CHAPTER 2

REVIEW OF RELATED LITERATURE
Review of Related Literature

2.1. Introduction:

As the present study is to find the effect of computer assisted instruction to promote inclusive education of children with mild mental retardation with reference to teaching Mathematics, the review of literature focused on the following key words:

- Mental Retardation: Teaching Strategies
- Strategies to Promote Inclusive Education.
- Effectiveness of Computer Assisted Instruction.
- Attitude of Teachers and Parents towards Inclusive Education.

2.2: Mental Retardation: Teaching Strategies

Mental retardation is a condition due to arrested brain development resulting into significantly poor adjustment in personal, social, communication, academic, and cognitive functions of an individual. The concept is defined by various agencies and also in the Persons with Disabilities (Protection of Rights, Equal Opportunities and Full Participation) Act 1995, India. All the authors who have defined the concept of mental retardation agree on the following aspects:

1. The mental retardation is due to arrested development of brain or damage of brain.

2. Resulting in significantly poor performance in adaptive behaviour, which is expected from an individual as per his/her
age, gender and culture. This may be a) personal work involving self-care, home living, health and safety and self-direction, b) communication involving ability to comprehend the people around him/her and expressing various needs, c) social skill that helps an individual to cope up with the family and community to prove to be a social being, and d) functional academic involving the day to day required skill to meet the personal needs such as counting, reading a label, and writing the basic personal information to higher order academic skills required for meeting demands of an occupation.

3. The manifestation must occur during the developmental period i.e. from conception to the age of 18 years. (Kirk et al. 2006; pp 157-162).

Due to the arrest of brain development, the functional strength in all areas of an individual are diminished to a level leading to maladjustment in the community.

Depending on the degree of retardation it can be categorised as:

1. Mild Mental Retardation: Functioning at Intelligence Quotient level from 50 to 70.
2. Moderate Mental Retardation: Having Intelligent Quotient at the range of 35 to 49.
3. Severe Mental Retardation: Having Intelligence Quotient at the range of 25 to 34.
4. Profound Mental Retardation: Having Intelligence Quotient below 25.

One may observe the difficulties in the areas described below in the persons with mental retardation:

1. Personal care: Persons with various degree of mental retardation vary in their ability to perform to care their personal needs. Some of them need reminder to complete the activities of daily living and some of them need support to work and some need total care in this area.

2. Communication: The persons with mental retardation with high level of intelligence may be able to communicate the basic needs required for daily living but many of them need training and supervision in carrying out of communication with others. They lack both in receptive and expressive language.

3. Social Interaction: The persons with mental retardation fail to interact with other than familiar persons. Some of them interact with others but fail to meet the changing demand of a social situation. A few of them who are severely and profoundly retarded confine their social interaction to their family members only.

4. Academic Functions: Some persons with mental retardation may be able to learn the basic academic functions as reading and writing to primary level and may be trained to be independent to lead day to day functions such as marketing, bank operation etc. Some may need constant supervision for using functional academic in day to day living (Hallahan and Kauffman, 2000).
The cause of mental retardation may be 1. Genetic and/or 2. Environmental.

1. Genetic causes: The chromosomal anomalies, mutation of genes, phenylketonuria, and fragile-X syndrome are some of the causes of mental retardation.

2. Environmental causes: Toxic agents such as alcohol and lead may cause mental retardation. Other environmental factors such as infections during developmental period (pre-natal, natal or post natal period) may cause mental retardation. Injury to the central nervous system during the developmental period may cause mental retardation.

3. Unknown Causes: Some causes of mental retardation are not known so far. (Madhavan T. 1999)

It is understood from the above discussion that mental retardation is a complex condition due to limitations in all areas of functioning. The children with mild mental retardation exhibit more adaptive behaviour compared to other degree of retardation. These children can be trained to lead independent life at adult stage. They need to be given proper training in time. These children who were earlier attending special schools are now enrolled in the regular schools after implementation of SarvaShikshyaAbhiyan (Education for All), need appropriate support and facility to gain most benefit from this environment. Various methods are being practised in the special schools to enhance their skills for their independent living. Research is also carried out to successful inclusion of these children in the regular school.
The researchers have tried to find out various strategies that help the children with mental retardation to develop skill for an independent life. Some of the study reports are cited here.

Narayan, J & Panda, K. (1993), conducted a study on effect of modelling in teaching children with mental retardation. The study was on 170 children with mental retardation of which 70 were children with mild mental retardation. The results showed that peer modelling has positive effect on learning various skills among the children with moderate and mild mental retardation. The study also indicated that the children with mild to moderate mental retardation may be successfully integrated in the regular school without compromising the individualized education programme and modelling will be one effective strategy for helping these children integrating in the classroom.

