CHAPTER II
RELATED STUDIES

2.1 Introduction
2.2 Math Phobia
2.3 Math Achievement
2.4 Self-confidence
2.5 Hemisphericity
2.6 Math Phobia and Math Achievement
2.7 Math Phobia and Self-confidence
2.8 Math Phobia and Hemisphericity
2.9 Math Achievement and Self-confidence
2.10 Math Achievement and Hemisphericity
2.11 Self-confidence and Hemisphericity
2.12 Math Phobia, Math Achievement and Self-confidence
2.13 Math Phobia, Self-confidence and Hemisphericity
2.14 Math Achievement and self-confidence and Hemisphericity
2.15 Synthesis
2.16 Conclusion
CHAPTER- II

REVIEW OF RELATED LITERATURE

2.0.0 Introduction

The purpose of research review is — To select suitable research method to
the problem; to locate the data useful in the interpretation of results and to provide
ideas, theories, explanations or hypotheses valuable in formulations the problem.


A review of the related literature gives the investigation an understanding
of the previous work that has been done. It develops in the investigator an insight
he needs to convert his tentative research problem to a specific and concise one. It
helps the research possibilities that have been overlooked. It provides the
investigator, with an opportunity for understanding the methods, measures,
subjects and approaches employed by others. This in turn will lead to significant
improvement of his research design.

This section gives evidence of the investigator's knowledge of the field. A
brief summary, indicting areas of agreement or disagreement in findings or gaps in
existing knowledge are included. The author finds an opportunity to justify his own
endeavor and to emphasize new, worthwhile elements of her study.

The investigator proposes to present the previous studies undertaken in this area
under following sections:

1. Studies on Math Phobia
2. Studies on Mathematical Achievement
3. Studies on Self confidence
4. Studies on Hemisphericity
5. Math Phobia and Self confidence
2.2.0 Studies on Math Phobia

**Symptoms and Causes, (2010)** Math phobia results in physical symptoms such as panic, paranoia, passive behavior, or avoidance and a lack of confidence.

**Ertekin, Dilmac and Yazici, (2009)** show a societal trend to minimize the need for math. This increases math phobia because adults are unwilling to overcome it if they do not think it is important. In fact, the opposite is true. Math not only teaches the steps to do a problem but it also involves developing and using logic. This is something adults use in everyday life to make decisions and problem solve. Formal math may not be used everyday, but logic is used every day. They also stated that because of the way math has been traditionally taught, audio learners do tend to do better. Visual learners do best by watching. In traditional math education, visual learners tend not to be as effective as audio learners. Kinesthetic learners learn best by doing. This is where traditional math education has failed. Most math has been taught verbally leaving the visual and kinesthetic learner behind. Math is a cumulative subject. This means that if the student does not understand one concept he or she cannot move on to the next skill, and the student falls further and behind. If teachers teach in only one or two ways, the students who prefer to learn differently may not be able to keep up. Many teachers have been trained to teach math to obtain results in the quickest way and without causing problems so students can “pass the test”. Many teachers believe that math is a set of rules to memorized and designed activities around those rules.

**Ertekin, Dilmac and Yazici, (2009)** noted a significant negative correlation of students with a high level of math anxiety and kinesthetic learners
and visual learners. Kinesthetic learners had a high correlation than visual learners. Kinesthetic learners had a high correlation than visual learners. These findings confirm that traditional teaching methods for math favor learners with an auditory learning preference. The authors of this study also looked at other factors such as social interaction, amount of light needed, authority, time, and perseverance. Those who rated high in perseverance had a higher rate of math phobia than those who rated high in authority, the need to have someone direct the learning process. There was little correlation between time and amount of light needed and math phobia.

When participating in math activities in daily life, the research shows an increase in math phobia for the person needing authority. The researcher feels this is because in daily life the student does not have the authority figure available to assist in completing the activity. Those with a kinesthetic learning preference experience experiences a decrease in anxiety levels when lessons were taught using real world examples.

**Arnet and Van Horn, (2009)** stated that the anxiety associated with taking a math class can interfere with the learning of math. As mentioned earlier, anxiety appears in the working or short term portion of the brain, the same area that is used to do math calculations. By including math with other subject, the level of anxiety is decrease and more learning can take place. In a study done at Unity College, researchers noticed many incoming freshman expressed concern about having to take a math class but were looking forward to taking biology class. The researches saw this as a concern about having to take a math class but were looking forward to taking biology class. The researchers saw this as a concern because algebra skills are needed to be successful in biology and other science areas. To succeed in this field of study, students would need to be comfortable with math concepts.

**Marikyn, (2009)** stated that the use of technology adds another level of learning, particularly of kinesthetic learners, when combined it with the textbook and the presentation in the class. It offers a way for students to practice skills in a non − treating, repetitive manner. With practice activities online, students may repeat skills over and over until the skill is master. In a correctly developed system,
the numbers would change for each attempt. Because it is online, there is an increased level of privacy. Adults are more sensitive to revealing their level of knowledge, or lack of knowledge. With technology, the instructor is the only who needs to know how long or how many attempts were made to master the skill.

**Arnet, (2009)** briefed that when working with adults with math phobia, the teacher’s focus should not be on teaching the skills but rather helping the students gain the confidence to do math. With increased confidence, the anxiety will be lowered and more working memory will be freed to do math. By ensuring students have small successes along the way, the anxiety levels will slowly decrease and will develop into a positive spiral of math success. Math phobia is not a permanent condition. By providing students with the confidence needed to do math, the skill will follow.

**Deniz and Uldas, (2008)** explained that teachers often teach math in accordance with their own attitudes towards math. There is a trend towards looking at the process instead of the end product in math. Teachers realize this is the best way to have students learn the logic behind the process. Teachers identified assessments as a source of math phobia as well. No single assessments method, particularly timed tests, could fully assess student achievement.

They also stated that math students are placed in many situations, such as completing a problem on the board, where they feel a sense of threat, inadequacy, and embarrassment because the experience is so public. Just one incident under such a circumstance can cause a lifelong math phobia. These situations in the classroom are often brought on by teachers who are insensitive to student fears and the impact the humiliations this may cause.

**Gray – (2005)** stated that having anxiety about math becomes a self – fulfilling prophecy affects the same areas of the brain as the resources needed to perform math.

**Bowd – (2005)** they listed a number of pedagogical practices that contribute to the math phobia and they identified behaviors of teachers as a major
contributor to the development of math phobia which affects mathematical achievements.

**Brady and Bowd (2005a)** stated that negative attitudes towards math can produce results in math and teachers with math phobia may foster the early development of math anxiety among their students.

**Gray, (2005)** stated that anxiety affects the working memory, which is the memory needed to do math calculations. Adults and children become anxious about a situation associated with math, usually testing. The ability to do math is reduced so they become more anxious about testing and the cycle continues.

**Brady and Bowd (2005b)** explained that research done in conjunction with pre-service teacher education at Lakehead University in Canada, 16% of pre-service teachers attribute math phobia to experiences in the third or fourth grade, specifically to working with fractions and memorizing multiplication tables. Another 26% can relate it to specific incidences in middle and high school. They also noted that a lack of knowledge or a poor attitude toward math may inhibit the learning about math and math instructional methods during pre-service studies and later their use of effective methods of teaching math. Negative attitudes toward math can produce negative results in math and teachers with math phobia may foster the early development of math anxiety among their students.

**Lehrman, (2005)** the study revealed the women assumed their math skills were being evaluated their math skills were being evaluated and this affected their performance. The study was repeated with white males. This group was told Asian – Americans were better at math. The group that was given this instruction did much worse than the group that was given no instructions. The conclusion is the fear of confirmation negative stereotypes can hurt performance.

**Gray, (2004)** explained that that there are three key elements to successful program. Exposure provides the students with exposure to another student struggling to learn the same skills. The experience needs to meet a community need for it to be valuable to the student. The students also need to have the time to
provide reflection. This is necessary to gain the confidence needed to overcome math phobia.

**Li, (2003)** stated that adults use math every day for everything from shopping for groceries to deciding how much fertilizer to buy for the lawn to planning a household budget. In addition to such activities, the skills developed to do math, logic and reasoning, are important to the problem solving adults need to succeed in many aspects of life. If an adult is lacking or does not have confidence in his or her skills, math phobia.

**Quing Li – (2003)** stated that skills developed to do math, logic and reasoning, are important to do problem solving need to succeed in many aspects of life, but lacking or does not have confidence in his or her skills, math phobia develops.

American Psychological Association has a diagnostic code for math phobia : 315.1 – mathematics disorder, If math phobia exists , the person’s mathematical ability is substantially less than is expected and impedes academic achievement in math (Disorder information sheet, n.d)

**Civil, (2003)** mentions that to minimize the MP in adults we have to develop the mother’s uses and knowledge of mathematics in their everyday life. His work was more oriented towards developing a better perspective of contemporary formal mathematics and creating activities that could be utilized by parents and community to make mathematics more accessible to their children. She concluded that the foundations of school mathematics with identifying regular implicit of mathematics in daily life decisions and practices.

**Civil, (2003)** also detailed that math is widely recognized as a problem area and maximum failures at matriculation are in mathematics. He explained that the social interaction within the family and society tends to prepare the child to dislike mathematics through assigning, time and gain, a variety of negative adjectives like dry, difficult, boring etc. to describe mathematics is general.
Ashcraft and Kirk (2001a) Math phobia and working memory are related together, students suffering from other forms of academic phobias have no improvement but math phobia and working memory needed to perform math.

Ashcraft and Kirk (2001b) stated that among low, medium and higher math anxiety level students high math anxiety group did significantly worse than the other two groups and also performance deficits due to generalized anxiety will be prominently in exactly those task that tap the limited capacity of working memory, it results either a slowing of performance.

Ashcraft and Kirk (2001c) explained that bright math anxiety took longer and had significantly more errors than those who had low math anxiety. Couple that with the fact that people with high math anxiety participant in avoidance stages so they do not practice math skills as often, a self– fulfilling prophecy of math phobia becomes evident.

Ashcraft and Kirk, (2001d) promoted researchers to look into the relationship between math phobia and the working memory needed to perform math. In comparing students with a high level of Math anxiety to students with low level math anxiety to students with low level math anxiety, researchers did not typically note performance differences on basic whole number facts of simple addition or multiplication. As soon as the difficulty was increased to two – column addition where carrying was involved, the performance differences became evident. The researchers also noted that there was a higher error note on these problems showing a classic speed – accuracy tradeoff when confronted with more difficult material. This indicated a willingness to sacrifice accuracy on especially difficult trials, either to avoid having to deal with the deal with the math problems or merely to get done with the problems faster. They also stated that performance deficits due to generalized anxiety will prominently in exactly those tasks that tap the limited capacity of working memory. The intrusive thought and worry characteristic of high anxiety are thought to compete with the cognitive tasks, such as math, for the limited resources of the working memory. The result is either a slowing of performance or decline in performance. They also explained that people
with high math anxiety participant in avoidance strategies so they do not practice math skills as often, a self – fulfilling prophecy of math phobia becomes evident.

**Vivek M. Wagh, (2001)** explains in his investigation that more than 90% of the parents of children facing difficulties in the learning of mathematics were found to have a phobia or impulsion towards mathematics. He found out to improve math leaving and performance, the parents underwent counseling that led to change in their attitude and perspective of formal mathematics as well as an improvement in mathematical skills. He concludes that these activities led to elimination or substantial reduction in fear of math and also there is a correlation between parents fear for math and the child’s anxiety towards the math subject.

**Stuart, (2000)** stated that adults who are affected by math phobia need help to understand that they can do math and will slowly develop the confidence to move on and overcome their fears.

**Peskoff, (2000)** stated that when adults with math phobia study math, the first step is to identify the problem and find the best strategies that will help the student overcome their phobia. The problem with math phobia, or any phobia, is that students will often not seek out strategies to help them because they feel it is not worth it because they cannot do math anyway. Research indicates that students with little or no math phobia both used and valued a wider variety of coping strategies than those students with higher levels of math phobia.

**Evans, (2000); Fitz Simons, (1994)** conducted a research in adult education has shown that one of the biggest obstacles that adult learners face is the fact is the fact that many of them return to study with not very good memories in mathematics in school. They also mention that the emotional response of the students towards mathematics appears to be learn through the social interaction within family and community through the use of negative adjectives.

**Evans, (2000); Fitz Simmons, (1994)** conducted a quantitative study aimed at finding gross estimates of relation of parents fear for math and the child’s anxiety about it. The sample of over 5000 cut cross the entire cross – section of the
population from highly educated and rich to functionally literate and marginalized population for the period of 3 years (2000 to 2003) and sample was anxiety of the child in dealing with formal math education in rural and urban localities, he concluded that 90 of the sample of 5000 students who had problems in coping with math at least one parent had a fear for math, nearly 70% are fear in the both parents, and also discovered that children had difficulty in coping with math in fraction and ratio accounted for the largest number of troubles, geometry and worded problems were next high troubles.

Burns – (1998a) the findings states that math phobia is a serious national problem because it limits the self confidence of the peoples daily lines and their long – term decisions.

Burns – (1998b) stated that math phobia is not genetic but highly contagious. Parents tell their children that math is hard or how hard they had to work at math, parents puts the negative images about math into the childs thought. Many believe that girls are not as good as boys when it comes to math from about math phobia influences self confidence of the family.

Gupta, n.d., Burns, (1998) explained that math phobia is not a minor problem. Math phobia affects the daily lives of approximately 20% of adults, while as many as 66% suffer from it to some degree. Many people have difficulty dealing with money. During the recent mortgage crisis, a large percentage of those who lost their homes suffered from math phobia: because they were so paralyzed by the numbers, they did not realize the problem they faced.

Burns, (1998) explained that many parents think that academic ability is do math is genetic. If the parents were unable to do math or struggled with it, their children will as well. Burns states it as “math phobia is not genetic but highly contagious”. Parents tell their children that math is hard or how hard they had to work at math. This puts the negative images about math into the child’s thoughts. This is especially true with girls. Many believe that girls are not as good as boys when it comes to math, but that girls are better than boys when it comes to reading.
As this belief perpetuates through generations, it becomes a self-fulfilling prophecy with generations of girls believing they are programmed to not be able to do math.

