CHAPTER III

REVIEW OF RELATED LITERATURE

3.1 STUDIES RELATED TO INSTRUCTIONAL STRATEGIES IN GENERAL

3.2 STUDIES RELATED TO PATH-SMOOTHING MODEL

3.3 STUDIES RELATED TO CREATIVE PROBLEM SOLVING ABILITY

3.4 STUDIES RELATED TO PERCEPTUAL SPEED

3.5 STUDIES RELATED TO ACHIEVEMENT IN MATHEMATICS
REVIEW OF RELATED LITERATURE

The review of related studies is an essential aspect of any investigation. For a worthwhile study in any field of knowledge, the research worker needs a substantial familiarity with the earlier research which has gone into his area of study. According to Turny and Robb (1971) identification of problem, development of research design and determination of the scope of the problem, all depend to the great extent, on the care and intensity with which a researcher has examined the literature to the intended research.

Review of literature studies helps the research worker to find out different aspects of problem under study. This is the basis of most of the research project and enables the researcher to know the meaning of getting the frontier in the field of his research. This enables the investigator to learn more about the grounds on which the study has to be built upon. It helps the researcher to select suitable methods for his study, and statistical procedures which are important. It reveals the advantages and limitations of the issues taken and directs the researcher to frame a suitable technique to carry out the study successfully. The review of related literature helped the investigator to have a clear perspective of the problem chosen for the present investigation.

A number of studies have been reported in conducting path smoothing model and problem solving skills. These studies had helped the investigator to get a clear picture of what has been done on the particular topic. The studies cited below helped the investigator to plan a suitable methodology for the present study.

The studies collected are arranged under the following heads.

3.1 Studies Related to Instructional Strategies in General

3.2 Studies Related to Path-Smoothing Model
3.3 Studies Related to Creative Problem Solving Ability

3.4 Studies Related to Perceptual Speed

3.5 Studies Related to Achievement in Mathematics

3.1 STUDIES RELATED TO INSTRUCTIONAL STRATEGIES IN GENERAL

Studies related to Instructional Strategies and Modern Models of Teaching are given below:

Fathima, Sasikumar & Roja (2014) conducted a study on meta cognitive intervention strategies for enhancing the teaching competency of graduate teacher trainees. It was found that there was a continuous improvement in all the dimensions of teaching competency by means of the applied strategies.

Matsuda et al. (2013) in their study introduced an E-learning material that they developed using Three-Dimensional Virtual Reality (3D-VR) technology in Cyber ethics education. They verified the effectiveness of their method over conventional method and their method was found to be more effective than conventional method for Cyber ethics education.

Ray and Chakrabarti (2012) designed and implemented an affective E-learning strategy based on facial emotion recognition in which the learner’s affective state is identified using Biophysical signals which in turn explore the emotion of the learners during learning process. This produces a feedback that can be used to improve learning experiences. From the analysis of results, this strategy was found to be more effective in comparison with the other existing systems.

Kenni et al. (2012) conducted a quasi-experimental research on the effect of Concept Mapping instructional strategy on Achievement in Physics of
Secondary school students in Nigeria. The population comprised of 168 Senior Secondary school students. The study revealed that, Concept mapping instructional strategy contributed to Achievement in Physics and there is significant effect of treatment on students’ retention of learned materials and students learning attitude.

Saleh (2011) investigated the effectiveness of Co-operative and Individualistic Learning Strategies on the academic performance of students in the general Chemistry laboratory using an experimental study. The findings revealed that the Co-operative learning strategy is more effective than Individualistic learning strategy and the students in the co-operative learning Strategy performed significantly higher than that of the Individualistic Learning Strategy.

Brill and Hodges (2011) investigated the Effectiveness of Peer Review as a Learning Strategy to foster the Knowledge and skill attainment of adult learners preparing for professional practice including those students who were preparing for instructional design and technological practice. It was found that peer review is an effective Instructional Strategy not only for developing Instructional Design and technology Practice but also to address on-going concerns regarding the inadequate preparation of Instructional Design and technology professionals.

Korgh et al. (2010) conducted a study on the Effectiveness of the Models of Teaching on student learning. This study sought to explore the degree to which student’s interactions with the models of teaching influence learning. The purposefully sampled population consisted of gifted and non gifted students in grades 2-5 from an urban school district in Southern California. A mixed method approach was employed to analyse data obtained from exist in primary research, as well as from recently attained Secondary research.
Mukherjee (2011) investigated the effectiveness of concept attainment model (CAM) in terms of achievement in science of class VIII. The results of the study indicated that CAM was effective in terms of achievement of students in science.

Rama, Rani and Kaur (2010) developed a Mathematics Concept Understanding Test to assess the mathematics concept understanding of students. It is observed from the study that concept attainment model was effective in terms of mathematics concept understanding than traditional method of teaching when groups were matched with respect to pre-mathematics concept understanding.

Sithara (2010) conducted a study on Effectiveness of 7E instructional models on Achievement in Chemistry of Secondary School students. The study found that 7E Instructional Model is effective than the Activity Oriented Method of Teaching on Achievement in Chemistry of Secondary School Students.

Kalani (2009) aimed at investigating relative effectiveness of concept attainment model and conventional method of teaching on achievement and retention of students. The study showed that concept attainment model was more effective than conventional method on attainment of concepts in science and in the retention of concepts.

