaching science. The finding of the study indicated that the vast majority of elementary school teachers believe that teaching science is important or very important in the curriculum. They also perceive their principal’s view of science as important or very important in the curriculum.

Tobias (1994) through his article discusses the importance of studying interest and reviews research on the association between interest and prior knowledge. It is concluded that there is a substantial linear relationship between interest and prior knowledge. Research suggests that working on interesting, compared to neutral, materials may engage deeper cognitive processing, arouse a wider, more emotional and more personal associative network, and employ more imagery. A model of the interest-knowledge relationship is updated, and suggestions for further research are made. Finally, the similarity between interest and curiosity explored and advantages of research on these constructs are discussed.

Watson (1994) conducted a study on sixth form ‘A’ level student’s perceptions of the difficulty, Intellectual Freedom, Social benefit and Interest of Science and Arts subjects. Grammar School Students (n=1073) completed a repertory grid comprising 20 constructs to measure their perceptions of the difficulty of, intellectual freedom offered by, social benefit derived from, and interest in eight academic subjects. Results indicates that ‘A’ level subjects are chosen on the basis of pupil’s interest in and perceived academic freedom offered by them.

Chamber and Andre (1995) studied the relationships among gender, interest in and experience with electricity, and conceptual change text manipulations were studied for 48 male and 50 female college students learning basic electricity concepts. Conceptual change text facilitated learning, as expected. Interactions of gender and interest were discussed.
Kuriakose (1995) conducted a study on the relationship between scientific attitude and Science interest among higher secondary students in relation to their Chemistry classroom climate. The objectives of the study were: (i) to study the relationship between Science interest and Chemistry classroom climate and (ii) to study the relationship between scientific attitude and chemistry classroom climate. The major findings of the study were: (i) There is a positive correlation between the scientific attitude and Chemistry classroom climate and (ii) There is a positive relation between Science interest and classroom climate.

Lekha (1996) conducted a study on Science interest of secondary school students of coastal areas with respect to certain psychosocial variables. The objectives of the study were (i) to make comparative studies on the science interest of secondary school students of coastal areas based on age, order of birth and parental education, (ii) to compare Science interest of boys and girls of secondary schools in coastal areas and (iii) to compare the Science interest of secondary school students of coastal areas with high home learning facility, average home learning facility and low home learning facility. The major findings of the study were: (i) there is no significant difference between the Science interest of students with order of birth. (ii) there is significant difference between Science interest of students with high and low parental education level and (iii) there is significant difference between Science interest of boys and girls. It was seen that boys were superior to girls in Science interest.

Reju (1997) conducted a study on science achievement as related to scientific attitude, Science interest and Home learning facility of upper primary school pupils. The major objective of the study was to compare the Science interest test scores of high, average and low achievers. The major finding of the study was the Science interest cannot discriminate between the boys and girls, but discriminate significantly between urban and rural population.

Ben-Chain, et al. (2000) conducted a study to measure the disposition of Eleventh Grade Science students towards Critical thinking. The California Critical Thinking Disposition Inventory (CCTDI) was used to assess the disposition of Israeli eleventh grade science student towards critical thinking according to school type affiliate, scientific level, and gender. The major findings strongly support a)
the establishment of a baseline reference for disposition toward critical thinking of high school science students, b) the application of the CCTDI in the context of ongoing science education in different settings and finally c) the reliable use of the CCTDI in future research aiming at evaluating the effectiveness of critical thinking (CT) and Higher Order Cognitive Skills (HOCS) oriented instructional goals.

George (2000) conducted a study on student’s attitudinal changes toward science overtime. The result of the present study shows that student’s attitudes toward science generally decline over the middle and high school years. Science self concept was found to be the strongest predictor of attitudes toward science. Teacher encouragement of science and peer attitudes is also significant predictors of student’s attitudes. The effect of the parent variable was found to be quite small and statistically non significant, with the exception of the seventh grade. Boys were found to have higher initial status on attitudes towards science and their attitudes dropped faster than girls. Also it was found that students in metropolitan and rural schools have less positive attitudes toward science in the seventh grade compared to students in suburban schools. Substantive and methodological implications of this technique were also discussed.