**Rapalje (1997)** stated that math phobia is described as an intense, persistent, often illogical, fear of not succeeding in math. Persons experiencing math phobia hold the belief that they are unable to handle the difficulty associated with learning math or believes that they “can’t” do math.

**Felder and Henriques, (1995)** study reported that an inconsistency between the learner’s preferred style and the teacher’s teaching style negatively influenced the student’s learning and his or her attitudes towards the subject. This study focused on language learning. However, based on the research done by Lindsey, a correlation can be made to the study of math as well. They also stated that based on this research, it can be determined that a teacher’s preferred teaching style is among the behaviors which are considered to be sources of math anxiety. When a teacher’s teaching method is inconsistent with the learner’s preferred learning style, the students will withdraw from the lesson. This explains many adult’s attitudes towards math and the development of math phobia.

**Mattel, (1992)** introduced the talking Barbie doll. One of the things this doll said was, “Math is hard!” This started a debate about the stereotype that girls are bad at math.

**Taylor, Lyn; Brooks, Kathryn (1986)** explained the notions that math is a male domain and requires logic, not intuition, are both myths. The learning mathematics is a developmental process that takes time and practice. Negative attitudes towards or anxiety over mathematics can be altered by establishing a supportive classroom environment, using concrete manipulative materials to help bridge the gap between concrete learning and abstract thought, using a variety of teaching techniques, and addressing the student’s personal attitudes toward math.

**Taylor, and Brooks, (1984)** explained that researchers studied college students who were taking math classes to meet requirements for their degrees. The
research suggested there are two types of coping strategies. One type is cognitive or math-dominated strategies, which focus on the learning of math content. These strategies focus on the learning of math content. These strategies focus on math content and assume that if the student understands it, there will be less anxiety towards it. The strategies in this category were: asking questions, doing extra homework and completing on time so as to not fall further behind, allowing extra study time, getting a tutor, and discussing problems with the instructor outside of class. The other category of coping strategies focused on the psychological aspects of overcoming the phobia. These strategies included: peer support groups, counseling with a professional counselor, positive self-talk, and relaxation activities including exercise, socializing and stress reduction training.

What students used to cope with their math phobia differed based on their level of anxiety. Students with a higher degree of math phobia tended to rely more on counselors and tutors. Of the strategies studied, these two were considered to be among the least helpful to students. Students with low math phobia tended to rely on a wider variety including relaxation, peer support groups, asking questions, homework, self-talk, extra study time, and instructor help. Taylor and Brooks (1984) also found significant gender differences with how the strategies were used. Males tend to use physical activities or exercise, both of which fell under the relaxation strategies. This was more of an avoidance technique for males and one of the lower strategies for success in coping with math phobia. Females were more likely to take on extra homework and complete it on time so as to not fall behind and talk to the instructor if they do not understand the course material. Both of these strategies were identified as being among the most effective coping strategies.

They also stated that negative attitudes toward math or a math phobia can be changed by establishing a positive and supportive learning environment in the classroom. Strategies to achieve this include: using concrete manipulative materials to help bridge the gap between concrete learning and abstract thought, using a variety of teaching techniques, and addressing the student's personal attitude towards math.
Taylor, Lyn; Brooks, Kathryn (1986) explained the notions that math is a male domain and requires logic, not intuition, are both myths. The learning mathematics is a developmental process that takes time and practice. Negative attitudes towards or anxiety over mathematics can be altered by establishing a supportive classroom environment, using concrete manipulative materials to help bridge the gap between concrete learning and abstract thought, using a variety of teaching techniques, and addressing the student’s personal attitudes toward math.

Richardson and Suinn, (1972) spend less time planning math lessons and using math instruction time for non–math related activities.

2.3.0 Studies on Mathematical Achievement

Fadia Nasser-Abu Alhija and Marcel Amasha (2012) examined the Modeling achievement in mathematics: and found the role of learner and learning environment characteristics. This study revealed a structural model of mathematics achievement among Druze 8th graders in Israel. Variables in the model included gender, father's and mother's education, classroom mastery and performance goal orientation, mathematics self-efficacy and self-regulated learning, mastery and performance goals, and mathematics achievement. Data on learner and learning environment variables and achievement in mathematics were collected from 273 boys and girls. Mother's education on mathematics achievement and classroom mastery goal orientation on self-regulation, were not invariant across gender. The same pattern of relationships accounted for different amounts of variance in mathematics achievement for boys and girls.

Dettmers, Swantje and Trautwein, Ulrich (2010) examined the development of achievement in mathematics. The present study examined the associations of 2 indicators of homework quality with homework motivation, homework behavior, and mathematics achievement. Multilevel modeling was used to analyze longitudinal data from a representative national sample of 3,483 students in Grades 9 and 10; homework effects were analyzed at the student and the class level simultaneously. Students who perceived their homework
assignments to be well selected reported higher homework motivation, and homework behavior at both the student and the class level predicted later achievement at the class level. Students who perceived their homework to be challenging (student level) showed relatively poor performance, but homework challenge was positively related to achievement at the class level.

**Saed Sabah and Hind Hammouri (2010)** studied the impact of instructional practices and resources on student achievement in science and mathematics: This study examined the effects of selected classroom factors and mathematics achievement of Jordanian eighth graders using data from the Trends in International Mathematics and Science Study of 2007. The analytical model also included some student-level factors such as the highest level of parents' education and attitudes towards subject. A hierarchical linear model was used to analyse the data; a significance level of 0.05 was used. The results of this study showed that there was a significant variation in science and mathematics achievement among Jordanian classes/schools. About 20% of the variation in achievement was found among the Jordanian schools. The results showed that the effects of the selected class-level factors were not stable across science and mathematics. Some implications for researchers, policy-makers and school personnel are offered to improve science and mathematics achievement.

**Minna Kyttala and Piia Maria Bjorn (2010)** had investigated that Prior mathematics achievement, cognitive appraisals and Phobia as predictors of Finnish students’ later mathematics performance and career orientation. The aim of this two-year longitudinal study was to investigate the role and impact of prior mathematics performance, cognitive appraisals and mathematics-specific, affective Phobia in determining later mathematics achievement and future career orientation among Finnish adolescents. The basic ideas of the control-value theory, assumed to be culturally universal, and previous controversial results regarding the relationship between mathematics Phobia and mathematics achievement were tested in the Finnish cultural context with a longitudinal design. The key premise of the control-value theory is that control and value appraisals are significant determinants of both activity and outcome achievement emotions. Our results
suggest that mathematics Phobia, a prospective outcome emotion, is determined by outcome expectancies (success or failure) and outcome value (the importance of performing well). The educational implications of the findings are discussed.

Sehee Hong, Sung-Kyung Yoo, Sukkyung You and Chih-Chun Wu (2010) had investigated that The Reciprocal Relationship Between Parental Involvement and Mathematics Achievement: Autoregressive Cross-Lagged Modeling. This study focused on comparing the longitudinal associations between two types of parental involvement (i.e., mathematics value and academic reinforcement) and high school students’ mathematics achievement, using data from the Longitudinal Study of American Youth (LSAY). Results, based on multivariate autoregressive cross-lagged modeling, indicated that parents’ academic reinforcement had no effect on students’ mathematics achievement and vice versa; however, a statistically significant positive reciprocal influence existed between parents’ mathematics value and students’ mathematics achievement throughout high school.

Stefanie R. McDonald, Marsha Ing and George A. Marcoulides (2010) had investigated those early parental motivational strategies on mathematics achievement by ethnicity: This study examined the developmental effects of early parental intrinsic and extrinsic motivational strategies on mathematics achievement scores obtained from White students compared to underrepresented minority students. There is no evidence of this relationship for underrepresented minority students. This research contributes to an emerging literature relating developmental change processes to mathematics achievement.

Ronald K. Hambleton, Stephen G. Sireci and Zachary R. Smith (2009) how Do Other Countries Measure Up to the Mathematics Achievement Levels on the National Assessment of Educational Progress? In this study, we mapped achievement levels from the National Assessment of Educational Progress (NAEP) onto the score scales for selected assessments from the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Achievement (PISA). The mapping was conducted on NAEP, TIMSS, and
PISA Mathematics assessments in 2003. A focus of the study was on whether the NAEP achievement levels were set too high. The results indicated that students from many other countries had substantially larger percentages of students meeting NAEP mathematics achievement levels. In general, the findings suggest the NAEP standard for Advanced is high, but not too high when considered within an international context. With respect to the NAEP standard of Proficient, none of the top-performing countries approached 100% proficient, which seems to underscore the different conceptualizations of “Proficient” in NAEP and No Child Left Behind.

Mojeed K. Akinsola and Adeneye O.A. Awofala (2009) had investigated that Effect of personalization of instruction on students’ achievement and self-efficacy in mathematics word problems. This study investigated the effect of personalized print-based instruction on the achievement and self-efficacy regarding mathematics word problems of 320 senior secondary students in Nigeria. The moderator effect of gender was also examined on independent variable (personalization) and dependent variables (mathematics word problem achievement and self-efficacy). The $t$-test statistic was used to analyse the data collected for the study.

Martha Abele Mac Iver and Douglas J. Mac Iver (2009) had investigated that Urban Middle-Grade Student Mathematics Achievement Growth Under Comprehensive School Reform. The authors report on the relation between mathematics achievement growth for middle-grade students on the Pennsylvania System of School Assessments and the number of years schools implemented with National Science Foundation-supported mathematics curriculum from 1997 to 2000. As the authors hypothesized, mathematics achievement gains (Grades 5-8) were positively related to the number of years those schools were implementing a specific mathematics curricular reform. Additional analyses indicated that the relation held for both computation skills and ability to apply mathematics concepts.

Noor Azina Ismail (2009) understanding the Gap in Mathematics Achievement of Malaysian Students. Of 46 countries that participated in the
Trends in International Mathematics and Science Study in 2003 (I. V. S. Mullis, M. O. Martin, E. J. Gonzalez, & S. J. Chrostowski, 2004), Malaysia was ranked 10th in international scores of mathematics achievement for 8th-grade students. The present author aimed to examine the importance of students' home backgrounds, resources for learning, activities, and attitudes toward learning mathematics in accounting for high student achievement in mathematics. Using multiple logistic regression analysis, the author found that having self-confidence in learning mathematics, having a large number of books at home, regularly using computers, and being non-Malay have a high positive association with mathematics achievement among Malaysian students.

**Jian Wang and Emily Lin (2008)** an Alternative Interpretation of the Relationship between Self-Concept and Mathematics Achievement: Comparison of Chinese and US Students as a Context. The paradoxical findings about students’ mathematics self-concept and academic achievement shown in international and comparative studies prompt this exploration of the function and development of mathematics self-concept. That is, when examining data within individual countries, a positive relationship exists between students’ self-concept and achievement in mathematics while a negative relationship emerges in cross-country comparisons. This challenges the popular and commonly held assumption among North American teachers who generally believe that self-concept predicts student achievement and thus, the improvement of students’ self-concept in mathematics leads to higher mathematics achievement. Using comparative studies of Chinese and US student mathematics learning, this study further analyses the inadequacy of existing theories and then seeks to explain the relationship between self-concept and achievement in mathematics using an alternative interpretation.

**Kevin J. Grimm (2008)** had explored that Longitudinal Associations between Reading and Mathematics Achievement. The association between early reading skills and changes in mathematics was examined in a large, low-income sample to determine whether students who have a greater level of reading skills in early elementary school exhibit more rapid gains in tests of mathematics. The longitudinal associations between third grade reading comprehension and changes
in three components of mathematics achievement from third through eighth grade were examined. The results showed males and African-American students tended to have shallower rates of change than females and non-African-American/non-Hispanic students. Early reading comprehension was shown to be related to a conceptual understanding of mathematics and the application of mathematics knowledge. These findings lend support for the notion that early reading skills are important for success in mathematics.

Telle Hailikari, Anne Nevgi and Erkki Komulainen (2007) had revealed that the Academic self-beliefs and prior knowledge as predictors of student achievement in Mathematics: a structural model. The aim of this study was to explore the relationships between prior knowledge, academic self-beliefs, and previous study success in predicting the achievement of 139 students on a university mathematics course. Structural equation modeling was used to explore the interplay of these variables in predicting student achievement. Academic self-beliefs strongly correlated with previous study success and had a strong direct influence on prior knowledge test performance. However, self-beliefs predicted student achievement only indirectly via prior knowledge.

Keith Zvoch and Joseph J. Stevens (2006) had explored that the Longitudinal Effects of School Context and Practice on Middle School Mathematics Achievement. The authors analyzed mathematics achievement data from a longitudinally matched student cohort from a large southwestern U.S. school district to investigate school context and practice effects on the academic performance and growth of middle school students. Teacher educational attainment and the mathematics curricula delivered to students were not related to student performance levels but were moderately associated with mathematics growth rates. The investigation of school impacts on student achievement may be facilitated when an analytic strategy that takes into account the time-dependent and cumulative nature of schooling is adopted.

Elin K. L. Reikeras (2006) investigated the Performance in solving arithmetic problems: a comparison of children with different levels of achievement
in mathematics and reading. The aim of the present study was to investigate the performance in arithmetic related to achievement levels in reading and mathematics. At the two highest age levels the relations between the groups, in multi-step calculation, were in accordance with the results regarding basic facts. The findings indicate, for both normal and low general mathematical ability, that low achievement in reading to a small extent interferes with the pupils’ development of arithmetic performance

**J. Daniel House (2006)** examined that the Mathematics Beliefs and Achievement of Elementary School Students in Japan and the United States: Examined relationships between mathematics beliefs and achievement of elementary school-aged students in the United States and Japan. The students had participated in the Third International Mathematics and Science Study (TIMSS; A. E. Beaton et al., 1996). The author examined several self-beliefs and used variance estimation techniques for complex sampling designs. The author identified a number of significant relationships between self-beliefs and mathematics achievement. Students who attributed success in mathematics to controllable factors (e.g., hard work, studying at home) showed higher test scores whereas students who attributed success in mathematics at school to external factors (e.g., good luck) tended to earn lower mathematics test scores.