Bindu (2007) conducted a study on the topic Effect of Apprenticeship – Type Learning (ATL) Model of Teaching Chemistry in Higher Secondary Students. It was found that Apprenticeship – Type Learning Model of Teaching was more effective than Conventional Method of Teaching in Student’s Achievement in Chemistry.

Cicy (2006) conducted a study on Effectiveness of Sharan and Sharan Model of group investigation on Achievement in Biology of Secondary School
Students. This model focused on the co-operative learning and is conducted under the best conditions of learning. The study concluded that Sharan and Sharan Model of group investigator is more effective than Conventional Method of Teaching on Achievement in Biology at Secondary level.

Chithra (2005) conducted a study on Effectiveness of Hunt’s model of Reflective Level Teaching on Achievement in Physics of Secondary School Students. From the analysis it was concluded from the results of the study that Hunt’s model of Reflective Level Teaching is more effective than the Conventional Method of Teaching on Achievement in Physics at Secondary School Level. Hunt’s Model of Reflective Level Teaching is more effective than the Conventional Method of Teaching under the category of objectives: Comprehension, Application, Analysis, Synthesis, and Evaluation.

Maya (2005) conducted a study on Effectiveness of Constructivist Learning Model on Achievement in Chemistry of Secondary School Students. The findings of the study revealed that Constructivist Learning Model is more effective than Conventional Activity Method on Achievement in Chemistry of Secondary School Students.

Sidhu and Singh (2005) made an attempt to compare Concept Attainment Model (CAM), Advance Organizer Model (AOM) and conventional method in teaching physics in relation to intelligence and achievement motivation on scholastic achievement of students for learning concepts in physics. The results indicated that there was no significant difference among various teaching techniques, intelligence and achievement motivation on scholastic achievement of students in learning concepts in physics.

Varghese (2004) conducted a study to compare the effect of Mastery Learning Strategy with the existing Activity Oriented Method on certain variables like Achievement in Physics, Retention Power, Science Interest,
Scientific Attitude, Achievement Motivation and Self Concept of Standard IX students of Kerala state. The sample consisted of 156 students of Standard IX studying in various Schools of Kerala. It was found that the Mastery Learning Strategy is more effective than Conventional Method of Teaching in enhancing the variables under study.

Divya (2003) conducted a study on Cognitive growth model and major findings are Cognitive Growth Model (CGM) is more effective than the Conventional method on Achievement in Physics of secondary school students. CGM is more effective than the text book oriented method on Achievement in Physics under the category of Objectives: Knowledge, Understanding, Application and Skill.

Kinsley (2002) conducted a study on the Effectiveness of the Four-Stage Model of Mathematical Learning. He discusses about the instructional implication of this Model. Analysis and conclusion shows that this model is very effective than the Existing Method on Mathematical Learning.

Sindhu (2002) conducted a study for determining the Effectiveness of Discipline Model over the Conventional Lecture Method in the Teaching of Social Sciences at the Secondary level. The finding of the study shows that the Discipline model in the teaching is more effective than the Conventional Method.

Maccini and Hughes (2000) investigated the effect of Problem Solving Strategy within a graduated teaching Sequence (ie. concrete, semi concrete, abstract) on the representation and solution of Problem solving skills encompassing integer numbers for secondary students with learning disabilities. Result showed that Problem-Solving skills involving integer numbers dramatically improved by following instructions at concrete, semi concrete and abstract levels.
Singh et al. (1991) took up a study to see the effectiveness of Computer Assisted instruction (CAI) in teaching Mathematics. He found that students who used the computer has higher attainment than those taught through conventional method.

3.2 STUDIES RELATED TO PATH-SMOOTHING MODEL

Wigley (1992) in an article Models of Teaching Mathematics described Path Smoothing Model for teaching Mathematics, found that the teachers who were using this model to exercise professional care for their pupils and help them to achieve success in public examinations. Also it was found out that the taking classes using this model was very helpful for the students to achieve and teachers felt that the syllabus could be covered this way very easier and effectively.

There are very few studies conducted with the Path-Smoothing Model and that proves the importance of this model. But the obtained study conducted found helpful and is an effective method for teaching the desired Subject.

3.3 STUDIES RELATED TO CREATIVE PROBLEM SOLVING

Creative Problem solving is a mental process of creating a solution to a problem. It is a special form of problem solving in which the solution is independently created rather than learned with assistance. Creative problem solving always involve creativity. The studies reviewed are:

Wong and Michael (2012) conducted a study on creativity which is concerned with problem solving which is essential, if we are to generate new solutions to the massive and complex problems in the unknown future. Our next generation need an educational platform where they can be taught to possess creativity. Therefore it is essential to understand the creative design process and it’s routine in order to show how students can generate creative
output and how teachers can guide students in the design process. The
investigator done the creative design process as it is employed in producing
creative designs, and further recommended how students can practice and learn
to be creative based on the model process. This model is expected to provide
guidelines for teachers to facilitate students along the creative thinking process.

Clinton and Hokanson (2012) in their article presents a discussion of
research and theoretical perspectives on creativity and instructional design,
offering a conceptual model of the connection between these two constructs.
Central to the model is a representation of the iterative, looping problem
solving cycle that can include established stages of creative thinking. As an
instructional designer is routinely confronted with the next task or design
problem in a project, these tasks or problems spawn iterative mental excursions
that are opportunities for creative thinking. This article also explores ways that
the design and development process that benefit from an emphasis on creativity
and offers suggested directions for future research.