Vincent (2000) conducted a study on the association between scientific attitude, Science interest, scientific reasoning and the strategies adopted by science teachers. The findings of the study was scientific temper of pupils is superior in schools where teachers have adopted high strategies in teaching science.

Potty (2001) developed a Scientific Attitude Scale and its application at secondary level. The reliability and validity of the scale were 0.87 and 0.91 respectively. The test -retest reliability at an interval of one month was found to be 0.891. The study revealed that the amount of scientific knowledge to science course made significant impact on scientific attitude.

George (2003) conducted a study the track charges in student’s attitudes about the utility of science over the middle and high school years using data from the Longitudinal Study of American Youth (LSAY). The results of the present study show that the overall trend for student’s attitudes about the utility of science is positive. It is clear from the present analysis that some of the important predictors of attitudes about the utility of science include science self concept,
teacher encouragement of science, and to a lesser extent achievement motivation and science activities.

Han-Kins, et al. (2004) has developed a Rangeland Inventory as a tool for Science education. It is a program pairs range professionals, teachers and students together to conduct vegetation measurements and teach Inquiry-based science. The first goal of this rangeland education program was to spark an interest in Rangeland science and management among middle school and high school students. Another goal for this program was to increase a ‘sense of place’ and give students a heightened understanding and awareness of their local environments. The solution in this project was to develop a basic rangeland vegetation inventory model that fits the needs of educators.

Eshach and Fried (2005) argued the question of why we should teach Science to K-Z. After initial consideration of two traditional reasons for studying science, six assertions supporting the idea that even small children should be exposed to science were given. They were: 1) children naturally enjoy observing and thinking about nature, 2) Exposing students to science develops positive attitudes towards science, 3) Early exposure to scientific phenomena leads to better understanding of the scientific concepts studied later in a formal way, 4) The use of scientifically informed language at an early age influences the eventual development of scientific concepts, 5) Children can understand scientific concepts and reason scientifically and 6) Science is an efficient means for developing scientific thinking, concrete illustrations of some of the ideas discussed in this essay, particularly, how language and prior knowledge may influence the development of scientific concepts, were then provided.

Lee (2005) studied the effects of a Kit-based science Curriculum and teacher characteristics on student’s attitude towards science. This study examines 5th and 8th grade student’s (N=1063) attitude towards science in relation to science instruction, science achievement and teacher characteristics. Results show 5th grade students having a significantly more positive attitude towards science compared to the 8th grade students.

Trumper (2006) conducted a study on factors affecting junior high school student’s interest in Physics. The study was conducted at the end of the student’s
compulsory schooling in Israel carried out in the framework of the ROSE Project. Factors studied were their opinions about science classes, their out of school experiences in physics, and their attitudes toward Science and Technology. Student’s overall interest in Physics was neutral, with boys showing a higher interest than girls. The finding raise serious questions about the implementation of changes made in the Israel Science curriculum in primary and junior high school especially if the goal is to prepare the young generation for life in a scientific technological era.

Udo, et al. (2009) conducted an investigation on Gender related Science anxiety. Earlier studies by the investigators was revealed that science anxiety in various student cohorts suggested that non science major were highly science anxious, regardless of what science courses they were taking. In this study, they investigated science anxiety in a cohort consisted mostly of non-science major taking general education Science courses. Regression analysis shows that the leading predictors of science anxiety were i) non-science anxiety and ii) gender, as they were for different cohorts in the earlier studies. They confirm earlier findings that females are more science anxious than male’s chi-square analysis of acute science anxiety shows an amplification of these differences. They found acute levels of anxiety in several groups, especially education, nursing, and business majors. They described specific interventions to alleviate science anxiety.