In a study on “Motivation in Mentally Retarded Children” by Tanaka, M., (1979), it is found that motivation of the children with mental retardation can be enhanced with providing task that they can be successful and also they are to be rewarded for each success. In an experimental design taking 48 normal children and 48 children with mental retardation the researcher found that though the children with mental retardation show poor motivation due to failure in the tasks. Later it was found that due to presentation of the tasks that could bring success, the children got motivated to work. Their motivational level was compared with the normal children when they got work that brought them success.
The children with mental retardation have poor short term and long-term memory. Recalling the information is difficult for them due to poor short-term memory. Their short-term memory can be enhanced by rehearsing the information. The tasks which were selected for training were presented repeatedly and were rewarded each time they performed. It was observed that their recalling capacity had become faster than at the beginning of the training (Bebko&Luhaorg, 1998).

Children with mental retardation are given specific instructional strategies like shaping, temporary help and activities like visual stimulation, systematic auditory stimulation to increase attention (Nizamie, et al., 2004). Some studies suggest that they can be motivated through demonstration and allowing observation of the other tasks in a breakage of time (Hallahan, et al., 2000)

The children with mental retardation are to be taught by simplifying the task. The task to be taught is to be broken into simpler subtasks for easy learning. The tasks must be presented to them in a sequenced manner from simple to complex tasks. Child must be rewarded for achievement of a simple task. It is required to support them to achieve the task. The materials must be attractive to get their attention (William, H., 2000).

A study was conducted by Rath, S. (1991) on individualized instruction training approach for teaching children with learning difficulties in reading and comprehension skills. In this study; a sample of five subjects was chosen keeping in view that did not read at the level of their mental and physical age.
At the time of conducting the present study, all the subjects were enrolled in a special education programme at Open Learning Systems, Bhubaneswar. Their ages ranged between 12 and 19 years. These children are identified earlier as having difficulties in abilities, by the institutions they were attending. This small group was chosen as the sample after careful screening of over 15 children enrolled in the same programme. It was found that there was improvement in scores in the post training session as compared to the pre-testing scores (Basu, A., Unpublished Ph. D. Thesis).

Malik, S., (2009) carried out investigation on the impact of intervention training on mental abilities of slow learners. A sample size of 40 slow learners of 5-6 years old of Hisar district was selected. These slow learners were divided into two categories i.e. experimental (20) and control group (20). Impact of intervention training revealed marked improvement in mental abilities of experimental group. Most of the children of pre-testing stage were in the category of low to moderate mental abilities. After intervention, the experimental group performs better in all the activities of verbal, perceptual performance, quantitative and memory aspects of mental abilities. The findings of the present study proved that due to intervention there was gain in all aspects of mental abilities of experimental group slow learners. The care, education and training of the slow learner may help them to cover up earlier deficiencies and became an achiever. By developing a modified curriculum based on the research with slow learners, there is a strong likelihood that more slow learners would pass high stake tests (Basu, A., Unpublished Ph. D. Thesis, 2016).
2.3. **Strategies to Promote Inclusive Education:**

As the process of inclusion is a very recent trend, a few efforts have been taken to find out the strategies that promote inclusion. At times, inclusion teachers work with the whole class, small groups, and individual students. Baseline levels inform teachers which students need direct skill instruction, practice, remediation and/or enrichment. Inclusion at its finest involves general and special education teachers and related staff forming collaborative and respectful partnerships that honour all students’ levels. Overall, the most important thing to remember is to always have high expectations for the students and to highlight their strengths.

According to a research it is found that students with disabilities meet a greater number of their Individualized Educational Programme (IEP) goals when they are placed in inclusive setting, they are more motivated to learn in inclusive settings, inclusive classrooms provide better access to peer models for the facilitation of learning appropriate social behaviours, in inclusive settings, students with disabilities encounter the real expectations and diversity of society, graduates from inclusive schools are more successful as adults, more friendships between classmates with and without disabilities develop in inclusive settings, students without disabilities learn to appreciate and accept individual differences, and students without disabilities learn to appreciate the abilities and strengths of their classmates with disabilities. (Davis 1992)

Cooperative Learning has been an effective strategy for Inclusion. Cooperative learning meets the needs of a diverse population of children with
varying cognitive abilities; developmental and learning disabilities; sensory impairments; and different cultural, linguistic, and socioeconomic backgrounds. It is based on the premise that children of differing abilities and backgrounds will benefit both academically and socially from cooperative learning (Putnam, JoAnne W., 1993)

The movement towards greater integration has thus resulted in a significant change in the structure of special education, but questions remain about the success of it. Empirical evidence about the efficacy of special education continues to be equivocal, and this has resulted in discussion being increasingly fuelled by political and ideological concerns. These differences have often resulted in contentious discussion about how and for whom the inclusion of students with disabilities should be accomplished (O’Neil, 1994-95).

A comprehensive programme for preparing a school setting for inclusion must consider the involvement of all staff members. As Roach (1995) points out “Successful planning models ensure that all teachers, paraprofessionals, and related service personnel are included in the process”. Although many pre-service training programmes acquaint teachers-in-training with working with students with diverse needs, the nature of this preparation varies greatly. Moreover, many teachers who are already in the field have not been exposed to information important for implementing of inclusive practices.