Renzulli and Joseph (2012) conducted a research on why and how
should a society devote special resources to the development of giftedness in
young people for the twenty first century. The goal of gifted education and
talent development are to maximize young people’s opportunities for self-
fulfillment and increase societies reservoir of creative problem solvers and
producers of knowledge, then it would seem wise that programming and
services enhance student’s capacity for creative productivity, not just content
acquisition. This general theory for the development of human potential is
discussed through an exploration of four research-based sub theories: The
Three-Ring conception of giftedness, the Enrichment Triad Model, Operation
hounds tooth and executive functions. The investigator made a reexamination
of current gifted and talented programming is intended to generate future
research, extend dialogue among scholars and inspire continued support for
programming based on theory and related research.
Tinsley (2012) conducted a study using Talking Aloud Partner Problem Solving (TAPPS) which is a teaching learning strategy has increased the speed and effectiveness of partner problem solving, has little to do with the monitor and much to do with the problem solvers own behavior.

Fernandez & Kochler (2011) experimented on mathematics teachers circle around problem solving. Math teachers circles were developed with the aim of establishing a culture of problem solving among middle school mathematics teachers. The culture could then be carried back into these teachers classrooms.

Manapure (2011) studied the effect of problem solving method on science teacher trainers for the solution of the environmental problems. It shows that problem solving method improves the scientific operation skills of the science teacher trainees.

Wiley and Jennifer (2011) conducted a research on what makes a person able to solve problems creatively ? One interesting factor that may contribute is experience with multiple languages from an early age . Bilingual individuals who acquire two languages by the age of 6 have been shown to demonstrate superior performance on a number of thinking tasks that require flexibility. However bilingual advantages have yet to be identified particularly on insight problems that are used as a model of Creative Problem solving following initial impasse. As such the goal of the present study as to investigate the influence of language experience on problem solving performance on a matched set of insight and non-insight problems.

Sebastien (2010) proposes a unified framework for understanding Creative Problem Solving , namely the explicit implicit interaction theory . The new theory of Creative Problem Solving constitutes an attempt at providing a more unified explanation of relevant phenomena .This work represents an
initial step in the development of process based theories of creativity encompassing incubation, insight and various other related phenomena.

Yeung (2010) Studied the impact of problem based learning on a pre-university geography class. Results showed that students could analyse problem statements and presents their understanding systematically but varied considerably in organization, argument and quality of thinking.

Walinga (2010) the purpose of the study was to explore and develop a conceptual model for how individuals unlock insight. The concept of insight – the out of the box solution to a problem offers a framework for exploring and understanding how best to enhance problem solving skills due to the cognitive shift insight requires. Creative problem solving is inherent to a variety of performance realms including effective decision making, innovational and organizational development however related processes of insight, innovation and creativity remain intangible. The model based on a review of Problem Solving literature, purposes that insight involves a five stage, cyclical process emerging as: primary appraisal of the problem, secondary appraisal based on the prior knowledge, initial focus, problem representation, and solution generation. When no solution is found, the cycle begins again. The research has implications for individual, team and organizational settings suggesting that performance on a wide variety of problems may be improved by utilizing an integrated focus rather than a barrier or goal focus alone.

Lin (2010) conducted analysis of attributes patterns of creative problem solving ability among upper elementary students in Taiwan. The purpose of the research is to find the relationships among attributes of Creative problem solving ability and their relationship with the math creative problem solving ability. In addition the attribute patterns of high, medium and low Mathematical creative groups were identified and compared. There are 409 fifth and sixth grades recruited from two elementary schools in Taiwan. The
results showed that the creativity is evidenced as multi-faceted and domain-specific. The data showed three different patterns of attribute composition and the threshold effect on students Creative Problem Solving.

Pannels and Tammy C (2010) studied the effect of training pre-service teacher in creative problem solving and classroom management. The purpose of the study was to examine the effectiveness of teaching a specific creative problem solving model to pre-service. The study included 74 participants, 67 females and 7 males enrolled in an undergraduate educational psychology course in Mid-western university. In a 2×2 full factorial design, participants were randomly assigned to either a treatment group or a control group in both classroom management training and creative problem solving training. The participants received one hour training in either creative problem solving or an alternate creativity treatment and 12 hours of classroom management training either before or after one of the creativity treatments. The participants who had received creative problem solving training had lower scores on elaboration and higher scores on application of creative problem solving strategies. Implications are that a short, concise model of creative problem solving which can be effectively taught to pre-service teachers as a pro-active measure for enhancing pre-service teacher creative problem solving skills.

Sebastien and Ron (2010) cited in an article on Incubation, insight and creative problem solving: A unified theory and connectionist model. This article poses a unified framework for understanding creative problem solving namely the explicit-implicit interaction theory. The work represents an initial step in the development of process-based theories of creativity encompassing incubation, insight and various either related phenomena.

Romberg (2010) studied wilt rocks influence on mathematics education. Instruction should involve the stimulation for a student store of relevant
background experiences in relation to information to be learned so that they can construct meaning from it.