3.3 STUDIES RELATED TO MULTIPLE INTELLIGENCES AND SCIENCE / SCIENCE INTEREST

Bracey (1984) conducted a study to explain the relation between science teaching and cognitive styles. The investigator looks at what happens to student achievement when the cognitive styles of teachers are matched or mismatched with those of students. The major findings of the study was that a test of mechanical reasoning that was a good predictor of grade-point average for males was not a good predictor of grade point average for females.

Eylon and Linn (1988) examine the four research perspectives in Science education. Recent research in Science education examines learning from four perspectives are characterized as: 1) concept-learning focus, 2) a developmental focus, 3) a differential focus and 4) a focus on problem solving. This paper
illustrates how these perspectives, considered together, offer new insights into the knowledge and reasoning processes of Science education students and provide a framework for identifying mechanisms governing how individuals change their knowledge and thinking processes.

Gardner and Hatch (1989) conducted a study on Educational Implications of the theory of Multiple Intelligences. In this a new approach to the conceptualization and assessment of human intelligences is described. According to Gardner’s Theory of Multiple Intelligences, each human being is capable of seven relatively independent forms of information processing, with individuals differing from one another in the specific profile of intelligences that they exhibit. The range of human intelligences is best assessed through contextually based, ‘intelligence fair’ instruments. The measures must involve materials that are appealing and familiar to children, there is little precedent for developing scoring systems that go beyond Linguistic and Logical criteria; and materials appropriate for one Age group, Gender or Social class may not be appropriate for others. Three research projects growing out of the theory are described. Preliminary data secured from project spectrum, an application in early childhood, indicate that even 4 and 5 year old children exhibit distinctive profiles of strength and weakness.

Fort (1990) expresses a strong wish for identifying the gifts in Science. She argues that no one can discover an aptitude or a gift in Science without having the opportunity to exercise it. Society has never needed individuals with gifts in Science and Technology (science in action) more than it does as the 20th century comes to an end. The twin goals of achieving scientific literacy for all and encouraging excellence for the gifted are inextricably linked.

Habraken (1996) through his article explains that chemistry has evolved from science dominated by mathematics into a science highly dependent on Spatial-Visual intelligence. Chemistry, today, is recognized by Chemist as the molecular science. Computers played a significant role in this context. It helped young people to be more comfortable with visual imagining that their instructors were at the same age. Gardner through his theory found that among the seven Intelligences, two of them are important to Chemist-Spatial and Bodily-Kinesthetic. Spatial intelligence involving visual memory, visual imagination and
the mental processing of visual information is clearly an essential component in the arts. Pictorial language based on imagery as well as Linguistic and Logical mathematical thoughts are unswervingly employing by the chemist.

Woodrow & Mayer (1996) presents a qualitative case study of a Technology Enhanced Instruction (TEI) model called Technology Enhanced Secondary Science Instruction (TESSI). The implementation of TEI in TESSI classrooms resulted in significant changes in the educational beliefs and the teaching and learning process practices of those involved: a) classroom structures were modified to emphasize guided, self-directed learning, b) views of learning were transformed to regard skills such as time management, goal setting, self monitoring, and problem solving to be as significant as science knowledge and c) teacher’s roles were changed from transmitters of knowledge to facilitators of learning. These changes were illustrated through reflections by the teachers, students, administrators and researchers associated with the project.

Lerman (1997) presented a paper ‘Science, Technology and Social boundaries in Industrializing City’ through it, she argues that by the end of the century, when the early upheavals of industrialization had largely been worked out for the urban middle class, traditional patrician ‘separate spheres’ concerns with Gender roles had to some degree given way to the more pressing concerns of immigrant lifestyles and labour unrest. Industrialization always causes a huge explosion in the field of Technology and Science. But it will adversely trust the social boundaries and sustain attention on cultural product.