**Craig, Jim and Cairo, III, Leslie (2005)** explored the Assessing the Relationship Between Questioning and Understanding to Improve Learning and Thinking (QUILT) and Student Achievement in Mathematics: A pilot study of the effects of QUILT on student achievement was conducted to explore the feasibility of an efficacy study of QUILT and to identify the methodological issues that would have to be addressed in its conduct. Twenty-eight fifth-and sixth-grade elementary school teachers in a rural school district in Kentucky were trained to implement QUILT as a teaching/learning strategy. During the spring of 2005, the teachers videotaped three different mathematics instructional sessions in which they used QUILT questioning techniques. Each tape was viewed by researchers from the Appalachia Educational Laboratory at Edvantia, Inc., and summarized using a special coding sheet. The QUILT behaviors were examined in relation to gains in
mathematics achievement. This was accomplished using the mathematics section of the Measures of Academic Progress (Northwest Evaluation Association, 2005). The findings indicate that teachers implemented some QUILT questioning behaviors but not others in some of their mathematics instructional lessons and that a well controlled, randomized control trial is needed to examine the efficacy of QUILT as an effective instructional technique, being sure to address teacher training, fidelity of implementation, and assessment of student achievement issues.

Jennifer E. V. Lloyd, John Walsh and Manizheh Shehni Yailagh (2005) Sex Differences in Performance Attributions, Self-Efficacy, and Achievement in Mathematics: If I'm so Smart, Why Don't I Know It? In this study, we tested the claim that sex differences in mathematics achievement are related to boys' and girls' differing achievement-related beliefs. We compared the mathematics report card grades, 2001 Foundation Skills Assessment (FSA) Numeracy subtest scores, performance attributions, and self-efficacy of 161 British Columbian public school students' (62 fourth-graders, 99 seventh-graders). Findings indicated that girls' mathematics achievement met or exceeded that of boys and that girls' attribution patterns were more self-enhancing than those found in previous studies. However, girls were more apt to display under-confidence relative to their actual mathematics achievement and to attribute mathematics failure to a lack of teachers' help than were boys.

Xin MA (2005) analysed the Growth in Mathematics Achievement: Analysis With Classification and Regression Trees. Using a recently developed statistical technique often referred to as classification and regression trees (CART), the author classified students into groups with differential rates of growth in mathematics achievement during middle and high school according to individual and family variables, and characterized students who grew fast and those who grew slow in mathematics achievement. Hispanic, Black, and other students were sandwiched in-between. One in 3 socially disadvantaged students in the sample overcame the negative impacts of low family SES and large family size and progressed to the 2nd best rates in mathematics achievement; 1 in 7 socially
advantaged students did not take advantage of high family SES and small family size.

**Fadia Nasser and Menucha Birenbaum (2005)** Modeling Mathematics Achievement of Jewish and Arab Eighth Graders in Israel: The Effects of Learner-Related Variables. This study examined a structural model of mathematics achievement of 2 culturally different groups of Jewish and Arab 8th graders in terms of 5 learner-related variables, namely, gender, epistemological beliefs, self-efficacy, attitudes, and mathematics anxiety. Multigroup structural modeling analysis indicated that the goodness of fit of the hypothesized structural model and the total effects of mathematics self-efficacy and epistemological beliefs were comparable in both groups. The 2 groups differed in the effects that gender, attitudes toward mathematics, and mathematics anxiety exerted on mathematics achievement. They also diverged in terms of the amount of variance in mathematics achievement that the 5 learner-related variables accounted for.

**Steven B. Sheldon and Joyce L. Epstein (2005)** examined that the Involvement Counts: Family and Community Partnerships and Mathematics Achievement. National and international studies have made student performance in mathematics a high priority in schools. Using longitudinal data from elementary and secondary schools, the authors examined the connections between specific family and community involvement activities and student achievement in mathematics at the school level. After the authors controlled for prior levels of mathematics achievement, analyses indicated that effective implementation of practices that encouraged families to support their children's mathematics learning at home was associated with higher percentages of students who scored at or above proficiency on standardized mathematics achievement tests.

**Hind Hammouri (2004)** Explored that Attitudinal and motivational variables related to mathematics achievement in Jordan: findings from the Third International Mathematics and Science Study. The purpose of the present study was to examine the effects of student-related variables on achievement in mathematics. The sample consisted of 3736 13-year-old Jordanian 8th-graders who
participated in the Third International Mathematics and Science Study. The participants completed a student questionnaire and participated in the mathematics test. A structural equation model was used to estimate and test the hypothesized relationships of the factors with achievement in mathematics. Results from this study indicate that four attitudinal and motivational variables had strong positive total and direct effects; and two variables had negative total and direct effects on mathematics achievement.

Xin Ma and Jiangmin Xu (2004) analyzed the causal ordering between attitude toward mathematics and achievement in mathematics. The purpose of this study was to determine the causal ordering (predominance) between attitude toward mathematics and achievement in mathematics in secondary school (grades 7-12). Structural equation models were employed to analyze data from the longitudinal study of American Youth. Results showed that achievement demonstrated causal predominance over attitude across the entire secondary school. Found an imbalanced reciprocal relationship between attitude and achievement across almost entire secondary for non elite students, with achievement showing causal predominance over attitude. Such a reciprocal relationship was absent among elite students. When there was a causal relationship between attitude and achievement among those students, achievement always claimed causal predominance over attitude.

Charles Wolfgang, Laura Stannard and Ithel Jones (2003) attempted the advanced constructional play with LEGOs among preschoolers as a predictor of later school achievement in mathematics. The dependent or outcome variables obtained from the participants' school cumulative records included: (1) results from the California Achievement Test, (2) the grades in mathematics courses, and (3) higher mathematics courses taken in high school. The State that there is a statistical relationship between early LEGO performance among preschool and achievement in mathematics, not seen during the elementary school years, but later developing at the middle and high school level
**Aimee J. Ellington (2003)** Developed that the Meta-Analysis of the Effects of Calculators on Students' Achievement and Attitude Levels in Precollege Mathematics Classes. The findings of 54 research studies were integrated through meta-analysis to determine the effects of calculators on student achievement and attitude levels. The results for both skill types were mixed when calculators were not part of assessment, but in all cases, calculator use did not hinder the development of mathematical skills. Students using calculators had better attitudes toward mathematics than their non-calculator counterparts. The research is needed in the retention of mathematics skills after instruction and transfer of skills to other mathematics-related subjects.

**Jia Wang and Pete Goldschmidt (2003)** analyzed the Importance of Middle School Mathematics on High School Students' Mathematics Achievement. The authors explored the consequences of middle school mathematics course taking, a measure of opportunity to learn, disparity in students' high school mathematics achievement, and achievement growth. Using 4-year longitudinal data from an ethnically and linguistically diverse district, they applied a 3-level hierarchical linear growth model to address potential inequity in course taking and its consequences. The distribution of mathematics course taking among various subgroups not only differed in Grade 8 but also became increasingly inequitable by Grade 11.

**James B. Schreiber (2002)** had investigated the Institutional and Student Factors and their Influence on Advanced Mathematics Achievement. The author examined advanced mathematics achievement with 1,839 students from 162 schools. Average parent education was observed to be associated with the magnitude of the coefficient for attitude toward mathematics on achievement. The more a student believed that success in mathematics was caused by natural ability, the higher the score on the test. Finally, resources, school size, and average parent education were significantly associated with school mean achievement in advanced mathematics.
Constantinos Papanastasiou (2002) investigated the Effects of Background and School Factors on the Mathematics Achievement. Using a structural equation model, this research study investigated the mathematics achievement of 8th grade students in Cyprus enrolled in the year 1994–1995. The study demonstrated that although attitudes, teaching, and beliefs had direct effect on mathematics outcomes, they were not statistically significant. It was also found that family educational background directly affected SES, attitudes toward mathematics, school climate and beliefs related to success in mathematics. Reinforcement exerted a direct effect on attitudes, teaching and beliefs regarding success.

Bednar, Janet; Coughlin, Jane; Evans, Elizabeth and Sievers, Theresa (2002) described that the Improving Student Motivation and Achievement in Mathematics through Teaching to the Multiple Intelligences. This action research project described strategies for improving student motivation and achievement in mathematics through multiple intelligences. Too often, multiple intelligences strategies were lacking, thus causing underachievement in mathematics. Math interest was not inherent in some students. Poor attitudes in mathematics were likely to foster lower student achievement. Research indicates that students have an inability to transfer math concepts into real life situations. Review of literature for possible solutions communicated the need for non-traditional teaching strategies. Students seemed to exhibit higher achievement and greater enthusiasm when able to explore different learning styles. Improvements were noted in student participation and student enthusiasm during mathematics.

Jordon, Nancy C.; Kaplan, David and Hanich, Laurie B. (2002) Found out the Achievement growth in children with learning difficulties in mathematics: Findings of a two-year longitudinal study. The reading and mathematics growth of 180 children was examined over 4 points, spanning 2nd and 3rd grades. Initially, 4 achievement groups were identified: difficulties in mathematics but not in reading (MD only), difficulties in mathematics as well as in reading (MD-RD), difficulties in reading but not in mathematics (RD only), and normal achievement in mathematics and in reading. When IQ, income, ethnicity, and gender were held
constant, the MD-only group grew at a faster rate in mathematics than did the MD-RD group. In reading, the RD-only and MD-RD groups grew at about the same rate. Reading abilities influence children's growth in mathematics, but mathematics abilities do not influence children's growth in reading.

Marie-Christine Opdenakker (2002) analyzed The Effect of Schools and Classes on Mathematics Achievement. The effects of secondary schools, teachers, and classes on mathematics achievement are explored. The results of multilevel analyses indicate important recruitment differences between schools and classes within schools. After controlling for this, the group composition at the class level remained very important for the explanation of differences in mathematics achievement. Also the learning climate in the class, which correlates positively with group composition, explained an additional part of the variance. At the school level, the proportion of girls was positively related to mathematics achievements. Indications of differential effectiveness of classes and schools and of heteroscedasticity related to SES, average class SES, average class SES, sex, and learning climate were found.

Kusum Singh, Monique Granville and Sandra Dika (2002) examined that Mathematics and Science Achievement: Effects of Motivation, Interest, and Academic Engagement. The purpose of the present study was to examine the effects of 3 school-related constructs—motivation, attitude, and academic engagement—on 8th-grade students' achievement in mathematics and science. Although cognitive abilities of the students and their home backgrounds are important predictors of achievement, in recent years affective variables have emerged as salient factors affecting success and persistence in mathematics and science subject areas. Results supported the positive effects of the 2 motivation factors, attitude and academic time on mathematics and science achievement. The strongest effects were those of academic time spent on homework.

Catsambis Sophia, Beveridge Andrew A. (2001) Explores that the Does neighborhood matter? Family, neighborhood, and school influences on eighth-grade mathematics achievement. This paper explores ways by which
neighborhoods and schools may influence the mathematics achievement of eighth grade students. We use data from the National Educational Longitudinal Study (NELS: 88) and combine it with U.S. Census data at the level of students' residential zip codes. The findings are both disadvantaged neighborhoods and disadvantaged schools are directly associated with lower levels of mathematics achievement, even after controlling for individual level background variables. Disadvantaged neighborhoods are also indirectly associated with students' mathematics achievement, by weakening parents' ability to help children succeed in school. Despite these difficulties, parents may be able to overcome, to some degree, neighborhood disadvantages by frequently communicating with their children, closely monitoring their activities, and providing extra learning opportunities for them.

**Kurdek, Lawrence A.; Sinclair, Ronald J. (2001)** Found out that Predicting reading and mathematics achievement in fourth-grade children from kindergarten readiness scores. This study examined age and gender differences in verbal skills and visuomotor skills at kindergarten, in achievement in reading and mathematics at Grade 4, and in the link between skills at kindergarten and later achievement (n 281). With controls for age, verbal skills uniquely predicted later reading achievement, whereas both verbal skills and visuomotor skills uniquely predicted later mathematics achievement. Readiness in the specific areas of auditory memory and verbal associations predicted later reading achievement, whereas readiness in the specific areas of auditory memory, number skills, and visual discrimination predicted later mathematics achievement.

**Xin Ma (2001)** found out that Stability of Socio-Economic Gaps in Mathematics and Science Achievement among Canadian Schools. Using Canadian data from the Third International Mathematics and Science Study, examined the stability of within-school socio-economic gaps in mathematics and science achievement. Student characteristics had significant effects on student achievement. School characteristics were at most marginally related to school average achievement and had no effect on within-school socio-economic gaps. Within-school socio-economic gaps were highly correlated between mathematics
and science, and this correlation was not affected by student and school characteristics. School average achievement was not correlated with within-school socio-economic gaps, and this relationship was not affected by student and school characteristics.

**Charles H. Wolfgang, Laura L. Stannard and Ithel Jones (2001)** analyzed the Block Play Performance Among Preschoolers As a Predictor of Later School Achievement in Mathematics. In 1982, an intact group of 37 preschoolers (age 4) attending a play-oriented preschool were tested using the Lunzer Five Point Play Scale (1955) to obtain a block performance measure. No significance was found at the 3rd- and 5th-grade levels by evaluating report card grades and standardized math scores. At 7th-grade, there was a significant correlation between blocks and standardized math scores, but not report card grades. At the high school level, there was a positive correlation with all high school outcome variables. There was no correlation between block performance and standardized math tests or grades at the elementary school levels. At the beginning of middle school, 7th grade, and in the high school grades, a positive correlation between preschool block performance and math achievement was demonstrated.

**Stevenson, Harold W., Hofer, Barbara K. and Randel, Bruce (2000)** Explored that Mathematics achievement and attitudes about mathematics in China and the West. Evaluated the mathematics achievement of high school students, and assessed the relevance of students' attitudes and beliefs about mathematics to explain differences in achievement between students from China and other developed countries. A total of nearly 6,000 11th grade students from at least 9 private or public high schools in each location participated. Measures included a mathematics test and a questionnaire assessing self-evaluations, school and mathematics attitudes, beliefs about the role of effort in learning mathematics, interest in mathematics and satisfaction with mathematics performance. The results show that the disparities between students in Beijing and Taipei were often greater than the differences between the students in either of these cities and their North American or European counterparts.
Bruce Randel, Harold W. Stevenson and Evelin Witruk (2000) analyzed that Attitudes, beliefs, and mathematics achievement of German and Japanese high school students. A total of 1487 eleventh grade students in Leipzig (Germany) and Sendai (Japan) were given a test of basic concepts and operations in high school mathematics and a questionnaire involving beliefs, attitudes, and practices related to mathematics, their own abilities, and their psychological adjustment. Boys obtained higher scores on the mathematics test than girls, were more likely to spend more time studying mathematics, and placed more importance on going to college than did girls. The poor performance of the German students appears to be attributable to the same kinds of beliefs and attitudes as those found in prior studies of US students, who also have received low scores on tests of mathematics achievement.