Research indicates that the education of nondisabled students is not negatively affected by inclusion (National Study on Inclusion, 1995). Although
the movement has its critics, research on inclusion provides support for its continuations.

However, there are other viewpoints as well. National Centre on Educational Restructuring and Inclusion, New York, (1995) in a study on ‘National Study of Inclusion’ found out some reasons for not supporting the inclusive education movement by the parents and the professionals. Those are listed below: -

- General educators have not been involved sufficiently and are therefore not likely to support the model.
- General educators as well as special educators do not have the collaboration skills necessary to make inclusion successful.
- There are limited empirical data to support the model. Therefore, full implementation should be put on hold until sound research support the effort.
- Full inclusion of the students with disabilities into the general education classrooms may take away from the students without disabilities and lessen their quality of education.
- Current funding, teacher training, and teacher certification are based on separate educational systems.
- Some students with disabilities do better when served in special education classes by special education teachers.

Inclusion is a movement seeking to create schools that meet the needs of all students by establishing learning communities for students with and without
disabilities, educated together in age appropriate general education classrooms in neighbourhood schools (Ferguson, 1996).

According to Loreman and Deppeler (2001), an inclusive school must have:

- Welcoming environment for children with disabilities
- Flexible scheduling available, allowing private study sessions.
- Same subject choice was same as all other children
- Assistance provided by special education teacher and volunteers only as required
- Opportunity for formal and informal peer tutoring
- Positive staff attitude towards inclusion
- Positive school leadership from principal
- Ethos of caring and respect for individual differences
- Adaptation of curriculum as and when required
- Development of friendship supported by staff
- Team based approach for inclusion
- Parental involvement as partners
- Use of all possible strategies for enhancing learning

**Clock Partners** is a cooperative learning grouping method for assigning partners to work together. Teachers distribute the “My Clock Partners” graphic and instruct the students to circulate around the room and ask classmates to sign up for a time on the clock. When the clock graphic is completed, the students have 12 different partners – one for each hour on the clock. When the teacher wants to add some novelty to partner work, he or she
calls out, “Find your 3:00 appointment,” and the students navigate the classroom until they find their assigned partner. This structure saves instructional time and provides for structured movement within the classroom (Garmston & Wellman, 2002)

**Cooperative Learning Roles** are designed to increase engagement and equalize participation for everybody within cooperative learning teams. Examples of roles include reporter, recorder, timekeeper, leader, and encourager. Each team member executes a specific role to make efficient use of the team’s time together. Each role is directly taught to students, and appropriate tasks and sentence stems are modelled to assist with social skill development. (Tate, 2003)

Reciprocal teaching is a cooperative learning strategy that uses assigned roles to assist with comprehension of text. The reading materials used must be at the instructional level of all students within the group. It is also essential that the roles are adequately explained and modelled for the students. The teaching roles include predictor, clarifier, summarizer, and questioner. The teacher assigns each group an instructional-level passage to read. The students read the first section. Then, the summarizer retells the section in his or her own words, the questioner formulates questions for the group, the clarifier addresses any confusion over comprehension of the text, and the predictor makes predictions about the next selection. Roles are rotated so that each student gets an opportunity to practice each role. The teacher can strategically assign the reader role, so that readers will have an instructionally appropriate section to
read. For example, a reader who struggles may read a section of familiar text, consisting of several high-frequency words or a smaller segment of text. The other option is to have students read silently and then discusses the section. Reciprocal teaching promotes independent application of comprehension within a cooperative framework (Gajria, Jitendra, Sood, & Sacks, 2007)

European Agency for Development in Special Needs Education has recommended some strategies that works for helping inclusive education (Meijer, C.J.W., 2001)

1. **Supportive classes**

These classes contain a maximum of three children with special needs; consequently, a second teacher is not present during the entire lessons. Each pupil is only supported during a limited amount of lessons. Furthermore, the extent of support also depends on the number of disabled children per class, the type of disability and the regional situation. In these classes, successful inclusive teaching is largely dependent on the teacher’s skill. Another decisive factor is the amount of granted support, i.e. if it is sufficient to cope with the children’s needs.

2. **Co-operative classes**

Co-operative classes are classes for children with special needs featuring joint lessons with primary schools (to the greatest possible extent). However, this cooperation is limited to a few common projects where the children with disabilities can perform with their capabilities.
3. Inclusive pedagogy

Successful pedagogy for all children hardly differs from inclusive education, as is stated in an article by Wetzel, Moser, Brejcha et al. (1999). The children with disabilities have the same pedagogy as of their peers but adapted to their needs. The children with disabilities were encouraged to master the required skill along with their peers.

4. Team Work:

All teachers in an inclusive setting were working in a team, with one third of them in favour of shared responsibility for all children. In the remaining classes care for the children was limited to support the children with special needs, with one half of the teachers taking care of the individual locations for just a few lessons per week. Sharing competences in a supportive setting was encouraging for inclusion.