Ali (2010) in his study on the effect of using problem solving method in teaching mathematics on the achievement of mathematics students found that there was significant difference between the effectiveness of traditional teaching method and problem solving method in teaching of mathematics at elementary level.

Basantia and Panda (2010) conducted an experimental study to examine the effect of Multi-dimensional Activity based Integrated approach (MAI) over traditional method of teaching in developing creative abilities of elementary school children. Multi dimensional activity based integrated approach is suitable for development of creative abilities in all context areas of social studies.

Behare (2009) in his study of problem solving skills in mathematics learning investigated cognitive skills in solving mathematical problems of learner at the terminal stage of elementary education. It revealed that those who can verbalize the process of solution are better at solving problems.

Mohanty (2009) studied the effect of cognitive and meta-cognitive strategy instruction on the mathematical problem solving of elementary school students with learning disabilities. The intervention programme has been found to have a significant positive effect on the mathematical problem solving of students with learning disabilities.

Richard et al. (2009) conducted a case study on curriculum construction and teacher empowerment: supporting education with creative problem solving model. The case study demonstrate how the Osborn-Parnes Creative problem solving model can be used to enhance teacher creativity through the collaborative and inviting processes found within individual education, which
counter the individualistic and product oriented enterprises often associated with creative endeavors. Conclusions indicate that the model’s three stage guided, via sequenced divergent and convergent thinking strategies, teacher curricular decision making and ultimately, the learning opportunities provided to students. The CPS framework encouraged participants to engage in and experience optimism, trust, respect, care and intentionality, which are the five value based assumptions of invitational education.

John and Ram Ganesh (2009) conducted a study entitled “Creative Problem Solving Ability of Standard IX students”. Major findings of the study revealed that the Creative Problem Solving Ability of Standard IX students was just average and also noted that private school students were superior to the government school students in the Creative Problem Solving Ability. The type of syllabus had strong effect on the Creative Problem Solving Ability.

Umadevi (2009) conducted a study titled ‘A study on the relationship between Problem Solving Ability and Academic Achievement of secondary school students’. The study revealed that there was a significant relationship between problem solving ability and Academic Achievement of eleventh standard students.

Adams et al. (2009) conducted a study on problem solving and creativity in engineering: perception of novices and professionals. A number of semi structured interviews have been undertaken with engineering undergraduates at the university of Northampton, Southborough university and Birmingham university in order to explore this issues. The number of emerging themes that have been identified include: confusion with the concept of ‘creativity’ in engineering; identification of process in the case of professional against products in the cause of students, issues with motivation and ownership with regards to academic problems and significance being place a real life activities as a way of teaching and learning creative problem solving.
Alam (2009) conducted study on Academic achievement in relation of creativity and academic motivation a co-relational study. The present study aims to find out the extent of relationship between creativity and achievement motivation of the students and academic achievement. A representative sample of 450 students studying in 10th class was drawn using survey method. The findings revealed a significant positive relationship between (i) creativity and academic achievement (ii) achievement motivation and academic achievement. The findings and analysis present lead to the conclusion that creativity and achievement motivation have a significant bearing on academic achievement of students.

Chamberlin et al. (2009) conducted a study on problem based learning activities to identify creatively gifted mathematics student. The study investigates the potential of problem based learning activities as a vehicle for assessing the creativity of gifted mathematics students. The findings suggest that problem based learning tasks are lend themselves to the identification of creatively gifted mathematics students.

Saleem (2009) cited in an article on creative reader must for creative writing. In this article the author says that in order to develop creativity in writing the students should be asked not only to write their experiences and imaginations but should also be placed in situations of daily life and asked to write their own solutions to the problems or solutions.

Shikha and Asthana (2008) investigated on the effectiveness of instructional material on thinking skill of classification in terms of students achievement and relations at middle school level. Instructional material was found to be significantly effective in terms of achievement and development of thinking skill of classification of the students.

Simone (2008) examined the impact of problem based learning on prospective teachers problem solving abilities. The participants in problem
based learning were significantly better in constructing, elaborating, relating their solutions to the problem and using multiple resources than the control group following the traditional approach.

Redddy (2008) conducted a study on Creativity of Student teachers of college of education. This study aimed at finding out whether male and female student teachers differ in their creativity, the investigator finds that the male and female student teachers do not differ significantly with regard to their creativity.

Gandhi and Varma (2007) studied self regulated learning in mathematics through some pedagogic strategies. Results show that mathematics teachers who incorporate self regulation techniques in their daily lesson contribute to make the students lifelong learners by using their cognitive skills and strategies.

Mehmet, A.et al. (2007) found that the goal of the pedagogical content is to teach how to make mathematics education better through the use of different teaching methods and techniques. By learning the different teaching methods, future teachers will be able to apply their learning into the teaching. The aim of this exploratory study is to note and discuss some of the diversified views in the perspective of the prospective Mathematics teachers on improving creative thinking in problem solving. The results related to prospective mathematics teachers views on how to improve creative thinking and provide an analysis on their perception of creativity in problem solving were found. The pedagogical knowledge of mathematics content course should be reconsidered in how to provide subject matter knowledge and opportunities to teach creative problem solving techniques. The most effective method is to provide a relevant training. The factors of divergent thinking determined were special characteristics, types of thinking, supporting creativity and the ways to improve creativity.
Kumar and Natrajan (2007) examined the components of a theoretical problem based learning frame-work adopted by a reform minded tertiary institution in Singapore. It was found that by learning disciplinary content matter through the instructional strategy of solving real life or simulated problem, higher order skills such as critical evaluation and information processing developed in students.