Bikkar S. Randhawa and Ashum Gupta (2000) detailed that the Cross-National Gender Differences in Mathematics Achievement, Attitude, and Self-Efficacy within a Common Intrinsic Structure. Because of a marked increase in the Canadian immigrant and refugee population in recent years, school psychologists today are frequently called upon to make recommendations concerning the learning needs of students from many diverse backgrounds and cultures. The purpose of this study was to examine possible gender as well as cultural differences in mathematics attitude, achievement, and self-efficacy between Canadian high school students and English-speaking high school students from a northern city in India. The importance of these findings for the practice of school psychology is discussed.

Tapia, Martha and Marsh, George (2000) examined the effects of gender, math achievement, and ethnicity on attitudes toward mathematics. The inventory was completed by 545 students at a college preparatory bilingual school in Mexico City. Data were analyzed using a multivariate factorial model with four factors of Math Attitude as dependent variables (self-confidence, value, motivation, and enjoyment of mathematics) and three independent variables (gender, math achievement, and ethnicity). Multivariate analysis of variance was performed. Failing students scored lowest on self-confidence, motivation, value,
and enjoyment. There was an overall significant effect of ethnicity on three factors. Mexican students scored significantly higher than American students on self-confidence, value, and enjoyment. Students with dual citizenship--students who had one American parent--scored higher than Americans with no other citizenship on the value of mathematics.

**Conclusion:** The survey of related literature has helped the investigated to have a clean perspective of the problem chosen for the present investigation. The review of related literature has enabled the investigator to formulate relevant hypotheses for the present study. Further based on review, a suitable methodology and well-planed procedure for the present investigation could be adopted and it is dealt in the succeeding chapter.

**2.4.0. Studies related to self-confidence**

Several previous studies were referred and categorized as Indian Studies and Abroad studies. These are given below under separate caption.

**2.4.1. Studies related to self-confidence conducted in India**

**Parvathamma and Sharanamma (2010)** studied the anxiety level and level of self-confidence and their relation with academic achievement. Six high schools of Chamrajnagar taluk in Karnataka were selected randomly. Totally 300 students were selected by randomly selecting 50 students from each school including boys and girls. Tools were used self-confidence checklist (M.Basavanna), anxiety scale (Prof:D.N.Srivastasva & Dr.Govind Tiwari), school records for academic achievement. Major findings of the study were: 1. there was a significant difference between anxiety level of boys and girls. 2. There was a significant difference between self-confidence levels of boys and girls.

**Tirath Singh and Parminder Kaur (2008)** studied the effect of meditation on self-confidence of student-teachers in relation to gender and religion. Sample of the study were used 152 student-teachers of B.Ed. The tools were used self-confidence inventory (1987) in Hindi developed by the Dr.Rekha Agnihotry,
and Raven’s standard progressive matrices developed by J.Raven, J.C.Raven and J.H.Court (revised 2000) were used. Major findings of the study were: 1. there was significant effect of gender on self-confidence when pre-self-confidence was taken as a covariate. 2. There was no significant effect of interaction between meditation and gender on self-confidence when pre-self-confidence was taken as a covariate. 3. There was no significant effect of interaction between meditation and gender on self-confidence when pre-self-confidence and pre-general intelligence were taken as covariates.

Geeta, Pastey and Vijayalaxmi, Aminbhavi (2006) Impact of emotional maturity on stress and self-confidence of adolescents. Sample of the study consists of 105 adolescents studying in XI and XII class at Dharwad city Karnataka state, India. The scales such as emotional maturity (Singh and Bhargav, 1994), self-confidence inventory (Rekha Agnihotri, 1987) and students’ stress scale (Deo, 1997) were administered on the selected sample. The findings revealed that the adolescents with high emotional maturity have significantly high stress (t=10.44; p< 0.001) and self-confidence (t=-2.92; p< 0.01) when compared to those with low emotional maturity. Adolescents with more number of siblings have shown significantly higher level of self-confidence (t = 2.96; p< 0.01) than their counterparts. It is also found that educational level of father has significantly influenced stress of their adolescent children (F= 5.303; p< 0.01). Adolescent boys tend to have significantly higher stress than girls (t=1.72) and girls tend to have significantly high self confidence (t=1.83).

Subramaniam, Leena Mathew (2004) studied assessing self-confidence, mental health & frustration among injured sportsmen & women. The sample comprised 60 of which 30 were sportsmen and used to the other assess self-confidence 30 were sportswomen. Rekha Agnihotri’s self-confidence tool was Tovier personality inventory (TPI) was used to assess mental health and Chauhan and Tiwari’s frustration scale was used to assess frustration. Major findings of the study were: 1. there were significant differences in the self-confidence and frustration between injured sportsmen and sportswomen. 2. There was no significant difference in mental health between injured sportsmen and
sportswomen. 3. There were no interrelationships between self-confidence and mental health, self-confidence and frustration, and mental health and frustration of both.

**Dipika, Shah and Manivannan (2003)** made a study of the self-confidence of visually impaired children in integrated and special schools in Tamil Nadu. A sample of 320 visually impaired children was selected as the sample through stratified random sampling procedure. The tools used ‘students’ self-confidence scale (SCS) based on the Likert scale of summated ratings. Major findings of the study were: 1. there was no significant difference between the scores of visually impaired children in self-confidence on the basis of the gender. 2. There was no significant interaction between independent variables gender and nature of impairment as far as the scores of visually impaired children in ‘self-confidence’ are concerned is tenable. 3. There was no significant interaction between independent variables gender and nature of schools as far as the scores of visually impaired children in self-confidence are concerned. 4. There was no significant interaction between independent variables such as gender; nature of impairment and nature of schools as far as the scores of visually impaired children in self-confidence are concerned.

**Verma (1990)** aims to analyse the sex differences in risk-taking, self confidence and anxiety among adolescent learners. His sample consisted of 200 adolescents with equal number of male and female students studying in class X, selected randomly from different institutions of Behror in Alwar District in Rajasthan. Results indicate that male adolescent learners showed higher mean risk-taking than female adolescent learners. Male adolescent learners possessed significantly higher self-confidence than female adolescents. Female adolescent learners had significantly more anxiety than male adolescent learners.

**Basavanna (1971)** studied self-confidence as an attribute of self-concept. An inventory developed for the purpose of measuring self-confidence was standardized by using traditional psychometric procedures on a group of 300 college students. The self-confidence inventory was later administered to 800 male
students studying in various classes and courses in the constituent colleges of Sri Venkateswara University from whom three samples of twenty-five each were randomly drawn from various levels of score distribution to represent high, moderate and low levels of self-confidence respectively. All the seventy five subjects belonging to the three samples were individually tested to obtain a measure of their risk-taking behavior, a measure of their intellectual level, a measure of their level of aspiration, and a measure of their speed of conflict resolution. Further, they were given a Q-sort test individually under four instructional sets to obtain a self-sort, an ideal self-sort, and other person sort and an ideal other person sort. Major findings of the study: 1. Persons, who higher general perceived themselves as having high self-confidence, had mental ability than those who perceived themselves as lacking in self-confidence. 2. Persons with high self-confidence were capable of taking fairly higher risk in predicting the outcome of their performance in an intellectual activity than those who lacked self-confidence. 3. Persons with high self-confidence had higher self-regard than those who lacked self-confidence. 4. There were no significant differences between the persons with high and low self-confidence in their level of aspiration behavior. 5. The groups with high and low confidence did not differ significantly with regard to their speed of conflict resolution. 6. The people with high and low confidence did not differ significantly with respect to their regard for others.

2.4.2. Studies related to self-confidence conducted in Abroad

Sabira Kleitman, Jennifar Gibsun (2011) studied the Meta cognitive beliefs, self-confidence and primary learning environment of six grade students. Meta cognition is an integral component of a self-regulated approach to learning. The present study examined the relationships between academic self-efficacy and perceptions of one’s own competence in memory and reasoning abilities, and their role in predicting the self-confidence trait. The study also aimed to determine the role of key classroom factors (goal orientation and self-efficacy with the teacher) in predicting self-beliefs, the self-confidence trait and academic achievement in Year 6 students (N = 177). Students with stronger Meta cognitive Beliefs were less engaged in self-handicapping behaviours. Known common factors—intelligence,
gender and a proxy for self efficacy scale, school fees—were controlled for. The present study has important implications for both Meta cognitive theory and educational practice.

**Vealey & Campbell (2010)** conducted this study to (a) determine what achievement goal orientations are present in adolescent figure skaters, (b) examine the relationship between the goal orientations conceptualized by Maehr and Nicholls (1980) and those conceptualized by Vealey (1986), and (c) investigate the influence of different goal orientations on the precompetitive self-confidence, precompetitive anxiety, and actual performance of adolescent skaters. Subjects included 106 youth figure skaters participating in regional competition. Skaters were found to have two achievement goal orientations which were termed extrinsic and task orientations. Some support was found for the relationship between the achievement orientations and the sport-confidence/competitive orientation constructs of Vealey. Also, a multivariate relationship was supported between the sport-confidence/achievement orientation predictor constructs and the self-confidence, anxiety, and performance of adolescent figure skaters in sport competition.

**Ali Haydarsar, Ramazan Aveu, Abdullah Isiklar (2010)** studied the analyzing undergraduate students’ self-confidence levels in terms of some variables. Self-confidence has a very significant impact both on expressing yourself during interpersonal relations and making up relations with others. Acting without self-confidence may lead to isolation or retreatment of an individual from society. Because of that, therapists have been very much concerned about self-confidence. Many people have difficulty in asserting their rights. These people should increase their self-confidence levels in proper situations. In this context, self-confidence education consists of modeling people who are self confident, acting to show that you are self confident enough and reacting instantly. This research was made in order to analyze undergraduate students’ self-confidence levels in terms of some variables. The population of the study consisted of four departments at Aksaray University. As a sample, 168 students studying at Aksaray University took part in. Data were collected via a scale measuring self-confidence
levels of students. In data analyses, descriptive analyses, t-test and ANOVA were used. Results of the study showed that there was significant difference in terms of gender and departments.

**Alias & Hafir (2009)** investigated to determine the relationship between type of confidence inducing stimulus, academic self-confidence and cognitive performance among engineering students. The study samples consisted of two groups of engineering students from a Malaysian polytechnic. The type of confidence inducing stimulus (positive or negative) was the independent variable, cognitive performance was the dependent variable and ASC was the hypothesised mediating variable. The results indicate that the positive group has statistically significantly higher ASC level (3.08) compared to the negative group (2.67) and the positive group also demonstrates a statistically significantly higher cognitive performance compared to the negative group; 71% and 54% respectively. It is concluded that boosting the ASC of engineering students can enhance their cognitive performance.

**Chang & Cheng (2008)** studied the interrelationship between senior high school students' science achievement (SA) and their self-confidence and interest in science (SCIS) was explored with a representative sample of approximately 1,044 11th-grade students from 30 classes attending four high schools throughout Taiwan. Statistical analyses indicated that a statistically significant correlation existed between students' SA and their SCIS with a moderate effect size; the correlation is even higher with almost large effect sizes for a subsample of higher-SCIS and lower-SCIS students. Results of t-test analysis also revealed that there were significant mean differences in students' SA and their knowledge (including physics, chemistry, biology, and earth sciences subscales) and reasoning skill subtests scores between higher-SCIS and lower-SCIS students, with generally large effect sizes. Stepwise regression analyses on higher-SCIS and lower-SCIS students also suggested that both students' SCIS subscales significantly explain the variance of their SA, knowledge, and reasoning ability with large effect sizes.
Hannula et al. (2004) presented some preliminary results of the longitudinal aspect of a research project on self-confidence and understanding in mathematics. They collected a survey data of 3057 fifth-graders and seventh-graders and a follow-up data of ten classes (191 pupils) one and a half years later. The longitudinal data indicates that the learning of mathematics is influenced by a pupil’s mathematics-related beliefs, especially self-confidence. Pupils’ level of understanding fractions also influences their developing understanding of infinity. These relationships between different variables depend also on pupils’ gender and age.

Stoel et al. (2003) presented Latent growth curve (LGC) analysis of longitudinal data for pupils’ school investment, self-confidence and language ability. A multivariate model is tested that relates the three developmental processes to each other and to intelligence. All processes show significant differences between children in their developmental curves. The increase in language ability and the decrease in school investment correspond with the hypotheses. No hypothesis is formulated about self-confidence, but an increase for some and a decrease for others are found. The hypothesis that development in language ability, school investment, and self-confidence are mutually positively associated is supported, as is the hypothesis that intelligence accounts for some of the differences in language ability. School investment, self-confidence, and intelligence each explain a different part of development in language ability.

Bénabou & Tirole (2002) analyzed the self-identification process and its role in motivation. They build a model of self-confidence where people have imperfect knowledge about their ability, which in most tasks is a complement to effort in determining performance. Higher self-confidence thus enhances motivation, and this creates incentives for the manipulation of self-perception. An individual suffering from time-inconsistency may thus want to enhance the self-confidence of his future selves, so as to limit their procrastination. The benefits of confidence-maintenance must, however, be traded off against the risks of overconfidence (inappropriate tasks being pursued). Moreover, rational inference implies that the individual cannot systematically fool himself. To analyze the
workings of this "psychological immune system" and show that it typically leads to multiple equilibriums in cognitive strategies, self confidence, and behaviour. Moreover, while active self-esteem maintenance can improve ex-ante welfare, it can also be self-defeating. Systematically "looking on the bright side", avoiding "negative" thoughts and people, etc., can thus be beneficial in certain environments; but in other circumstances one can only lose by playing such games with oneself, and it would be better to always "accept who you are" and "be honest with yourself".