As observed by European Agency for Development in Special Needs Education (2001), the successful inclusion practices in Germany are (Meijer, C.J.W., 2001):

1. Flexible, differentiating instruction

During the lessons, the teacher differentiates according to the pupils’ achievements, time and interest. Differentiating implies the usage of differentiated material and the admission of different goals (internal differentiation). Differentiation according to time allows different working paces; in this case, it is sensible to work within a weekly plan and to organize the daily work more flexibly beyond the fixed 45-minute lesson. Differentiation according to interest implies that all children (including those with special
educational needs), single or in small groups, can carry out different projects that are not necessarily assigned to the curriculum. However, this can only be allowed under the condition that the projects´ results are regularly introduced to and discussed with the learning group.

2. Concentration and relaxation

Phases of concentration and relaxation, of cognitive and physical work, of aesthetic presentation (singing, moving, acting) and quiet work, working alone and working in the group, should always vary and alternate during the school day. The same goes for different kinds of plenary work (teacher lectures, pupil lectures, playing, singing, celebrating etc.). This also includes a flexible handling of time.

Centre for Studies on Inclusive Education (CSIE), Bristol, United Kingdom has recommended ten reasons for inclusion through three headings (Meijer, C.J.W., 2001):

Human Rights

1. All children have the right to learn together.

2. Children should not be devalued or discriminated against by being excluded or sent away because of their disability or learning difficulty.

3. Disabled adults, describing themselves as special school survivors, are demanding an end to segregation.

4. There are no legitimate reasons to separate children for their education. Children belong together - with advantages and benefits for everyone. They do not need to be protected from each other.
**Good Education**

5. Research shows children do better, academically and socially in integrated settings.

6. There is no teaching or care in a segregated school, which cannot take place in an ordinary school.

7. Given commitment and support, inclusive education is a more efficient use of educational resources.

**Good Social Sense**

8. Segregation teaches children to be fearful, ignorant and breeds prejudice.

9. All children need an education that will help them develop relationships and prepare them for life in the mainstream.

10. Only inclusion has the potential to reduce fear and build friendship, respect and understanding.

There are many different advantages of inclusion, including opportunities for social interaction (Peck and Scarpati, 2004); ease in accessing the general curriculum, (Abell, Bauder, & Simmons, 2005); academic improvement (Hunt, Doering, & Hirose-Hatae, 2001); and positive outcomes for students with and without disabilities (Idol, 2006). Although they may not be included as extensively as students with mild disabilities, inclusion also creates learning opportunities for students with severe disabilities (Downing & Eichinger, 2003).

From the philosophical perspective, there are four assumptions underlying inclusive education (Peters, 2007).
1. All students come to school with diverse needs and abilities. It is the responsibility of the general education system to be responsive to all students.

2. A responsive general education system provides high expectations and standards, quality academic curriculum and instruction that are flexible and relevant, an accessible environment, and teachers who are well prepared to address the educational needs of all students.

3. Progress in general education is a process evidenced by schools and communities working together to create citizens for an inclusive society who are educated to enjoy the full benefits, rights, and experiences of social life. (p.99)

4. As an educational practice, inclusive education obviously attempts to provide equal access to academic instruction and social opportunities for all students, regardless of ability levels.

Daud and Carruthers (2008) have observed that social inclusion has helped to develop the followings in the children with disabilities.

1. Learning positive behaviour and values

2. Development of a sense of competence

3. Development of a positive plan for the future

Rally Coach is a coaching structure for groups of two students and is used for reinforcing skills and providing additional practice with feedback. Pairs of students are given one set of problems and one pencil. Partner One
solves the problem while Partner Two watches, listens, checks, coaches, and praises. Then the two switch roles and Partner One becomes the coach while Partner Two solves the problem. Partners repeat this process until the assignment is complete. This structure gives the teacher an opportunity to observe partners and assist partnerships as needed. Rally Coach Pairs are most effective when pairs are academically similar. For example, high achievers are paired with medium achievers and medium achievers are paired with low achievers for a particular assignment. This arrangement within the pairs eliminates one partner from dominating opportunities to coach and the other partner becoming a passive learner (Kagan & Kagan, 2009).

Talking Chips ensures that all student voices are heard during cooperative learning discussions. Teams of four are given a discussion topic and several minutes of individual think time. Each teammate receives two talking chips to use during the discussion time. When students participate in the group discussion, they place a talking chip in the centre of the table. Once all students have used both of their talking chips, one student summarizes the conversation. The team divides up the talking chips in the centre of the table and continues the conversation using the chips until time is called. The use of talking chips encourages all students to communicate their ideas and be active and attentive listeners (Kagan & Kagan, 2009).

(Dawson & Liddicoat, 2009) found that the children with disabilities felt good after social inclusion with non-disabilities. The children with disabilities
expressed that they would not have learnt so much without social inclusion. They also expressed that they learn coping skill after social inclusion.