Indira Sharma (2007) conducted descriptive survey method on 240 students of standard XI on “the problem solving ability and scientific attitudes as determinant of academic achievement of higher secondary students” She found that the group had average scientific attitude of boys and girls. On the basis of value of coefficient of correlation, it can be inferred that all the three variables achievement and problem solving ability, achievement and scientific attitude, scientific attitude and problem solving ability, all are scientifically correlated.

Frenzel (2006) the focus of the present study is on students experiences of enjoyment, an emotion largely neglected in educational research. Resent a model in which specific levels of generalization of the construct of enjoyment are differentiated. Based on the extend of generalization, these differentiated constructs of enjoyment are located in a hierarchical structure. Enjoyment of life is presented as most generalized and is consequently located at the highest level of the hierarchical structure, followed by student’s enjoyment concerning their education, learning and most specifically their use of learning strategies. The enjoyment scales further showed clear linkages to learning behavior including self-regulated learning and creative problem solving.

Sungur and Tekkaya (2006) investigated the effectiveness of problem based learning and traditional instructional approaches on various facets of students self regulated learning, including motivation and learning strategies. Results revealed that problem based learning students had higher levels of
intrinsic goal orientation, critical thinking, meta-cognitive, self regulation and peer learning compared with control group students.

Jayanti (2006) made a study on enhancing creativity for the teachers for building positive socio-emotional classroom climate. The purpose of this study was to find out the relationship between verbal creativity of teachers and socio-emotional classroom climate. It has been statistically found that the teachers possessing high verbal creativity are more successful in creating positive socio-emotional classroom climate in comparison to the teachers possessing low verbal creativity. Therefore every possible attempt should be made for enhancing the verbal creativity of the teachers.

Biswajit Behera (2006) conducted a study on “Problem solving skills in Mathematics learning “ The study was designed to investigate cognitive skills in solving Mathematical problems of learners at the terminal stage of elementary education. Contrast group of achievers with equal no. of boys and girls constituting higher ability and lower ability were selected on the basis of Mathematics result. The main objective of the study was to find out the cognitive skills of high Mathematical ability students on Mathematics problem solving. The study was conducted on students of class VIII. The results showed that there was a significant difference between higher ability and lower ability groups both on the scores of core and non-core problems.

Mann (2006) cited in an article on Creativity: the Essence of For the gifted Mathematics student, early mastery of concepts and skills in the Mathematics curriculum usually results in getting more of the same work and moving through the curriculum at a faster pace. In this article, a review of related literature defines mathematical creativity develops an understanding of the creative students of mathematics and discusses the issue and implications for the teaching of mathematics.
Mohanty (2005) synthesized the research findings related to creativity and their effect in developing curricular implications for social studies. Findings revealed that creativity can be developed if adequate training strategies are provided.

Sheffield (2005) explored the importance of mathematical creativity and the use of some creative techniques and their application to mathematical context. He suggested a model of a heuristic to encourage students to pose and solve problems creatively. Using these students might create, original solutions or insights, rules, principles and generalizations, new algorithms, new questions and problems and new mathematical models. Further he suggested strategies for enhancing mathematical creativity.

Chung and Tam (2005) examined the effects of different approaches to teaching learners with mild intellectual abilities to solve mathematical word problem. Students presented with worked example and cognitive strategy instruction solved more problems correctly and outperformed students presented with conventional instruction in both immediate and delayed tests.

Donald (2005) in an article resents a summary of research developments and applications of Creative Problem solving in educational settings and more specifically in gifted education. The CPS framework is widely known and applied as one important goal in contemporary gifted education as well as in relation to initiatives for teaching thinking in the broader context of general education. This article traces the history and evolution of the CPS framework through more than five decades of research, development and practical application. We describe and discuss the specific changes in the model over time as well as their rationale and foundations. We discuss the implication and changes within the CPS framework for teaching and learning. Our purpose is not to compare or contrast CPS with other perspectives on creativity from Psychology, cognitive science or management. Finally we present the
implications of contemporary CPS for instruction and assessment in gifted education.

James and Marice (2005) made a study on select variables as determinants of problem solving ability. The investigator in this study assessed the effect of reasoning and brain hemisphericity on problem solving ability of the learners. Reasoning ability and gender are found to be most significant predictors of problem solving ability in science.

Muneyoshi (2004) researched how teachers use Creative Problem Solving in the classroom. According to the results of the research, the use of creative problem solving in the classrooms raised their motivation and self-confidence, provided positive attitudes towards learning and problem solving, helped students become more enthusiastic and active in learning. Scott, Leitz and Mumford (2004) emphasized that creativity programmes have an important effect on performance, attitude and behaviours, especially on divergent thinking and problem solving.

Bharath (2004) reported that Mathematical creativity ensures the growth of Mathematics as a whole. However the sources of the growth, the creativity of the Mathematician is a relatively unexplored area in Mathematics and Mathematics education in order to investigate how Mathematicians create Mathematics, a qualitative study involving five creative Mathematicians was conducted. The results indicate that, in general the Mathematician’s creative process followed the four stage Gestalt model of preparation, incubation, illumination, verification. It was found that social interaction, imagery, heuristics, intuition and proof were the common characteristics of Mathematical creativity.