Ramey-Gassert (1997) through her article examined the learning science beyond the traditional classroom system. Science education reform documents call for science to be taught in the manner that students learn best, by conducting hands-on, engaging investigations using simple every day materials. In this article she examined a cross-section of craft knowledge and research based literature on Science learning beyond the classroom, describe informal science education programs and discuss implications for enhanced science teaching. A model for enhanced school/informal Science education and for school-level policy change was proposed.
Klein (1998) conducted an experiment to know the role of children’s theory of mind in Science Experimentations. The present research findings suggest that children use their theory of mind to interpret and manage their own thinking. The children were able to explain their own inferences at about the same age that they are able to explain the inferences of an alter. The result contrasts with the seemingly commonsense view that individuals have immediate access to the causes of their own beliefs. In the present study, the children’s ability to explain their casual inferences lagged well behind their ability to draw these inferences, even when the evidence was in plain sight. This result extends previous research findings that young children do not initially attribute their knowledge to the perceptions, verbal messages and clues that produced it.

Jung, et al. (1999) conducted a proton MR Spectroscopy study of normal human brain to define the bio-chemical factors of intelligence. Proton Magnetic Resonance Spectroscopy (H-MRS) offers a unique non-invasive approach to measurement of N-Acetylaspartate (NAA) and Choline (Cho), Putative makers of neuronal and glial integrity. Previous studies revealed that these neuro-chemicals predict cognitive impairment in diseased subjects, although little is known about their relationship to cognitive functioning in healthy people. They measured the concentrations of NAA and Cho in the left occipitoparietal white matter of 26 healthy adults and compared them with intellectual performance assessed by the Wechsler Adult Intelligence Scale- 3. They found that NAA (b = 0.6, P< 0.01) and Cho (b = 0.42, P< 0.01) were independently associated with the Full –Scale Intelligence Quotient. Together, these metabolites accounted for a large proportion of the variance in intelligence ($r^2 = 0.45$). This research establishes the relationship between individual neuro-metabolic concentrations and intellectual function in the normal human brain.

Newbold (1999), using Gardner’s profiles of Intelligences, he compared two geniuses Einstein and Picasso from his own perspective. He argued that they possessed an astounding similarity in the quality of their thought: One was a physicist who thought like an artist, the other an artist whose best work encompasses the principles of quantum physics. Relatively and Cubism met in these two geniuses. Gardner characterized Picasso as possessing Spatial and
Bodily-Kinesthetic Intelligences and Einstein as possessing a combination of Spatial and Logical-Mathematical intelligences. Einstein and Picasso shared through processes that were remarkably similar, almost as if Picasso came at pointing in a very scientific way and Einstein though of physics in an Aesthetic sense. It is clear that Picasso possessed a Visual way of thinking.

Stern (1999) conducted a research on the culture of intelligence in a Canadian Inuit community. The understanding of intelligence and cognitive functioning of culturally diverse people have long been an interest of Social scientists. The data collected are used to examine the manner in which community members define, assess and develop intelligence. Modernity has created new conditions in which intelligence is nurtured and assessed. All the Multiple Intelligences and Emotional levels were assessed.

McPhail, et al. (2000) conducted a study on the interest in fostering student’s identities at sixth Grade. The paper is based on the combined works of John Dewey and Jerome Bruner, provide a frame work spanning a century of educational thought which can inform curriculum decisions concerning student’s educational development, especially for middle school students whose warning of motivation toward school has been well documented by researchers and has long concerned parents and teachers. In this article, they discussed to study of a team-taught double classroom of sixth Grade students whose interests were determined through a series of brainstorming sessions, and individual and focus group interviews. Student’s interests were found to be effective tools for informing curriculum decisions in the creation of sixth Grade learning contexts.