Karten, T. (2010) has recommended 18 strategies that promote inclusion as listed below:

1. Establish prior knowledge.
2. Pre-plan lessons with structured objectives, but also allow for inter/post planning.
3. Proceed from the simple to the complex by using discrete task analysis, which breaks up the learning into its parts.
5. Reinforce abstract concepts with concrete examples, such as looking at a map while learning compass directions or walking around a neighbourhood to read street signs.
6. Think about possible accommodations and modifications that might be needed such as using a digital recorder for notes, reducing the amount of spelling words, and having enrichment activities prepared.
7. Incorporate sensory elements: visual, auditory, and kinaesthetic ones, like writing letters in salt trays or creating acute, right, and obtuse angles with chopsticks.
8. Teach to strengths to help students compensate for weaknesses such as hopping to math facts, if a child loves to move about, but hates numbers.
9. Concentrate on individual children, not syndromes.
12. Use modelling with both teachers and peers.

13. Vary types of instruction and assessment, with multiple intelligences and cooperative learning.


15. Remember the basics such as teaching student’s proper hygiene, social skills, respecting others, effectively listening, or reading directions on a worksheet, in addition to the 3R’s: Reading, Writing and Arithmetic.

16. Establish a pleasant classroom environment that encourages students to ask questions and become actively involved in their learning.

17. Increase students’ self-awareness of levels and progress.

18. Effectively communicate and collaborate with families, students and colleagues, while smiling; it’s contagious (http://www.teachhub.com/18-inclusion-strategies-student-success)

The primary goal in respect of inclusion of all pre-service and in-service training of general education teachers include creating positive attitudes towards working with students with diverse needs and diminishing apprehensions and concerns teachers might have about their competencies to address the needs of these students. These goals are achieved by three major training related activities: 1) opportunities to see good examples of inclusions; (2) provision of information about inclusion, students’ diversity, and inclusion-related practices, together with the development of skills that a teacher needs; and (3) time to plan with team members (Smith, T.E.C.et al, 2011).

Numbered Heads Together maximizes team cooperation and peer tutoring. Teams of four numbers off, one through four. Each teammate has an
assigned number. The teacher poses a higher order thinking question to the class. The teams stand up and work together to answer the question and ensure that all members can adequately explain the team’s answer. Once the team is confident that all members can explain their thinking, the team sits down. When all the teams are seated, the teacher randomly calls out a number, and the student assigned to that number explains his or her team’s answer. Students can respond using response cards, individual chalkboards, or orally. Numbered Heads Together increases individual and team accountability along with teamwork (Anjarsari, E. et al., 2013).

The cooperative learning structures that are embedded into classroom procedures enhance active learning for students with disabilities and their nondisabled peers. Such structures are especially helpful for students who require additional practice as well as confirming and corrective feedback throughout the school day. Cooperative learning structures continue to support inclusive practices and complement academic and social skill development. Students who work together, learn together to improve academic achievement and social acceptance of all (Emerson, L. M., 2013).

Peer tutoring is a supplementary method used for enhancing learning as well as encouraging inclusion of the children with disabilities. The peer tutoring method of teaching is helpful for students as a) they receive more time for individualized learning, b) direct interaction between students promotes active learning, c) it reinforces their own learning by instructing others, d) students feel more comfortable and open when interacting with a peer, and e) peers and
students share a similar discourse, allowing for greater understanding. It has been a resource for teacher working in inclusive set up to train and give individualized support to children with special need. They can train Peer Tutors or Buddies to give support to special child in response, there would be a feeling of love and belongingness, sensitivity for each other and foremost they learn to help each other in order resulting in inclusion in the classroom (Tiwari, M. 2014)

2.4: Effectiveness of Computer Assisted Instruction:

With the development of computer and software, teaching-learning processes have been very fast and interesting. Specially, these developments have made the persons with special needs more efficient and independent. The computer assisted instruction has played a vital role in developing skills and enhanced participation of the children with mental retardation in various activities.

The first computer-assisted instruction (CAI), developed by Patrick Suppes at Stanford University during the 1960s, set standards for subsequent instructional software. After systematically analyzing courses in arithmetic and other subjects, Suppes designed highly structured computer systems featuring learner feedback, lesson branching, and student record keeping (Coburn et al. 1982).

Hartley (1977) was the first to apply meta-analysis to find on Computer Assisted Instruction (CAI). Her study focused on mathematics education in elementary and secondary schools. She reported that the average effect of CAI
was to raise student achievement by .41 standard deviations, or from the 50th to the 66th percentile. She also reported that the effects of CAI were not as large as those produced by programs of peer and cross-age tutoring. But, they were far larger than effects produced by programmed instruction or use of individual learning package. Hartley discovered only small effects of study features on study outcomes.

Student learning rate was found to be faster with CAI than with conventional instruction. In some research studies, the students learned the same amount of material through computer assisted instruction in less time than the traditionally instructed students; in others, they learned more material in the same time (Capper and Copple -1985).