Klassen (2002) conducted a study which examined the self- and collective efficacy beliefs of Indo-Canadian and Anglo-Canadian early adolescent students. The research participants included 112 Anglo-Canadian and 158 Indo-Canadian (children of Punjabi Sikh immigrants) grade 7 students. On a 22-item measure of math performance, the Indo-Canadian students earned a significantly higher score than the Anglo-Canadian students and also rated their self-efficacy at a higher level. There were no differences between the groups in terms of calibration of self-efficacy and performance. In a multiple regression analysis, self-efficacy was the only motivation variable that predicted math performance for both groups. For the Anglo-Canadian students previous math grade was the only other significant predictor of performance; for the Indo-Canadian students, math self-concept was the other significant predictor. Of the hypothesized four sources of efficacy beliefs, emotional arousal was the strongest predictor of efficacy for both cultural groups. Past performance was the next strongest predictor for Anglo-Canadians, while for the Indo-Canadian students, vicarious experience was the second significant predictor of self-efficacy.

Wilson, Rodney Carlton (2000) made a study of sources of sport-confidence of senior adult, college, and high school athletes. Found that the perceived importance of various sources of self-confidence differed between and within gender.

Ziegler, Albert, Heller, Kurt (2000) made a study of conditions for self-confidence among boys and girls achieving highly in chemistry. Indicated that girls
already expressed significantly lower levels of self-confidence regarding chemistry than did boys.

**Einarson, Marne, Santiago, Anna (1996)** made a study of background characteristics as predictors of academic self-confidence and academic self-efficacy among graduate science and engineering students: an exploration of gender and ethnic differences. They found gender and ethnic differences in academic self-confidence, academic self-efficacy.

**Hripsime A.Kalaian, Donald J.Freeman (1994)** studied the gender differences in self-confidence and educational beliefs among secondary teacher candidates. This longitudinal study examined gender differences among secondary teacher candidates across three categories of criterion measures: (a) levels of self-confidence in teaching, (b) anticipated sources of professional knowledge, and (c) educational orientations and beliefs. Relative to males, females entered teacher preparation programs with lower levels of confidence in themselves as teachers and higher expectations for what they would gain from education courses and practical experiences related to teaching. Females were also more likely to favor student-centered approaches to instruction and to believe that instructional strategies have limited generalizability. These differences in self-confidence and educational beliefs persisted to program completion.

**Hall, Evelyn (1990)** made a study of the effect of performer gender, performer skill level, and opponent gender on self-confidence in a competitive situation. He found that self-confidence of females is not lower than that of males.

**Sleeper, Lynn, Nigro, Georgia (1987)** made a study of —it's not who you are but who you're with: self-confidence in achievement settings. Found overall, sex-of-subject differences in self-confidence are less powerful than the effects yielded by the sex of others in achievement settings.

**Debra Instone, Brenda Major, Barbara B.Bunker (1983)** studied the gender self-confidence and social influence strategies: An organizational simulation. Investigated whether men and women in positions of equal power
differ in the strategies they use to influence subordinates. 24 male and 24 female undergraduates were placed into a supervisory role in a simulated organizational setting and were compared on the frequency, range, and types of influence strategies they used to direct the work of 3 bogus subordinates. Although gender differences consistent with general sex-role stereotypes were found, most differences were weak and only of marginal significance. Relative to males, females made fewer influence attempts, used a more limited range of influence strategies, used fewer rewarding strategies, particularly promises of pay increases, and used more coercive strategies, especially pay deductions. Females displayed lower levels of self-confidence than did males, and sex-linked differences in self-confidence explained much of the gender difference observed in the frequency with which influence attempts were made and the extent to which coercive strategies were used.

**Aron, Arthur and Others (1981)** made a study of the transcendental meditation program in the college curriculum: A 4-year longitudinal study of effects on cognitive and effective functioning. Found that participation in transcendental meditation intelligence classes and produced increased significant social freshman-senior increased on self-confidence, sociability, general psychological health, and social maturity.

**Konvalina (1981)** investigated self-assessment, achievement, and confidence in basic mathematics skills. Thirty college students enrolled in a self-paced developmental mathematics course were randomly assigned to either an experimental group that performed a written self-assessment before each test, or to a control group that did not perform the written self-assessment. No significant differences were found between the groups in achievement or general confidence in basic mathematical skills. However, the experimental group consistently had a higher confidence mean over a 25-item basic skills inventory and scored higher on a significant proportion of skills. A highly significant correlation was found between skill confidence and achievement over the 25 basic skills for the combined groups. A significant correlation was found between group confidence and group achievement for the experimental group, but not for the control group.
Lenney & Orono (1977) highlighted previous reviewers who have suggested that women display lower self-confidence than men across almost all achievement situations. The empirical validity of this suggestion is assessed. The literature indicates that although low self-confidence is indeed a frequent and potentially debilitating problem among women, they are not lower in self-confidence than men in all achievement situations. Instead, it is argued that the nature of this sex difference depends upon such situation variables as the specific ability area, the availability of performance feedback, and the emphasis placed upon social comparison or evaluation.

David Kipnis, William P. Lane (1962) studied the self-confidence and leadership. The object of this study was to examine the relationship between lack of confidence in one's leadership ability and reliance upon passive leadership techniques to cope with supervisory problems. 77 Navy petty officers were given a questionnaire containing 20 supervisory problems and were asked to evaluate the desirability of each of 5 ways of solving each problem. Ss also evaluated how satisfied they were with their leadership abilities. Principal findings were: (a) Ss were highly consistent in the extent to which they endorsed each of 5 approaches to correcting performance, (b) there was a correlation of .52 between endorsing the use of administrative procedures to solve the problem and informally asking a superior to solve the problem, and (c) Ss who lacked confidence in their leadership abilities were significantly less willing to hold face-to-face discussions with subordinates and significantly more often endorsed both referring the subordinate to a superior and relying upon the use of administrative rules to solve the supervisory problems.

2.5.0 Studies Related to Hemisphericity

Several previous studies were referred and categorized as Indian Studies and Abroad studies. Only 3 studies could collect and remaining is from abroad. These are given below under separate caption.
2.5.1 Studies Related to Hemisphericity conducted in India

Parveen Sharma (2007) found out the thinking styles of individuals in relation to their cerebral dominance. The styles depend upon cerebral dominance of an individual in retaining and processing different modes of information in their own style of learning and thinking. This study attempted to find out the relationship and significance of difference between academic achievement and learning-thinking style of secondary school students. The study was delimited to class Xth students only. The purpose of the present study was to see whether there is a relationship between academic achievement and learning-thinking style of secondary school students or not. It has been found that learning-thinking style and academic achievement of secondary school students are positively and significantly related to each other. Students having high academic achievement are better for teaching. It can be said that academic achievement is a factor which influences the learning-thinking style of secondary school students. It can also be concluded that male and female secondary school students are not different in respect to their academic achievement whereas they are different in respect to their learning-thinking style.

Kalpana Vengopal and Mridula K (2007) examined the styles of learning and thinking. The present study is aimed at examining the hemispheric preferences for information processing and styles of learning and thinking in children. A sample of 250 students of class VIII which included both boys and girls from five English medium schools were selected. The tool Styles of Learning and Thinking was administered. Results revealed that there was a significant difference in the right and left (brain) hemisphere preference for information processing among children and that boys were more right hemispheric oriented and girls were more left hemispheric oriented in information processing. Significant differences were observed in the styles of learning and thinking and concept preference among right hemisphere and left hemisphere dominant children with respect to both genders.

Amarjit Singh (2002) analyzed the behavioral perceptions of design and construction engineers. Hemisphericity in behaviour studies is the role and
dominance of right bran/left brain in the human brain, each side of which has varying roles and characteristics, thereby leading to different thinking orientations in the human. A study was conducted to measure the hemisphericity orientation of construction and design engineers in a large public construction organization. We know from literature that people of different hemisphericity orientations have unlike personalities and dissimilar perspectives of specific situations. The essential characteristics of hemisphericity as established in literature are presented and used in analysing the organization. From this study of engineers, it was seen that construction engineers in the organization, State Department of Engineering Construction (SDEC), are predominantly left-brained while design engineers are predominantly right-brained. This difference in orientation partially explains why the design and construction engineers at SDEC are unable to see eye-to-eye in issues concerning implementation of drawings. Left hemisphere dominant engineers are also seen to desire more organizational changes than their right hemisphere dominant counterparts. Ideally, researchers believe that a 50–50 distribution of hemisphericities in large organizations is desirable. Details, analysis, and recommendations are presented in the paper

2.5.2 Studies related to Hemisphericity in Abroad

A. B. M. Abdullah, Muhammad Muazzem Hossain and Carmen Joham (2011) explored the relationship between online shoppers' brain hemisphericity and their preference for electronic catalogs (e-catalogs). e-Catalogs provide information on online products and services and can be presented in various forms, including text-oriented catalogs, audio-enabled catalogs, 3D catalogs, virtual trials, and custom animated catalogs. It is proposed that Web shoppers' brain hemisphericity can provide a basis for personalization of e-catalogs. Data were collected using two survey instruments. A verbalizer–visualizer questionnaire was used to measure participants' brain hemisphericity. Participants' preferences for different features of e-catalogs were measured using an e-catalogs questionnaire. Data were collected from a total of 1,087 respondents. The findings suggest that participants' verbal and visual scores provide a basis for customization of e-catalogs. The personalization of e-catalogs can facilitate and improve Web
shoppers' online shopping experience and assist their decision-making process for online purchases.

**Erin Michelle Oliver (2009)** Found out the Relationship between Problem Solving Strategies and Brain Hemisphericity in High School Students. The associations between problem solving strategies and brain hemisphericity are examined. The hypothesis is that there is a correlation between the methods used to solve a single opened-ended mathematics problem and the scores obtained in the Style of Learning and Thinking Questionnaire, which measures student’s brain dominance (Torrance, 1988). A total of 98 ninth grade students were randomly selected from a High School in South East Texas to be surveyed. The listing method did not correlate with left brain dominance as expected on any level of complexity of the mathematics problem. The relationships identified in this study show that the general characteristics associated with each hemisphere of the brain, also apply to mathematical problem solving. This information could be used to help develop more whole brained mathematical problem solvers, by teaching strategies that are associated with both hemispheres.

**Bielefeldt, Steven D (2006)** Analyzed the right- and Left-Brain Thinkers and Certain Styles of Learning. The purpose of this study was to analyze right- and left- brain thinkers and certain styles of learning (specifically visual, auditory, or kinesthetic) in college level adult learners. This study includes data collected from approximately 100 adult learners with a survey, as well as a comprehensive review and analysis of literature concerning the brain, brain-based learning, and certain learning styles. Research-based evidence from the study will be used to encourage instructors to develop and use appropriate styles of teaching to enhance their student's educational experience.

**Flerida C. Alvaro (2006)** Analyzed Engaging Diversity Through Brain Hemispheric Orientation (BHO) Among College Students: Some Implications On Their Mathematics Performance. This study primarily sought empirical results to be used for a more complicated future research undertaking. This study categorized the students of the College of Teacher Education according to their left, right, or
confluent brain hemispheric orientation through a preference scale. Also, these college students were classified with respect to their low, average, or high level of Mathematics performance basing from the grades in Mathematics subjects. Diversity in college students’ gender, age, and ethnicity were analyzed for their effect on the brain hemispheric orientation as well as their effect on their level of Mathematics performance. This study investigated the influence of brain hemispheric orientation on the level of Mathematics performance of the college students. Findings revealed that there were significantly more left-brained than the combined number of right-brained and confluent-brained college students. More female college students had high and average level of Mathematics performance than their male counterparts but the numerical difference did not show significant results. There were significantly more college students at age bracket 16-21 years with average level and low level of mathematics performance than their counterparts in other age brackets. More Visayan college students had average level and low level of mathematics performance and which outnumbered their counterparts in other ethnic groups. Gender was found to have not significantly affected the level of Mathematics performance but age, and ethnicity did significantly affect the level of Mathematics performance. Results revealed that brain hemispheric orientation of college students significantly explained their level of Mathematics performance.

Bruce E Morton, Stein E Rafto (2006) Explain that Corpus callosum size is linked to dichotic deafness and hemisphericity, not sex or handedness. Individuals differ in the number of corpus callosum (CC) nerve fibers interconnecting their cerebral hemispheres by about threefold. Early reports suggested that males had smaller CCs than females. Using quantitative MRI, we found the midline CC area of 113 subjects was significantly correlated, not with handedness or sex, but with dichotic deafness, and even more so with redefined hemisphericity, the latter accounting for over 19% of CC variability. That is, both dichotic hearing and right brain-oriented individuals of either sex had significantly larger CCs than dichotically deaf or left brain-oriented persons. Thus, current
traditions of brain laterality and gender may benefit from revisions that include redefined hemisphericity.

Coulson, Seana and et.al (2005) investigated that Right Hemisphere Sensitivity to Word- and Sentence-Level Context: Evidence From Event-Related Brain Potentials. Researchers using lateralized stimuli have suggested that the left hemisphere is sensitive to sentence-level context, whereas the right hemisphere (RH) primarily processes word-level meaning. The authors investigated this message-blind RH model by measuring associative priming with event-related brain potentials (ERPs). Results do not support the message-blind RH model but do suggest hemispheric asymmetries in the use of word and sentence context during real-time processing.

A.B. M. Abdullah (2005) Examined that the User Preference Modeling for Customised Dynamic Electronic Catalogs Generation Based on Web Shoppers’ Brain Hemisphericity/Cognitive Style. This study examined the impact of online shoppers’ brain hemisphericity/ (cognitive style) on their preference for different aspects of information presentation via electronic catalogs. Two instruments were used to measure participants’ cognitive styles/brain orientations. In addition to ANOVA, regression analysis has also been conducted to reaffirm the findings of the ANOVA analysis. As expected, most of the findings in regression analysis are inline with the ANOVA results.