Root-Bernstein (2001) through his journal ‘Music, Creativity and Scientific thinking’, he asked some questions to the readers. Are Music and Science different types of intelligence, in the context of Gardner’s Multiple Intelligences? Or are they two manifestations of common ways of thinking? By focusing on Scientists who have been Musicians and on the ways they have used their musical knowledge to inform their scientific work, the author argues in this article that Music and Science are two ways of using a common set of “tools for thinking” that unify all disciplines. He explores the notion that creative individuals are usually polymaths who think in trans-disciplinary ways. He illustrate the idea by using a number of
examples such as James Dewas, a physicist, made his own violins, Karl Rudolph Koenig, a violinist, invented new types of acoustical and optical equipments and he listed a huge number of scientist-composers which reveal that Music and Science were the common set of thinking acting in two ways.

Simmons III (2001) published an article on ‘Multiple Intelligences and models of Learning Arts’, he suggested a Multiple Intelligences Based Art curriculum can broaden the scope of successful learning by tapping into students differing strengths, backgrounds, and interest. It, thus, promotes educational equity while encouraging individualization. However the crucial point in Multiple Intelligences based instruction, as in any theory driven practice, is effectively to apply the theory in all its implications. Playing background music in the art room is not likely to engage the Musical intelligence either in problem solving or product making. But these capacities can be activated by asking students to translate music they hear into a computer animated dance or painting or demonstrating an experiment or craftsmanship probably would. In this process, it can yield for every child the recognition of growing mastery that in turn, can help promote justifiable self-esteem. While such positive feelings won’t ensure a lifelong love of art, they are nonetheless important foundations for both, and so essential elements at all levels of Art education.

Chowning (2002) introduced a new collaborative effort resulted in the first student Biotechnology Expo, a new kind of Science fair that values the diversity of student talent and abilities and promoter Bio-science education. Educator has applied the theory of Multiple Intelligences especially useful for student projects. The collaborative, real world projects featured in the Expo were assessments that enhanced learning, rather than serving merely as end points. By independently initiating and focusing on such projects, students can develop important learning skills. This model for a new type of science fair represents what educators have learned both about the importance of addressing different student learning styles and the power of involving the professional community in education.

Gibbons (2003) conducted a study to develop an evaluation instrument for Elementary school administrators to promote Constructivist teaching of Elementary science for English learners. Classroom observations were conducted
in 5th grade classrooms of Hispanic and Filipino English learners in a multicultural school district in the southern San Joaquin Valley of California. The repeated use of the instrument within the clinical supervision model resulted in increased frequency of ELD (English Language Development) and SDAIE (Specially Designed Academic Instruction in English) methods and Constructivist strategies in the Elementary Science classroom.

Habraken (2004) in his Article argued that today’s out-of-school learning is dominated by PC games, videos and TV. These media provide children with the optimal conditions for nurturing their Visuo-Spatial intelligence. Gardner reminds us that there is a plurality of Intelligences and that not all students learn in the same way. In science, Spatial intelligence involving visual memory, visual imagination and mental processing of Visuo-Spatial information has long been acknowledged. In chemistry and biochemistry, over the past 125 years, thinking has shifted from the Logical-Mathematical to the Logical Visuo-Spatial. In chemistry Visuo-Spatial thinking has never been so dominant as today. By confining themselves in their teaching of chemistry to the Logical – Mathematical and the verbal, teachers and chemical educators are conveying a false and abandoned conception of chemistry in the class rooms.

Das (2010) conducted a study on the relationship between Multiple Intelligences and achievement in chemistry of higher secondary students. From the present study it is observed that there were no relationship between dimensions of Multiple Intelligences and achievement in chemistry, except for Logical-Mathematical Intelligence.

3.4 CONCLUSION

The foregoing Review of Related studies enabled the investigator to check whether his study was a duplication of what has been done earlier in this field. The Review also helped the investigator to formulate objectives, hypotheses and to identify the variables of the study.

These reviews reveal that there is a wide variety of studies have been done on Multiple Intelligences theory, science interest and relationship between components of Multiple Intelligences and Science/Science interest. All the studies point out to the significance of teaching based on Multiple Intelligences theory. This review helped the investigator to develop various tools, which were used for the present study.