Computer assisted instruction is very powerful to evoke motivation in students. In several studies, they reported that the students like working with computers because the computers:

- Are infinitely patient
- Never get tired
- Never get frustrated or angry
- Allow students to work privately
- Never forget to correct or praise
- Are fun and entertaining
- Individualize learning
- Are self-paced
- Do not embarrass students who make mistakes
- Make it possible to experiment with different options
• Give immediate feedback
• Are more objective than teachers
• Free teachers for more meaningful contact with students
• Are impartial to race or ethnicity
• Are great motivators
• Give a sense of control over learning
• Are excellent for drill and practice
• Call for using sight, hearing, and touch
• Teach in small increments
• Help students improve their spelling
• Build proficiency in computer use, which will be valuable later in life
• Eliminate the drudgery of doing certain learning activities by hand (e.g., drawing graphs)
• Work rapidly--closer to the rate of human thought.

(Bialo and Sivin 1990; Braun 1990; Lawton and Gerschner 1982; Mokros and Tinker 1987; Robertson, et al. 1987; Rupe 1986; Schmidt, et al. 1985-86; Wepner 1990.)

Based on the degree of interaction between student and computer, researchers have identified three levels of CAI:

a) **Drill and practice**: The computer provides the student with exercises that reinforce the learning of specific skills taught in the classroom, and supplies immediate feedback on the correctness of the response. Used in this manner, CAI functions as a supplement to regular classroom instruction, and may be
especially useful when a teacher does not have the time to work individually with each student. Drill and practice on the computer may also motivate students more than traditional workbook exercises.

b) **Tutorial**: CAI provides some information or clarifies certain concepts in addition to providing the student with practice exercises. In this sense, the computer begins to take over actual instructional functions, tailored to the student’s individual level of achievement.

c) **Dialogue**: With this type of computer use, the student takes an active role in interacting with the computer, giving instructions in the form of a computer language so as to structure the student’s own curriculum. The computer provides information, exercises, and feedback. Dialogue CAI is believed to come closest to actually substituting for regular instruction (Gourgey, Azumi, Madhere, & Walker, 1984).

The items of CAI point to students' appreciation of the immediate, objective, and positive feedback compared to teacher-directed activities. The CAI helps in reduction in negative reinforcement and allows the student to learn through trial and error at his or her own pace. Therefore, positive attitudes can be protected and enhanced through CAI (Robertson, et al. -1987). It is further reported that computer based instructions have been very much helpful to the children’s learning rate. Reportedly, 92% to 94% of the studies reviewed were supportive in favour of CAI (Vinsonhaler and Bass in 1972, Edwards,

Computers have become important instructional tools in most educational settings. Those have a proven role in helping students with disabilities learning more effectively. Computer hardware and software can be very useful in creating learning environment for the students with learning and other disabilities. Among the functions that the computers can serve promoting successful learning are: a) providing self-paced mathematics tutorials and mathematics drill and practice, b) providing drill and practice in spelling, and spell checking functions, c) promoting writing fluency by allowing for easy revision, and d) promoting problem solving and higher order thinking skills through software exercise and simulation (Hasselbring and Goin, 1988).

Arithmetic problem solving performance of students with mild mental retardation could be enhanced through computer-assisted instruction. A program that was used, included a cognitive problem-solving strategy, animated depictions of problems in a tutorial format, and minimal or no reading. The researchers concluded that students with mild mental retardation could successfully use computer-assisted instruction to facilitate problem solving (Mastropieri, Scruggs, and Shiah -1997).

In a study conducted by Irish, 2002 to improve the multiplication fluency to evaluate the effects of learning math facts through a mnemonic keyword strategy worked daily on the CAI programme as well as classroom.
review with paper/pencil drill sheets recalling math facts. The study suggested that computerised drill may be an acceptable format to produce accurate responding for students, but no comparative conclusions could be drawn.

It is worth noting that some of the research on effectiveness also addressed the cost-effectiveness of CAI and other computer applications. Ragosta, Holland, and Jamison (1982) concluded that equal amounts of time of CAI reinforcement and the more-expensive one-to-one tutoring produced equal achievement effects. Niemiec, Sikorski, and Walberg (1989) also found CAI activities significantly more cost-effective than tutoring and suggested that computers be used more extensively in schools. And in their 1986 study of costs, effects, and utility of CAI, Hawley, Fletcher, and Piele noted that the cost differences between CAI and traditional instruction were insignificant and concluded that "the microcomputer-assisted instruction was the cost effective alternative of choice" for both grades addressed in the study.