Sunitha (2004) made a study on effectiveness of problem solving approach on achievements and problem solving ability at higher secondary
level. It is concluded that the problem solving approach is more effective than the conventional text book approach.

Chaudhary (2004) conducted a study of urban and rural high school boys and girls in relation to creativity factors such as fluency, originality, flexibility and elaboration. The major findings of the study revealed that boys and girls were found to be equal for all the components of the creativity.

Singh (2004) made an analysis on teaching-learning strategies and mathematics creativity. The trend of research work done in the area of teacher education results that teaching learning strategies particularly for the development of mathematical creativity has been the most neglected area of teacher education. The results of several experimental studies reveal that the former aspect is most important. Development of teaching learning strategy is a difficulty, but an interesting task. It was observed that academically bright mathematics teacher easily construct questions of higher order level where as their counter parts are unable to do so. Higher order level questions pride stimulations to students to think and rethink and search out unusual responses.

Basile et al. (2003) in their study explored problem based learning as a dimension that adds context and framework to coaching & reflection. Implication from the study suggested that problem based learning is a valid process for the enculturation of teacher candidates to schools and to the profession of teaching.

Cass, M. et al. (2003) evaluated effects of manipulative instruction on perimeter and area problem solving performance of high school students with learning disabilities in Mathematics. Students rapidly acquired the problem solving skills, maintain these skills over a two month period, and transferred the skills to a paper-and-pencil problem solving format.
Neo and Neo (2001) assessed students problem solving skills and ability to evaluate a website’s design, creativity and navigational structure by requiring them to reconstruct and improve an existing website.

Kim and Lee (2001) conducted a study on the development of the creativity in secondary level mathematics in Korea. The study sheds light on the importance of developing creativity in mathematics, class by examining the theoretical base of creativity and its relationship to mathematics. This study presented research findings obtained from students who were guided to freely express creativity under encouragement and concern of their teachers. Thus teacher should make an effort to break from their riveting thinking process and fixed idea.

Jayalekshmi (2000) made a study to find the achievement related variables affecting the problem solving ability. The study established a close relation between Mathematics Achievement and intelligence of girls of the higher secondary level.

Singh (2000) in his study of mathematical creative thinking among adolescents has found that quality and quantity of mathematical creative thinking were significantly related to each other.

Davis (1995) examined the independent variables of reading comprehension, vocabulary and reading rate as they related to the ability to solve mathematical verbal problems. In addition, the study examined the influence of reading attitudes not only on reading ability but on mathematical verbal problem solving ability. The study was based on 75 students. Statistically significant correlations were found between the independent variables and mathematical problem solving ability. The result of stepwise regression analysis indicated that all the independent variables of confidence in learning mathematics correlated best with mathematics verbal problem solving.
Summary of Studies Related to Creative Problem Solving

Creative Problem Solving is very important for school children. Even though the concept of Creative Problem Solving is an odd one, lot of studies was conducted in this field. The studies conducted on Creative Problem Solving revealed that there is a positive correlation between Creative Problem Solving, Creativity and Problem Solving. After gone through the related literature the researcher found that fostering of Creativity and Creative Problem Solving was very important in today’s Mathematics teaching and learning.

3.4 STUDIES RELATED TO PERCEPTUAL SPEED

Perceptual speed is the rate at which individual performs acts involving vision. It may refer to how fast something is copied or manipulated or how quickly identical items in a given series are identified.

Rohde (2008) examined how Visual Perception abilities influence Mathematical Achievement. A total of 266 individuals with 152 males participated in the study. The findings of the study shows that the Visual Perception positively influence Mathematical Achievement among the Students at Secondary Level.

Ackerman and Ackerman (2007) explored Perceptual speed abilities in the context of assessment methods, cognitive abilities, and individual differences during skill acquisition. They developed two sets of computerized perceptual speed tests, with touch sensitive monitors that were designed to parallel several paper –and-pencil tests. The reliability and validity of the tests were explored across three empirical studies. The final study included two criterion tasks with 4.67 and 10 hours of time – on-task practice, relatively. Results indicated that these new measures provide both high levels of reliability and substantial validity for performance on the two skill-learning tasks.
Kulp (2004) has established that the visual perceptual skills have relation with Mathematics ability in second through sixth grade children. Alogistic analysis that included both Visual Perceptual areas, revealed a significant relation for only the new test of visual memory. Poor visual perceptual ability should be considered to be amongst the skills significantly related to poor Mathematics achievement.

Pallier (2003) examined the effects of gender on the self assessment of accuracy of visual perceptual judgments. College students completed a test of general knowledge and visual perceptual tasks. When results were analyzed by sex, men were more confident than women.

Ackerman and Cianciolo (2000) made an experimental study to explore three major ability determinants of individual differences in skill acquisition. Experiment 1 assessed the predictability of individual differences in asymptotic skill levels on the Kanfer- Ackerman Air Traffic Controller (ATC) task. Experiment 2 provided an exploration of the construct space underlying perceptual – speed abilities. Experiment 3 concerned an evaluation of the theoretical predictions for individual differences in performance over skill development in a complex air traffic control simulation task and the ATC task, with an extensive battery of general and perceptual speed measures, along with a newly developed PC based suite of psychomotor ability measures. Evidences addressing the predictability of individual differences in performance at early intermediate and asymptotic levels of practice are presented.