Harring, Kathleen E. (2004) found out the Right Hemisphere Positivity Bias in Preconscious Processing: Data From Five Experiments. Using a signal detection paradigm, participants' sensitivity to emotionally toned stimuli was evaluated in five experiments. Each experiment used a 222 mixed groups design. The within-subject variables were the hemispheric presentation (right and left) and the emotional tone of the stimuli (positive and negative). Gender of the participant was the between-subjects variable. The results of these studies indicate greater sensitivity in the right than in the left hemisphere, and greater sensitivity to positive than to negative stimuli. Interpretations focus on the automatization of affect and the brain lateralization of emotional processing.
Bruce E Morton (2003a) Analyzed the Line bisection-based hemisphericity estimates of university students and professionals: evidence of sorting during higher education and career selection. Recently, hemisphericity has been assessed by six intercorrelated methods. Entering university students (n=402) enrolled in three lower division courses were chosen as a reference population. Each of these classes contained about 56% left brain-oriented individuals. In contrast, mean student left-brain distributions in four specialized, upper level courses (n=180), ranged from 35 to 68%, suggestive of hemisphericity sorting. Even more pronounced hemisphericity distribution differences were found within university representatives of 15 professions (n=421) and within professional subspecialists (n=45). For example, of biochemists (n=18), 83% were left brain-oriented, while among astronomers (n=21), only 29% were. These results are of intrinsic interest, and demonstrate the capability of the Best.

Bruce E Morton (2003b) investigated Two-hand line-bisection task outcomes correlate with several measures of hemisphericity. While seeking new functional methods to reassess the concept of hemisphericity, a two-hand line-bisection task was investigated because of reports of large, stable differences among the general population. These were found to be due to hemispheric differences in judgment of the midpoint of horizontal lines, made visible due to the unilateral brain control of each hand. By use of a two-hand line-bisection test (Best-Hand Test), university workers (n=412) were readily sorted into theoretical response categories, resulting in the production of two large groups. These two groups correlated well with those produced by four independent hemisphericity assessments, two physiological and two psychological.

Chua, Yan Piaw (2002) carried out a study on Brain Hemisphericity, Analyzed the Creative Thinking and Critical Thinking of Malaysian Science and Arts Students. The purposes of this study were: (1) to explore the nature of brain hemisphericity, creative thinking and critical thinking abilities of Malaysian students, (2) to compare brain hemisphericity, creative thinking and critical thinking abilities of the students in terms of academic major, gender and ethnicity variables, and (3) to ascertain the relationships between brain hemisphericity and
creative thinking; and between brain hemisphericity and critical thinking. The subject of this study consisted of 216 form-six students (109 science major and 107 arts major) from twenty-seven secondary schools of the state of Selangor. The results demonstrated that the majority of the students were right hemisphere dominants, and they preferred to use only one of their hemispheres in learning and thinking (right hemisphere 54.6%, left hemisphere 36.6%, and whole brain 8.8%). Descriptive analysis on creative thinking abilities indicated that the students were relatively fluent in producing ideas, and the ideas they created were likely to be original. However, they have less ability to evaluate and elaborate the ideas creatively, and tend to leap to the conclusions about the ideas they create prematurely.

Allison E. Ladue (2002) The correlation between hemisphericity and sensory learning style, auditory, visual, or kinesthetic, and SAT excerpt scores, math and verbal, in gifted and talented high school students. Hemisphericity can be most simply defined as the location of an individual's dominant intelligence, centering in either the right side, left side, or both sides of the brain equally. Learning style can be derived from both the hemisphericity of the student and the student's sensory preference. These sensory-based learning styles are classified as auditory, visual, and kinesthetic. The purpose of this research was to find a correlation between hemisphericity, or brain dominance, and sensory learning style, and the SAT excerpt math and verbal scores of gifted and talented high school students. The tests used to determine hemisphericity and sensory learning style were entitles Your Style of Thinking and Learning and What is Your Personal Learning Style? Student samples were obtained from the Spring Valley High School Discovery Chemistry I Honors class and the Richland School District Two AP Psychology Distance Learning classes. The SAT excerpts were taken using similar instructions to an actual testing site. Students were also required to, though not facilitated in, complete both learning styles tests as well as have a parental consent letter signed. In attempting to find a basic correlation between learning style and SAT excerpt scores, no relationships, let alone strong correlations, were found. Any initial hypotheses made in regards to the varying
strengths of correlations between given independent and dependent variable pairings are therefore inapplicable. It can be deduced that hemisphericity scores and sensory learning style percentages are not valid indicators of standardized test performance, particularly on the SAT I verbal and math sections.

**Allison E. Ladue (2002)** The correlation between hemisphericity and sensory learning style, auditory, visual, or kinesthetic, and SAT excerpt scores, math and verbal, in gifted and talented high school students. Hemisphericity can be most simply defined as the location of an individual’s dominant intelligence, centering in either the right side, left side, or both sides of the brain equally. Learning style can be derived from both the hemisphericity of the student and the student's sensory preference. These sensory-based learning styles are classified as auditory, visual, and kinesthetic. The purpose of this research was to find a correlation between hemisphericity, or brain dominance, and sensory learning style, and the SAT excerpt math and verbal scores of gifted and talented high school students. The tests used to determine hemisphericity and sensory learning style were entitles Your Style of Thinking and Learning and What is Your Personal Learning Style? Student samples were obtained were obtained from the Spring Valley High School Discovery Chemistry I Honors class and the Richland School District Two AP Psychology Distance Learning classes. The SAT excerpts were taken using similar instructions to an actual testing site. Students were also required to, though not facilitated in, complete both learning styles tests as well as have a parental consent letter signed. In attempting to find a basic correlation between learning style and SAT excerpt scores, no relationships, let alone strong correlations, were found. Any initial hypotheses made in regards to the varying strengths of correlations between given independent and dependent variable pairings are therefore inapplicable. It can be deduced that hemisphericity scores and sensory learning style percentages are not valid indicators of standardized test performance, particularly on the SAT I verbal and math sections.

**Amany Saleh (2001)** Analyzed the Brain hemisphericity and academic Achievements: A This article reports on a study that investigated the correlation between students' choice of academic majors and their brain hemisphericity. The
participants in this research were 429 graduate and undergraduate students in a large university in the southern part of the United States. The data were analyzed using analysis of variance to determine the influence of brain hemisphericity on students' choice of academic majors. The results lent support to earlier research in their findings of a strong correlation between academic majors and brain dominance. The ANOVA model showed a significant effect of brain hemisphericity on students' choice of academic majors. The study also demonstrated an evidence of a general shift in students’ brain hemisphericity from earlier research, where more students were identified as whole brained.

**Tendero, Julieta (2000)** found out the Hemispheric dominance and language proficiency levels in the four macro skills of Western Mindanao State university college students. With Ellis’ (1985) Neurofunctional Theory as basis, this study was conducted to determine the relationship between the hemispheric dominance (HD) and English proficiency (EP) in the four macro skills of the college students of Western Mindanao State University vis-avis their age, gender and area of specialization. It was hypothesized that students’ HD would have a significant correlation with EP scores in each of the four macro skills of listening, speaking, reading and writing. The sample consisted of 240 respondents selected through purposive, stratified and random sampling techniques from among the 5,096 students of the three Colleges of Arts and Sciences, Engineering and Technology, and Education of Western Mindanao State University, Philippines. The students’ hemisphericity was determined by the use of the standardized Hemispheric Dominance Test, the language proficiency levels were based on their scores in the five language tests, namely, the standardized Listening and Reading Comprehension Tests, the researcher-made Speaking and Writing Skill Tests and the Cloze Test.

**Rosihan M. Ali (2000)** Investigated Association between Brain Hemisphericity, Learning Styles and Confidence in Using Graphics Calculator for Mathematics. This paper presents the preliminary H&S/c results of a study conducted to investigate the differences in brain hemisphericity and learning styles on students’ confidence in using the graphics calculator (GC) to learn mathematics.
Data were collected from a sample of 44 undergraduate mathematics students in Malaysia using Brain-Dominance Questionnaire, Index of Learning Style Inventory, and Confidence in Using GC to Learn Mathematics Questionnaire. Statistical analyses revealed that the sample differ significantly in their hemispheric preference and learning styles. In addition, sequential-global and sensing intuitive learning styles were found to associate significantly with brain hemisphericity. There was no significant association between brain hemisphericity with gender, race, and program of study. The study also revealed that GC confidence ratings are not significantly different across brain hemisphericity as well as learning styles.

**Tendero, Julieta (2000)** designed a study on Hemispheric Dominance and Language Proficiency Levels in the Four Macro Skills of Western Mindanao State University College Students. The sample consisted of 240 respondents selected through purposive, stratified and random sampling techniques. The students’ hemisphericity was determined by the use of the standardized Hemispheric Dominance Test, the language proficiency levels were based on their scores in the five language tests. The data were analyzed using Pearson Product-Moment Correlation Coefficient. The study concluded that students’ hemispheric dominance did not affect their English proficiency both in the four macro skills and global level; however, it did influence their English proficiency when they were categorized according to age and area of specialization.

**S. Knecht and et al. (2000)** did an investigation on Handedness and Hemispheric Language Dominance in Healthy Humans. To clarify the relationship between handedness and language dominance in healthy subjects, we measured lateralization directly by functional transcranial Doppler sonography in 326 healthy individuals using a word-generation task. The incidence of right-hemisphere language dominance was found to increase linearly with the degree of left-handedness, from 4% in strong right-handers (handedness = 100) to 15% in ambidextrous individuals and 27% in strong left-handers (handedness = −100). The results clearly demonstrate that the relationship between handedness and language dominance is not an artifact of cerebral pathology but a natural phenomenon.
Xiong J (1998) determined an Evaluation of Hemispheric Dominance for Language using Functional MRI: A Comparison with Positron Emission Tomography. The utility of a conventional (i.e., nonecho-planar) functional magnetic resonance imaging (fMRI) technique to determine hemispheric dominance for language was assessed using a semantic generation task in which subjects were presented with a series of nouns and generated aloud a verb for each one. A direct comparison of the fMRI results with positron emission tomography (PET), acquired from the same subjects, was also performed. When analyzed by group averaging, the results of this work were in concordance with those of previous PET studies, showing a left hemispheric dominance for language. Analyzed on a individual basis, 7 out of 9 subjects were left-hemisphere dominant and 2 subjects were right-hemisphere dominant; this applied with both PET and fMRI methods.

Lee, Jean Say Ying (1998) undertook a study entitled Brain Hemisphericity in Art and Non art-Elective Students (express) and Implications for Curriculum. The art elective program and non-art elective program students have taken as sample for the study in Singapore. Patterns of cognitive functions unique to the individual (Yeap, Chong, & Low, 1997), will give a qualitative picture of the hemispheric capabilities of the subject. The study found that the art students, in general, performed better on their left brain functioning tasks. However, there was also movement towards a mean score of zero in their cognitive profile which indicated whole brain functioning. On closer examination of the groups in terms of age, the younger students, that is, the 14-15 year old, were left brain functioning but their counterparts, the 16-17 year old, were right brain functioning. In terms of gender, the females had a more integrated brain functioning than the males.

Hylton, Jaime and Hartman, Steve E. (1997) explored a study on Personality, Hemispheric Dominance, and Cognitive Style. For this study, 154 medical students and 526 undergraduates (samples treated separately). Tools used were Hemispheric Mode Indicator, Myers-Briggs Type Indicator. A study of medical students and undergraduates shows those judged as left- or right-brained dominant have significantly different personalities.
**Junghee Kim and William B. Michael (1995)** analyzed the relationship of creativity measures to school achievement and to preferred learning and thinking style in a sample of Korean high school students. For this study, a sample of 193 11th-grade Korean high school students (92 males and 101 females) were participated. Tools used were performance in selected measures of creativity involving both verbal and visual tasks, related to (a) school achievement as revealed by a quantitative indicator (percentage score) and (b) the expressed preference for a given learning and thinking style as revealed in a standardized measure (Style of Learning and Thinking by Torrance). Results revealed that learning and thinking style preference associated with right-brain dominance are likely to earn higher scores on creativity measures than will those students classified as displaying a learning and thinking style preference correspond to either a left-brain dominance or an integrated-brain dominance.

**M Filippi and et al (1995)** conducted a study on, ‘Does Hemispheric Dominance Influence Brain Lesion Distribution in Multiple Sclerosis?’ To evaluate whether hemispheric lesion distribution in multiple sclerosis is related to the uneven interhemispheric localization of cerebral function, a 10 item self-administered questionnaire evaluating hand preference and supratentorial brain MRI was obtained from 23 patients with clinically definite multiple sclerosis. The data suggest that local events, possibly related to specialization of hemispheric function, might be responsible for the increased vulnerability of the dominant hemisphere to the pathological process of multiple sclerosis.

**Carthey, Joseph H (1993)** determined the relationships between learning styles and academic achievement and brain hemispheric dominance and academic performance in business and accounting courses. 64 students were participated in this study. Tools used were Kolb Learning Style Inventory and the McCarthy Hemispheric Mode Indicator to discover whether students were right-brained, left-brained, or whole brained. Academic achievement was measured by the students' final grade point averages earned in the courses. Direct and inverse tendencies seemed apparent between particular learning styles and academic
achievement. In brain dominance, direct and inverse tendencies appeared to exist between certain brain hemispheric modes and academic achievement.

Roig M, Ryan R (1993) designed a study on Hemisphericity Style, Sex, and Performance on a Letter-Detection Task. Subjects classified by scores on the Preference Questionnaire as preferring either a left- or a right-hemisphericity style were asked to read a one-page passage and to circle each letter they encountered as they read the passage. There were no statistically significant differences in letter detection between the 58 right- and the 64 left-style scorers. Our results suggest that hemisphericity style is not an important factor in letter detection.

Roig M and Neaman MA (1992) did an investigation on Hemisphericity Style and Belief in ESP. 108 students were classified as preferring either a style of left or right hemisphericity using Zenhausern's Preference Questionnaire. The students then completed two scales designed to measure belief in extrasensory perception (ESP). Students who scored as preferring a right style scored higher on belief in ESP than those who preferred a left style. The results are consistent with previous findings which suggest a connection between right hemisphere functions (e.g., imagery) and belief in ESP.