The single best-supported finding (1984 - 89) in the research literature is that the use of CAI as a supplement to traditional, teacher-directed instruction produces achievement effects superior to those obtained with traditional instruction alone. Generally speaking, this finding holds true for students of different ages and abilities and for learning in different curricular areas. As summarized in Stennett's 1985 review of reviews, "well-designed and implemented D&P [drill-and practice] or tutorial CAI, used as a supplement to traditional instruction, produces an educationally significant improvement in students' final examination achievement" (Research support: Bahr and Rieth 81
The effectiveness of computer-assisted reading to other instructional methods, including peer tutoring, reciprocal teaching, effective teaching principles, and direct instruction models on the achievement of elementary students with mild disabilities is compared. Results showed that achievement was significantly greater using CAI than peer tutoring and effective teaching principles. However the observation data suggested that direct instruction were the most engaging methods for students. The findings confirmed earlier studies reporting that computer aided instruction in the reading skills of sight words recognition, decoding and comprehension is highly effective when compared to other instructional methods (Marston, et al 1995).

Speech recognition software was used to improve reading and spelling of students with learning disabilities ages from 8 to 9 years. The control group was used to reduce differences that were dire to computer use rather than speech recognition itself. Both group worked on computer to complete writing
tasks for 50 minutes per week for 16 weeks. Results demonstrated that the speech recognition group had significantly higher improvement scores that the control group in spelling, reading recognition and reading comprehension (Raskind and Higgins, 1999).

IntelliTools was used in inclusive classrooms to study the effect of an early reading programme for reading failure on 32 first grade students with or at risk for mild high incidence disabilities. IntelliTools is a software programme that integrates the features of word recognition with a direct instruction phonics approach (IntelliTools, 2000). It provides the capabilities of reading and writing connected text for the purpose of providing basic phonemic instruction in meaningful contexts. The components of the software are:

1. Reading connected text for comprehension;
2. Word study and reading of connected text for building word identification and decoding skills; and
3. Structured writing activities.

The software contains anchor stories emphasizing predictable text with repeated lines and pictures relating directly to the text. It also includes a feature called “Little Books” that provides opportunities to build fluency with sight words and to apply decoding skills to new words. Practice activities are provided for word analysis and sentence composition. The goal of IntelliTools is to generalize these basic skills into tasks and texts found in the general education curriculum (Howell, et al. 2000).
A study on ‘science teaching through computer assisted instruction’ revealed that the CAI for teaching science has helped in increasing the students’ interaction in the class. This teaching has proved superior to the traditional teaching in 92% of cases. The teachers who used the CAI were finding it very useful in teaching science in the classroom in terms of presentation of subjects and explanation of the concepts (Ranade, M. D -2002)

The influence of computer assisted instruction on achievement in science was studied with the objective to find out the effect of computer assisted instruction on achievement in learning objectives such as knowledge, comprehension, application and skills of the students and found that students taught through computer assisted instruction showed significant difference in the attainment of the learning objectives; significant effect was observed on achievement in favour of computer assisted instruction in all aspects of learning. Students attended computer assisted instruction scored significantly higher marks over the control group students (Shanthi et al. (2002).

A study was conducted to determine how computer-assisted instruction improves student performance among various types of students. 161 middle school students of various program types: special education, non-English proficient, limited English proficient, and regular education completed instructional units using a computer program. Regular education students were found to have made greater pre test-post test gains than special education students (Traynor, P. L 2003).
The study by Lee and Vail (2005) revealed that a computer based sight-word reading recognition programme with four students with developmental disabilities, aged 6-8 years. The study incorporates constant time delay procedure and sound, video, text, and animations. Video segments included cartoons and movies segments 7-15 seconds made as Quick Times movies. The computer programme used a 5 seconds constant time delay procedure requesting the students to click on the correct word. After 5 seconds lapsed, students received a correct answer prompt and were given a second chance to answer correctly. A generalization procedure using story books followed. Results suggested that all students acquired their target words and generalised sight words recognition across the modes and materials. The study verifies precious findings about constant time delay for word recognition and added content generalisation as a benefit.

The effect of computer based cognitive mapping was used on reading comprehension of three 9th graders with emotional disturbed children. The students used the computer programme and were inspired for creating cognitive maps of the materials they read. The reading materials were a world history text that they independently read and created cognitive semantic maps. They were quizzed using all 20 concepts daily after reading was completed on materials that they had read and created computer based concept maps. All students showed rising trends in whole test occasions and mastery (Blankenship, et al., 2005).
Sridevi, K. (2005) conducted a study to find out the impact of technology in learning of science by secondary grade students with hearing impairment. The study was to find the impact of adapted content system by translating content into video material for hearing impaired children studying in Government and Private co-education system. This study adopted a quasi-experimental pre-post design of one group. The group was taught science through audio-video instruction. There was significant difference in the performance of the student.