Schater (1999) found that CAI facilitates differentiated instruction to each student’s particular ability levels and learning and learning speeds, provides visual imagery of difficult abstract concepts, and enables the instructor to more quickly and objectively identify student’s areas of weakness. At the same time, the value of computer assisted instruction can be restricted
by availability of equipments, instructors’ mastery of technology, and the student’s level of computer experience.

Bryce (1994) made a study to find the effect of perceptual speed on learning and information retrieval performance. An experiment was designed to test how this cognitive ability would interact with a system feature designed to enhance learning of search vocabulary, specifically, presenting subject descriptors as the first element of the display of a reference. Results showed significant interactions between perceptual speed and the order of presentation of data elements in predicting both vocabulary learning and search performance.

Gharara (1991) studied the impact of perceptual skills training on the EFL reading speed and comprehension. The experimental group was given rapid eye movement and word recognition exercises for two meetings weekly extended over a period of four weeks. It was found that the experimental subjects were able to read faster and comprehend better because of the fast perceptual eye movement and rapid visual recognition exercise.

Summary of Studies Related to Perceptual Speed

Perceptual Speed is very important for school children. Even though the concept of Perceptual Speed is an odd one, lot of studies were conducted in this field. The studies conducted on Perceptual Speed revealed that there is a great influence of teaching methods and Perceptual speed improvement. After gone through the related literature the researcher found that fostering of Perceptual speed was very important in today’s Mathematics teaching and learning.
3.5 STUDIES RELATED TO ACHIEVEMENT IN MATHEMATICS

Andersen et al. (2010) conducted a study which examined the impact of prior Mathematics Achievement on the relationship between high school mathematics curricula and student post secondary mathematics performance.

Gilleece et al. (2010) conducted a study which examines student and school background characteristics associated with low and high Achievement in Mathematics and science on the program for international student assessment, conclusions emphasize the need for targeting resources aimed at promoting equity in outcomes at students level as well as school level.

Jordan et al. (2010) conducted a study in the importance of number sense in Mathematics Achievement in first and third grades. Children’s symbolic number sense was examined at the beginning of first grade with short screen to competences related to counting, number knowledge and arithmetic operations. Conventional mathematics achievement was then assessed at the end of both first and third grades. Controlling for age and cognitive abilities (ie, language spatial and memory) number sense made a unique and meaningful contribution to the variance in Mathematics achievement at both first and third grades. The results showed that the number sense screen taps important intermediate skills that should be considered in the development of easily mathematics assessments and interventions.

Clark et al. (2010) conducted a study which examined linkages between children’s developing executive function abilities at age 4 and children’s subsequent Achievement in Mathematics at age 6, 1 year after school entry. Findings suggest that early measures of executive function may be useful in identifying children who may experience difficulties in learning Mathematical skills and concepts. They also suggested that the scaffolding of these executive skills could potentially be a useful additional component in early Mathematics education.
Keller (2010) conducted a study on motivation, volition, and belief change strategies to improve Mathematical learning. The purpose of this study was to investigate the effects of motivation, volition, and belief change strategies on student’s attitudes, study habits, and achievement in a calculus course for non-Mathematics majors.

Kyttala (2010) conducted a longitudinal study to investigate the role and impact of prior Mathematics performance, cognitive appraisals, and Mathematics-specific, affective anxiety in determining later Mathematics achievement and future career orientation among Finnish adolescents. He suggested that anxiety as a negative affective emotion is a problem not only for those who perform poorly but probably also for certain pupils across all achievement levels.

Sulak (2010) conducted a study on effect of problem solving strategies on problem solving achievement in primary school Mathematics. This research is extracted from master thesis and searches the success of the students in the second grade primary school on Problem Solving strategies. The research is experimentally carried out on the second grade primary school students during 14 weeks. During the research, the experiment group has been trained about problem solving strategies in Mathematics classes by the researcher while the control group was continued traditional problem solving practices. The data of the study was obtained from the two written problem solving tests including open-ended problems. These tests are applied in the middle and end of the practices and scored by rubrics. Additionally qualitative interviews were performed with the students to provide explanations describing their solutions, strategies they used, and their thoughts while solving the problems. At the end of the study, experimental group have been found significantly successful in the strategies of making a drawing-diagram, making a table, writing mathematical sentences, looking for pattern, making a list, using logical reasoning, and guess-check strategies.
Zelkowski (2010) investigated the effects of learning information system in Mathematics Achievement and classroom structure. Analysis of fourth and fifth graders in invention indicated that the instructional management system enhanced the Mathematics curriculum, results in increasing achievement and more time spent on classroom activities that contributed to positive academic outcomes.

Zulnaidi (2010) conducted a study on the effects of information mapping strategy on Mathematics conceptual knowledge of junior high school students. The study examined the relationship between Mathematical conceptual knowledge and Mathematics achievement, using a quasi experimental method and the study was carried out on 132 students.