Nestor PG and Safer MA (1990) explored a study on A multi-method investigation of individual differences in hemisphericity. This study investigated whether hemisphericity was related to personality variables, as measured by trait anxiety and the tendency to express versus inhibits emotions. Sixty six right-handed subjects completed personality measures and were tested on two occasions with multiple measures of hemisphericity, including dichotic listening, tachistoscopic emotion recognition, verbal ability and spatial ability. A composite hemisphericity index indicated that right hemisphericity was modestly correlated with the tendency to express emotions and left hemisphericity with the tendency to inhibit emotions. We discuss some reasons for the failure to find either construct or predictive validity for hemisphericity.
Yeap LL (1989) carried out an investigation on Hemisphericity and student achievement. The objective of the study was to investigate the psychological domain of learning styles in terms of the hemispheric patterns of Singapore Secondary Two students in the three achievement levels, namely Normal (low achievers), Express (average achievers), and Special (high achievers). Using the Cognitive Laterality Battery (Gordon, 1986) to measure the students' hemispheric dominance, the study found that it is in the psychological domain of the students' learning styles, in terms of their hemispheric dominance that the Secondary Two students in the three achievement levels are distinctly different.

Morrison, Lorena Ann Prosser (1989) designed a study entitled the relationship between Gender, Laterality, Brain Dominance, and Learning-Disabled Labeling of Selected Elementary School-Aged Students in Dade County. The major purpose of this research was to identify right-hemispheric elementary-aged male students who are being labeled as learning disabled. Twenty-one students were participated in the research study. An experimental and a control group were randomly assigned from this LD gifted group of students ranging from second to fifth graders. Style of Learning and Thinking (SOLAT) hemisphericity test for elementary-aged children by Paul Torrance was used as a tool. Results revealed that Right-brain students should remain in regular classroom situations where they will have a support team to determine that they will be accommodated in the regular classroom.

Beer J. (1988) determined a study on Hemispheric Dominance Inferred from Your Style of Learning and Thinking on Reports of Necker Cube Reversals and Maze Learning. 30 subjects volunteered from three sources: community adults (M age = 32.8, SD = 13.4), college adults (M age = 23.8, SD = 8.3), and children (M age = 9.5, SD = 1.7) and were categorized as 'left-' and 'right-dominant' by scores on Your Style of Thinking and Learning. They reported the number of Necker cube reversals perceived in 90 sec., attempted to locate four embedded figures, and blindly traversed a 16-choice point finger maze in that order. 'Right-dominant' subjects located more embedded figures and made fewer errors on the finger maze than did 'left-dominant' subjects. College adults reported more Necker
cube reversals than did community adults and children, and community adults reported more reversals than did children.

**Stafford EM. (1986)** analyzed the Relationship between Occupational Therapy Student Learning Styles and Clinic Performance. 33 occupational therapy students who graduated from the University of Puget Sound in May 1983 were participated in the study. Learning Style Inventory (LSI), Your Style of Learning and Thinking (SOLAT), and Fieldwork Performance Reports (FWPRs) were used to assess the relationship between learning styles and clinic performance of students. There were significant correlations between scores from both learning style instruments and components of the Physical Disabilities Fieldwork Performance Report (PDFWPR) and Mental Health Fieldwork Performance Report (MHFWPR) scores. Results indicate that a logical, sequential cognitive style enhanced PDFWPR scores, but negatively affected some MHFWPR scores. A preference for active experimentation contributed to both PDFWPR and MHFWPR scores.

**John Stellern and et al (1986)** conducted a study on Hemispheric Dominance of Native American Students. Native American Indians are presumed to be right-hemisphere dominant, and therefore need special teaching techniques. This study examined the language and spatial lateralization of American Indian students by means of the cognitive-manual dual task model as well as psychoeducational assessment techniques. The results indicated that the Indian students were lateralized to the left hemisphere for language, and some of those students were also lateralized to the left hemisphere for spatial function. Also, as scores went up on tests of right hemisphere dominance, behavior problems, and spatial function, scores went down on tests of reading, spelling, left hemisphere dominance, and being a good student. Two major conclusions are that the Indian students of this study were not right hemisphere dominant, and that right hemisphere dominance appears to be associated with a risk of learning and behavior problems.
Greenfield, Teresa Arambula (1986) undertook a study on Cerebral Hemisphericity and its Relationship to Academic Achievement, Sex, and Career Preference of High School Science and Mathematics. This study was undertaken to help assess the need for such restructuring by teaching different sections of a high school biology class (N = 83) for one academic quarter term, using methods based upon right and left hemisphere capabilities. Supplemental data were gathered by means of analyzing high school student (N = 101) hemisphericity scores in relationship to their scores on a standardized science achievement test, and by surveying students (n = 990) in northern Illinois high schools in efforts to determine whether or not hemispheric cognitive style could be related with sex or preferred college major. Hemisphericity of students was determined using Torrance's Your Style of Learning and Thinking hemisphericity questionnaire. Results indicated that, at least for the mostly white, middle-socioeconomic class population of high school students from which study samples were drawn, there is a significant relationship between most of the variables. However, two-way interactions between all three of the independent variables did result in significant increases in student achievement.

Lorraine Coffin (1985) determined The Effect of Hemisphericity and Field Dependence on Performance on a Programming Task. This study investigated the effects of hemisphericity and field dependence on programming skills. Twenty-five undergraduate university students from two introductory Logo programming courses completed the study. Results suggested that hemisphericity is related to the complexity of program structure (tree depth).

Hauck, LaVerne S. Jr (1985) analyzed Differences in Information Mapping Strategies in Left and Right Brain Learners. Subjects were 199 male and female eighth grade students in a high school industrial arts class. Torrance's "Your Style of Learning and Thinking" (SOLAT) was used to categorize cerebral dominance. The learning packet used the information mapping strategy, providing visual organization and functioning as an advance organizer. A 30-item multiple choice posttest assessed learning. Results indicated a significant difference between hemispheric dominance and test scores; subjects with an integrated style
scored higher than left dominant students. Integrated or right style students had a higher reading level than left style students. There was no gender difference in hemispheric dominance, but males scored higher on the test.

**Jung R, Altenmüller E, and Natsch B (1984)** did an investigation on Hemispheric Dominance for Speech and Calculation: Electrophysiologic Correlates of Left Dominance in Left Handedness. Left-sided laterality of negative potentials was taken as evidence of hemispheric dominance. It appeared during the processing of words and numbers in 26 of the 30 left-handers and was localized mainly in the left frontal and temporal parietal regions. This electrophysiological evidence indicates that the left hemisphere is dominant for language and calculation in the vast majority of left-handers.

**John Stellern, Mike Marlowe and James Jacobs (1983)** investigated the Relationship between Cognitive Mode and Right Hemisphere Test Performance. Seventy-six randomly selected elementary students were administered the Adapted Children's Form of Your Style of Learning and Thinking (SOLAT) to obtain their left, right, and integrated hemisphere cognitive mode scores. The same students were also administered the Judgment of Line Orientation test, Bender-Gestalt test, Torque Task, and the Word Production test. Subjects determined to have a predominant right hemisphere cognitive mode ($N = 38$) scored significantly higher on the Judgment of Line Orientation test, Torque Task, and Word Production test, and significantly lower on the Bender-Gestalt test than subjects with a predominantly left hemisphere cognitive mode ($N = 25$) and/or integrated hemisphere cognitive mode ($N = 13$). Right hemisphere cognitive mode scores correlated positively and significantly with Judgment of Line Orientation scores, and negatively and significantly with Bender-Gestalt scores.

### 2.6 Mathematics phobia and Achievement in Mathematics

**The American Psychological Association** has a diagnostic code for math phobia: 315.1 – Mathematics Disorder. To determine if math phobia exists, there are three areas that are looked at in comparison with the individual’s age, general
intelligence, and education level. The first measurement in standardized testing results to determine if the person’s mathematical ability is substantially less than is expected. The math deficiency can be increased if there is also a sensory defect. After review of this information determines that a deficiency does exists, it is studied to see if it impedes achievement in mathematics or daily life (Disorder information sheet, n.d.). adults with math phobia often participate in avoidance behaviors. In academic settings, students will pick a major or course of study based on whether a math class is required, thus altering the path of the career. Often times, they do not balance a checkbook or enter into contracts based on the advice of others because they do not understand how money works. For example, adults with math phobia may enter mortgage agreements they cannot afford, but because they fear numbers or do not understand the numbers, they tend to agree with what the mortgage broker says. This type of avoidance strategy can cause devastating financial consequences for the individual or family.

Beilock, Gunderson, Ramirez, & Levine, n.d. the University of Chicago researched whether teachers transmitted their anxiety about math and reading to their students. The study involved 17 first and second grade teachers and their students. During the year long study the 17 teachers had 52 boys and 65 girls in their classrooms. At the beginning of the year, the teachers’ attitudes about math were surveyed. The research team also surveyed the students’ feelings about math at the beginning and the end of the year (Beilock, Gunderson, Ramirez, & Levine, n.d). At the beginning of the school year, student math achievement was unrelated to teacher math anxiety in both boys and girls. By the end of the school year, however, the more anxious teachers were about math, the more likely girls, but not boys, were to endorse the view that “boys are good at math and girls are good at reading”. Girls who accepted this stereotype did significantly worse on math achievement measures at the end of the school year than girls who did not accept the stereotype and than boys overall.

Lindsey, (1999) research into the relationship between the learning style or preference and teaching styles has pointed out that inconsistency between instructors’s teaching style and a student’s preferred learning style negatively
affects academic achievement in math. In a study done with undergraduates, the researcher found that if there was a consistency with the student’s preferred learning style and the teacher’s preferred teaching style, there were significant increases in the learner’s achievement in the classroom.

2.7 Mathematics phobia and Self-Confidence

Champman and Boorsma (1979) conducted study on the learning disabled children by using the student’s perception of ability scale. Results show that the subjects had significantly more negative self perception of ability. The negative attitudes generalized to low self perception, poor self confidence and Negative attitudes to school.

Burns, (1998) argues that math phobia is a serious national problem because it limits people’s daily lives and their long-term decision

Qing Li (2003) found that skills developed to do math, logic and reasoning are important to do problem solving need to succeed in many aspects of life, adults lacking or does not have confidence in his or her skills, math phobia develops.

Gray (2005) stated that the ability to do math is reduced so they become more anxious about testing and the cycle continuous.

Burns (1998) had investigated to adults who have succeeded in math, the idea of a phobia of math is foreign. However, it is a real issue in America. Math phobia is an important issue to address and to overcome because math is something that a “disturbingly large percentage of the American populations fears and loathes”. Burns argues that math phobia is a serious national problem because it limits people’s daily lives and their long-term decisions, adults use math every day for everything from shopping for groceries to deciding how much fertilizer to buy for the lawn to planning a household budget. In addition to such activities, the skills developed to do math, logic and reasoning, are important to the problem solving adults need to succeed in many aspects of life. If an adult is lacking or does not have confidence in his or her skills, math phobia develops.
Gray, (2004) had designed one option to help students overcome math phobia is service learning. This method of teaching is used at all levels. It involves students assisting other students while meeting their own learning objectives. In math, this would involve a student assisting another student with math skills. With service learning, there are three key elements to a successful program. 1) Exposure provides the student with exposure to another student struggling to learn the same skills. 2) The experience needs to meet a community need for it to be valuable to the student. 3) The students also need to have the time to provide reflection. This is necessary to gain the confidence needed to overcome math phobia.

Arnett, A. and Van Horn, D. (2009) when working with adults with math phobia, the teacher’s focus should not be on teaching the skills but rather helping the students gain the confidence to do math. With increased confidence, the anxiety will be lowered and more working memory will be freed to do math. By ensuring students have small successes along the way, the anxiety levels will slowly decrease and will develop into a positive spiral of math success. Math phobia is not a permanent condition. By providing students with the confidence needed to do math, the skills will follow.

2.8 Mathematics phobia and Hemisphericity

Research at Staffordshire University shows that anxiety affects the some areas of brain as the resources needed to perform math.

Research at Cleveland state University looked at the relationship between short-term or working memory and math phobia. Early studies into math phobia, begun in the early 1970s, focused on the psychometric aspects of the condition. It was noted that adult who sought treatment for their phobia only, saw a significant improvement in the math grades with little or no additional assistance in math.

Ipser JC1, Singh L, Stein DJ. (2013) conducted a study on meta-analysis was undertaken to identify brain regions that were consistently responsive to
phobic stimuli, and to characterize changes in brain activation following cognitive behavioral therapy (CBT). We searched the PubMed, SCOPUS and PsycINFO databases to identify positron emission tomography and functional magnetic resonance imaging studies comparing brain activation in specific phobia patients and healthy controls. Two raters independently extracted study data from all the eligible studies, and pooled coordinates from these studies using activation likelihood estimation, a quantitative meta-analytic technique. Resulting statistical parametric maps were compared between patients and healthy controls, in response to phobic versus fear-evoking stimuli, and before and after therapy. Thirteen studies were included, comprising 327 participants. Regions that were consistently activated in response to phobic stimuli included the left insula, amygdala, and globus pallidus. Compared to healthy controls, phobic subjects had increased activation in response to phobic stimuli in the left amygdala/globus pallidus, left insula, right thalamus (pulvinar), and cerebellum. Following exposure-based therapy widespread deactivation was observed in the right frontal cortex, limbic cortex, basal ganglia and cerebellum, with increased activation detected in the thalamus. Exposure to phobia-specific stimuli elicits brain activation that is consistent with current understandings of the neuroanatomy of fear conditioning and extinction. There is evidence that the effects of CBT in specific phobia may be mediated through the same underlying neurocircuitry.

Asheraft & Krik, (2001) found that performance deficits due to generalized anxiety will be prominently in exactly that task that taps the limited capacity of working memory.

Ashcraft & Krik, (2001) found that two function math (e.g. 27+65) people with math phobia essentially are dealing with three functions, the two parts of the math and the anxiety tanking up the limited working memory space. Couple that with the fact that people with high math anxiety participate in avoidance strategies so they do not practice math skills as often, a self-fulfilling prophecy of math phobia becomes evident.
Reynolds (1974) conducted a study the relationship between cerebral dominance and the mental abilities. The major objective was to study the relationship between cerebral dominance and the mental abilities the differential. The major findings were that cerebral Dominance was negatively related to spatial relations abilities.