Holloway and Ansari (2009) conducted a study on the Numerical distance Effect and individual differences in children’s Mathematics Achievement. In a correlation analysis they found that the individual differences in the distance effect were related to Mathematics achievement but not to reading achievement. This relationship was found to be specific to symbolic numerical comparison.

Lin et al. (2009) conducted a study in the power of learning goal orientation in predicting student Mathematics Achievement. The purpose of this study was to investigate the relationship between student achievement in Mathematics and student background characteristics. Student socio economic status and student learning goal orientation were specified as predictor variables of student performance in Mathematics. The major implication obtained from this study was goal orientation was much more significant than Student Socio Economic Status in predicting student performance in Mathematics.

Abele et al. (2009) in the paper ‘Urban middle grade student Mathematics Achievement growth under comprehensive school reform’,
recognizing the need to implement standards based instructional materials with school wide coherence led some Philadelphia school to adopt whole school reform (WSR) models during the late 1990’s. The authors report on the relation between mathematics achievement growth for middle grade students on the Pennsy/Vania systems of school assessments and the number of years schools implement either a WSR model with National science foundation supported mathematics curriculum component from 1997 to 2000. As the authors hypothesized, Mathematics achievement gains were positively related to the number of years those schools were implementing a specific mathematics curriculum reform.

King (2009) conducted a study on achievement in Mathematics. The result indicate a significant correlation between Mathematics self concept and Mathematics achievement. The implications of these findings are discussed from the viewpoint of cultivating the student’s interest and confidence in learning Mathematics.

Olatoye et al. (2009) conducted a study about the parental involvement and achievement in Mathematics. The result shows that there exist a significant difference in the parental involvement of public and private primary school pupils. Private school pupils enjoy more parental involvement than their counterparts in the public schools.

Polley (2008) studied about the influence of calculator use and teacher effects on first grade student’s Mathematics achievement. The analysis indicated that the students, who frequently used calculators, shows significantly higher ability of solving Mathematics problems and write out algebraic expressions scores than their peers.

Taylor (2008) investigated the effects of computerised algebra program on Mathematics achievement of college and university fresh man enrolled in a developmental Mathematics course. The present study investigated the effects...
of a web based technology centric course, assessment and learning in knowledge spaces on the remediation of college freshman enrolled in an intermediate algebra class.

Beal et al. (2007) made a study on Mathematics motivation and Achievement as predictor’s among high school students using instructional software. The study was conducted to investigate the relation of adolescent student’s Mathematics motivation and achievement using the appropriate software. The study conclude that the instruction using appropriate software shows high achievement in Mathematics.

Ross and Bruce (2006) studied the impact of professional development programme on student achievement in Mathematics. It was found that there was no statistical significant difference in student’s achievement. This results demonstrated that professional development resources should be redirected to more intensive programmers delivered over larger periods.

Eriakan et al. (2005) conducted a study on factors associated with Mathematics achievement and participation in advance Mathematics courses. It was found that confidence in Mathematics was the strongest predictor of Achievement for students. also parents highest education level was highest predictor of achievement. Student’s home environment related variables also influence student’s achievement.

Ysseldgke et al. (2003) investigated the effects of learning information system on Mathematics achievement and classroom structure. Analysis of fourth and fifth grade indicated that the instructional management system enhanced the students mathematics curriculum, resulting in increased achievement and more time spent in classroom activities that contributed to positive academic outcomes.
Hoon (2002) conducted a study on An investigation of factors that contribute to rural students’ Mathematics achievement: A structural equation modeling approach. The purpose of the study was to examine the direct and indirect effects of basic concepts of Mathematics, Mathematics problem solving abilities, prior knowledge of Mathematics and attitude towards mathematics on students’ Mathematics Achievement in the rural schools of Sabah, Malaysia. A structural equation modeling (SEM) approach is used to propose a direct and indirect effects structural model to predict students’ Mathematics achievement. The research findings brings some meaningful implications to those who are directly or indirectly involved in the research and the development of Mathematics education and training of mathematics teachers especially in the rural schools of Sabah, Malaysia.

Freiberg and Connel (2001) studied the effects of consistency management on student Mathematics Achievement in elementary schools. It was found that students’ who were skilled in consistency management and cooperative discipline have higher achievement gains than students from schools with only constructivist mathematics programme.

Summary of Studies Related to Achievement in Mathematics

Achievement is very important in the field of education. Number of studies were conducted in this field. The studies conducted on Achievement in Mathematics revealed that there is a great effect in the teaching methods and Achievement among students. After gone through the related literature the researcher found that different teaching methods were very important in today’s Mathematics teaching and learning.

CONCLUSION

The investigator here makes an attempt to present a brief review of relevant literature on the status of the work oriented and industry based
learning at different levels of education. The investigator also reviewed the studies related to the use of outdoor learning resources to learn various academic subjects. This chapter is closed with the major outcomes of the review which converge towards the needs and relevance of the present research attempt.

Number of studies have been reported with respect to Creative Problem Solving Ability, Perceptual Speed and Achievement in Mathematics. But the investigator feels that no exclusive study has been conducted so far on the effectiveness of an Instructional Strategy based on Path smoothing model on Creative Problem Solving Ability, Perceptual Speed and Achievement In Mathematics. These studies had helped the investigator to get a clear picture of what has been done on the particular topic. The studies cited above helped the investigator to plan a suitable methodology for the present study.