2.9 Achievement in Mathematics and Self-Confidence

Noor Azina Ismail (2009) Understanding the Gap in Mathematics Achievement of Malaysian Students. Of 46 countries that participated in the Trends in International Mathematics and Science Study in 2003 (I. V. S. Mullis, M. O. Martin, E. J. Gonzalez, & S. J. Chrostowski, 2004), Malaysia was ranked 10th in international scores of mathematics achievement for 8th-grade students. The present author aimed to examine the importance of students' home backgrounds, resources for learning, activities, and attitudes toward learning mathematics in accounting for high student achievement in mathematics. Using multiple logistic regression analysis, the author found that having self-confidence in learning mathematics, having a large number of books at home, regularly using computers, and being non-Malay have a high positive association with mathematics achievement among Malaysian students.

Jian Wang and Emily Lin (2008) carried out a study on Alternative Interpretation of the Relationship between Self-Concept and Mathematics Achievement: Comparison of Chinese and US Students as a Context. The paradoxical findings about students’ mathematics self-concept and academic achievement shown in international and comparative studies prompt this exploration of the function and development of mathematics self-concept. That is, when examining data within individual countries, a positive relationship exists between students’ self-concept and achievement in mathematics while a negative relationship emerges in cross-country comparisons. This challenges the popular and commonly held assumption among North American teachers who generally believe that self-concept predicts student achievement and thus, the improvement of students’ self-concept in mathematics leads to higher mathematics achievement.
Using comparative studies of Chinese and US student mathematics learning, this study further analyses the inadequacy of existing theories and then seeks to explain the relationship between self-concept and achievement in mathematics using an alternative interpretation.

**Jennifer E. V. Lloyd, John Walsh and Manizheh Shehni Yailagh (2005)**

Sex Differences in Performance Attributions, Self-Efficacy, and Achievement in Mathematics: If I'm so Smart, Why Don't I Know It? In this study, we tested the claim that sex differences in mathematics achievement are related to boys' and girls' differing achievement-related beliefs. We compared the mathematics report card grades, 2001 Foundation Skills Assessment (FSA) Numeracy subtest scores, performance attributions, and self-efficacy of 161 British Columbian public school students' (62 fourth-graders, 99 seventh-graders). Findings indicated that girls' mathematics achievement met or exceeded that of boys and that girls' attribution patterns were more self-enhancing than those found in previous studies. However, girls were more apt to display under-confidence relative to their actual mathematics achievement and to attribute mathematics failure to a lack of teachers' help than were boys.

**Masqsud, Mohammed and Rouhani (1991)** examined the relationship of self – concept and academic achievement on sixteen to seventeen year students of south Africa. Novieki – Strickrandlovus of control scale was used. He found that self – concept was positively correlated to measures of achievement in mathematics and boy’s mathematic achievement was significantly higher than that of girls.

**Skaalvik, EM and Skaalvik. S (2006)** investigated self – concept and self – efficacy in mathematics: relation with mathematics motivation and achievement. They reported that the significant relationship between academic performance and motivation. Successful students were found to have significantly higher motivation for achievement than unsuccessful students.
Brady & Bowd (2005a) listed number of pedagogical practices that contribute the problem. They are many math teachers with different methods, vocabulary of math without sufficient explanation, an over use of “skill and drill” which leads to frustration, over emphasis on rote memory, and with little connection to real world.

Brady & Bowd (2005b) identified behavior of teachers as a major contributor to the development of math phobia.

Brady & Bowd (2005c) found that negative attitudes toward math can produce negative results in math and teachers with math phobia may foster the early development of math anxiety among other students.

Lehrman (2005) concluded in his research fear of confirmation negative stereotypes can hurt performance.

Yara, Philias Olatunde (2009) analysed the relationship between teachers attitude and students academic achievement in mathematics in some selected senior secondary schools in south western Nigeria. The findings revealed that there was good and positive attitude of teachers towards teaching of mathematics in the schools and the students and the students are also having good record in their academic achievement.

2.10 Achievement in Mathematics and Hemisphericity

Allison E. Ladue (2002) The correlation between hemisphericity and sensory learning style, auditory, visual, or kinesthetic, and SAT excerpt scores, math and verbal, in gifted and talented high school students. Hemisphericity can be most simply defined as the location of an individual's dominant intelligence, centering in either the right side, left side, or both sides of the brain equally. Learning style can be derived from both the hemisphericity of the student and the student's sensory preference. These sensory-based learning styles are classified as auditory, visual, and kinesthetic. The purpose of this research was to find a correlation between hemisphericity, or brain dominance, and sensory learning.
style, and the SAT excerpt math and verbal scores of gifted and talented high school students. The tests used to determine hemisphericity and sensory learning style were entitles Your Style of Thinking and Learning and What is Your Personal Learning Style? Student samples were obtained were obtained from the Spring Valley High School Discovery Chemistry I Honors class and the Richland School District Two AP Psychology Distance Learning classes. The SAT excerpts were taken using similar instructions to an actual testing site. Students were also required to, though not facilitated in, complete both learning styles tests as well as have a parental consent letter signed. In attempting to find a basic correlation between learning style and SAT excerpt scores, no relationships, let alone strong correlations, were found. Any initial hypotheses made in regards to the varying strengths of correlations between given independent and dependent variable pairings are therefore inapplicable. It can be deduced that hemisphericity scores and sensory learning style percentages are not valid indicators of standardized test performance, particularly on the SAT I verbal and math sections.

**Rani (2005)** conducted a study to find out influence of right, left and integrated hemisphere in enhancing achievement level in mathematics and science students. Solat tools (Venkataraman 1989) were applied to identify brain hemisphericity preference. The study proved that hemisphericity influences subject of mathematics and science. Right brain influences science subject and left brain influence mathematics subject.

**Hemavathy (2005)** conducted a study of identify hemisphericity of higher secondary students in Chennai schools. The hemisphericity tools (SOLAT) Venkataraman (1989) were administered to 500 students who are studying in Government, Corporation and Matriculation schools with regards to Arts and Science subject. The analysis concluded that majority of girls are right brain dominance and boys are left brain dominance. The study proved that type of school influence Hemisphericity preference. Reita Jessie and Sara Kumary (2006) studied the relationship between hemisphericity and loyus of control of higher secondary students with respect to their Achievement in maths of XI standard from selected schools in Chennai city. The study proved that there is an association
between hemisphericity and achievement in maths. Left brain influence maths and locus of control does not influence by Hemisphericity.

Venkataraman (1989) explored hemisphericity, divergent thinking and problem solving ability in general mathematics of XII students of matriculation schools. The study concluded that problem solving ability, divergent thinking are related to right hemisphere dominance.

Venkataraman (1989) studied the relationship between hemisphericity, problem solving ability and divergent thinking of the higher secondary students with a sample size of 800 students. The study proved that right hemisphere dominant students excel in divergent thinking and problem solving activities.

Morton (2006) foreign studies includes that individuals differ in the number of corpus callosum (CC) nerve fibers interconnecting their cerebral hemispheres by about threefold. Early reports suggested that males had smaller CCs than females. This was often interpreted to support the concept that the male brain is more “lateralized” or “specialized”, thus accounting for presumed male predominance in mathematics, as well as for aggressive behavior. Ultimately, meta-analyses of these many reports found no significant overall sex differences in inter-cerebral information carrying capacity. Here, using quantitative MRI, we found the midline CC area of 113 subjects was significantly correlated, not with handedness or sex, but with dichotic deafness, and even more so with redefined Hemisphericity, the latter accounting for over 19% of CC variability. That is, both dichotic hearing and right brain-oriented individuals of either sex had significantly larger CCs than dichotic ally deaf or left brain-oriented persons. Thus, current traditions of brain laterality and gender a may benefit from revisions that include redefined Hemisphericity.

2.11 Self-Confidence and Hemisphericity

Ram Kumar (2004) studied hemisphericity and self concept of B.Ed., Trainees with regard to arts and science students. The study proved that
hemisphericity (Venkataraman 1989) does not activate any influence on self concept of teacher trainees.

2.12 Achievement in Mathematics, Self- Confidence and Hemisphericity

**Rosihan M.Ali (2006)** The study conducted to investigate the differences in brain hemisphericity and learning styles on students self-confidence in using the graphic calculator to learn mathematics. Data were collected from a sample of 44 under graduated mathematics students in Malaysia using Brain Dominance Questionnaire.

2.13 Inference of the previous Researches

There are 135 previous researches reviewed by the investigator. The extract of the researches are given below in separate categories.

2.13.1 Mathematics phobia

The review of studies related to Math phobia indicates that maximum researches have been done to establish the relationship with Gender (Burns,1998;Lehrman ,2005;). They explained girls are not as good as boys when it comes to math. But (Taylor,Brooks,1984;) found out males are more phobic than girls.

Brady,Bowd,Lolt,2005; investigated that behavior of math teaches as a major contribution to the development of maths phobia.

Vivek M Wasgh, 2001;Evans,2000; explained that parent and society are influencing maths phobia to their children (Civil,2003) explained the parents and community are not making math more accessible to their children

Ashcraft,kirk,2001;Evans,2000 explained that family size and societal factors influences math phobia

Taylor,Brook,1984;Aunet,van horn (2009) found out that the math with other subject the level of anxiety is decreased and more learning can take place. (Vaness a stuart.Lott,2005) said that math phobia affect mathematical achievement and self confidence.
Erekin, Dilma Yazi, 2009; Broady, Browd, (2005) investigated that math phobia experiences high in primary and less in high schools.

From the above review of researches, it is evident that different aspects of math phobia have been explored but it points out the need of conducting more researches in math phobia to make it decrease in percentage in high schools. Keeping this point in mind the present study is also an attempt in development aspects of achievements in math.

2.13.2 Hemispercity and Achievement in Mathematics

Hemispercity is the cerebral dominance of an individual in retaining and processing modes of information in the own style of learning and thinking (Venkatraman 1989). Researches conducted during the last two decades have shown that the human left cerebral hemisphere is to be specialized for primarily verbal, analytic, abstract, temporal and digital operations (Bogen, 1969, Gazzaniga, 1970, Ornstein 1972). The same investigation revealed that the right cerebral hemisphere is to be specialized for primarily non-verbal holistic, concentrate, creative, analogic and aesthetic functions. The specialized functions of each hemisphere appear well lateralized and established early in life (Kinsbourne, 1975) and barring special intervention or insult, continue essentially unaltered throughout the normal life span (Zelinski and Marsh, 1976). For identifying the hemisphere dominance, the ways in which and the hemisphere dominance, the ways in which and the levels at which the information is being processed by the individual are to be studied. Tools have been developed to study the “style” of learning and thinking and hence it would be possible to infer the dominance of an individual.

2.13.3 Mathematical Achievements

Fadia Nazie. Abu Alhiga, Marshal Amasha, 2012; Fadia Nazier, Menucha Birenbaun, 2005; Eccles, 1983 found boys and girls are differing achievement in math.
Jennefer E.V. Lloyd, John Walsh, Mamizheh Shehni Yailash, 2005; Marnie Christin, opdenakker 2002; found that the girls’ achievement in math is higher than boys.

Bruce Randle, Harold W. Stevenson, Evelin Witruk 2000; found that boys obtained higher score in math test than girls.

Campbell, Beaudry, (1998) revealed gender gap is small in primary and greater in high schools regarding mathematical achievement.

Sehee Hong, Sung-Kyung Yoo, Sukk yung you, Chih-chun wu, (2010) James B. Schreiber, 2002; Constantinos papanastasiou,2002; Found that education influences the achievement of math in students.

National Research Council (NRC, 1989,p.13) found that socio-economic status correlated in mathematics achievement.

Xin Ma, 2005; Boaler, 2006;2006 c; NCTM 2000;Martin, 2007; Apple 1992; Stated that students belong to large family size secured higher in math.


2.13.4 Self Confidence

Jenifer et. al. (2005); casey, Nullah and pezairs (2001); jewellt (1996); fennema and Peterson (1985); Campbell and beaudry (1998); Eccles (1983); Wde and Ellis Jr.; Hripsime A. Klaian, Donald J. Freeman (1994) Debra Instroe, Brernda Major Barbara B. Bunet found that male students are more confident than girls.

Hall, Evelyn (1990) found that females are more confident than males.

Geetha Pasteyand, Vijayalakshimi , Aminbhavi (2006) and Hapin (1980) found that father qualification influences the self confidence of the students.

Verma (1990) found female adolescents are more anxious than males.
Hannula et. al (2004) found that age influences the self confidence. Sleeper, Lynn, Nigro Georgia (1987); Lenney and Orono (1977); Tuckman (2003); Chang and chunk (2008); vealey and Campbell (2010); found that self confidence influences the achievement in Mathematics.

Konvalina (1981) found that no significant difference between the groups achievement in general confidence in basic mathematics skill.

2.13.5 Mathematics achievement and self confidence

Hannula, Malmivuori; (1966); House (2000); found out the relationship between self-confidence and Math achievement. But, Linnanmaki, (2002); found out that no evidence for relationship between self-confidence and Math achievement.

2.14 Conclusion

From the foregoing eminent of related literature it can be concluded that most of the findings associated with the variables taken up for the study conflicting and inconsistent. These studies can be summarized as follows:

1) Majority of the above studies were to identify the relationship between math phobia and other variables like mathematical achievement, self-confidence hemisphericity at High school level.
2) To measure math phobia Grade point analysis (GPA) have been used in most of the studies. Standardized tests were also used.
3) In Indian context, the variables related to the math phobia have not been much researched.
4) In most of the cases, Hemisphericity has been measured by using SOLAT tool.
5) Majority of studies used conduct moment correlation, t-test, ANOVA, ANCOVA to study the relationship, difference between the variables, very few studies adopted multiple correlation analysis to determine the predictors of Mathematical Achievement.
6) Math phobia score was found to be positively related with Self-Confidence.
7) Mathematical achievement was positively related with math phobia.
8) High Achievers were mostly had low Math Phobia.
9) In most of the studies, math phobia was found to be negatively related with mathematic achievement.
10) Socio – Economic Status has been found to have a significant learning on the variables under study.
11) In most of the studies boys and girls different significantly in the variables under study.
12) In most of the studies in hemisphericity, left dominated students are good in mathematical achievement.
13) Math teacher is a vital role to influence math phobia in High school.