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A study was conducted to find out the use of computer assisted instruction for language teaching and learning during for academic year 1979-80. In this study it is found that the CAI has been very effective in language teaching and learning. Language learning focuses on verbal interaction,
vocabulary development and reading. The CAI has been very effective in improving all these three aspects of language learning (Ybarra, R., 2008)

There was a study aiming to investigate the effect of using an instructional software program of English language on the achievement of secondary students in Jordan. The instruments of the study were an instructional software program for teaching the passive voice and an achievement test. The findings of the study revealed that: 1. there were statistically significant differences between the students' achievement mean scores in grammar attributed to the instructional method of teaching. This difference is in favour of the students in the experimental group 2. There were statistically significant differences between the students' achievement mean scores in grammar attributed to gender. This difference is in favour of male students. 3. There were statistically significant differences between the students' achievement mean scores in grammar attributed to stream of study. The research revealed that the CAI has played an effective role in teaching English Grammar to the secondary students significantly and also the boys have performed much better in after using the CAI. The research team recommended to the teachers who are teaching English to use CAI in future (Abdallah Abu Naba'h et al., 2009)

A study on ‘Remediation of Arithmetical Learning Disability by Programmed Instruction and Computer Assisted Instruction’ was conducted to compare the relative effectiveness CAI and programme instruction with respect to remediation of arithmetical learning disabilities. The study concluded that
the programme instruction method and computer assisted instruction method of teaching were found to be significantly effective in remediation of arithmetical learning disability among lower primary level learning disabled students and both these methods of instruction were equally effective for both boys and girls and when comparisons between these two methods of instruction viz PI and CAI was made, no significant difference was found. But seeing the mean scores on arithmetic diagnostic test for primary school children, it can be stated that CAI for remediation of arithmetic learning disability has edge over PI method (Kumar, G. et al. 2011)

Yusuf, M. O. et al. (2010) conducted a study on ‘effects of computer assisted instruction (CAI) on secondary school students’ performance in biology’. Also, the influence of gender on the performance of students exposed to CAI in individualised or cooperative learning settings package was examined. The research was a quasi-experimental involving a 3 x 2 factorial design. The sample for the study comprised 120 first year senior secondary school students (SSS I) sampled from three private secondary schools, in Oyo State, Nigeria. The findings of the study showed that the performance of students exposed to CAI either individually or cooperatively were better than their counterparts exposed to the conventional classroom instruction. However, no significant difference existed in the performance of male and female students exposed to CAI in either individual or cooperative settings. Based on the research findings recommendations were made on the need to develop relevant CAI packages for teaching biology in Nigerian secondary schools.
A study on the role of manipulative in introducing and developing mathematical concepts in elementary grades was carried out by Susan, J., (1999). In the study, manipulative is defined as materials that are physically handled by students in order to help them see actual examples of mathematical principles at work. Manipulative is designed, marketed, purchased, researched and used throughout educational systems but in elementary schools. The major findings were manipulative is not the be-all to end-all in teaching mathematics. They can be a waste of time and effort. Moreover, the child is not developmentally ready for the concept; the child has not mastered pre-requisite concepts; the model used is too abstract for the students; the instructions shift to symbolic before the child has developed the cognitive concrete model to embrace the new concept; the gap between the model and its symbolic representation is too large (Basu, A., Unpublished Ph. D. Thesis).

2.5: Attitude of Teachers and Parents towards Inclusion:

Perception and attitude are important factor for successful inclusion of children with disabilities in regular class. Favourable attitude and positive perception may be supportive to the children with mental retardation to be integral part of the regular school. A few studies on these aspects are cited below.

A study investigated the attitudes of 354 Australian parents who have children with a disability and who attend a state school in Queensland. The children were in a range of classes, from special schools to schools where there was in-class help from a special teacher or teacher aide. Many of the parents
favoured inclusion, some would if additional resources were provided, and a small group of parents favoured special placement. There were a limited number of negative attitudes to inclusion reported by the parents, and though some parents thought that some need existed for in-service education about inclusion, this was not a widespread view (Elkins, J. et al., 2003).

A total of 274 pre-service teacher education students were surveyed at the beginning and end of a one-semester unit on Human Development and Education which combined formal instruction with structured field work experiences. The latter included interviewing community members regarding their knowledge of Down syndrome and opinions on inclusive education, and writing an associated report. At the end of semester, not only had student teachers acquired more accurate knowledge of Down syndrome, together with more positive attitudes towards the inclusive education of children with Down syndrome. Their attitudes towards disability in general had also changed, and they reported greater ease when interacting with people with disabilities. The study illustrated the value of combining information-based instruction with structured field work experiences in changing attitudes towards disability and inclusion (Campbell, J., et al., 2003).

Bradshaw. et al. (2006) found out the attitude and concern on inclusive education of 166 randomly selected pre-service and in-service teachers at the University of Brunei Darussalam on the BA primary education, B.Ed. and PGCE programs. A three-part pre-tested instrument was used to collect demographic, attitudinal and concerns data. At the whole group level, no
gender differences were found. Significant difference on attitudes to inclusive education was however found on all three bi-variate comparisons of the program students. The B. Ed. special education students were more favourable to inclusive education than the other two groups. Surprisingly the groups did not differ significantly on their concerns about inclusive students. Findings have implication for teacher education.

Sood, et al. (2011) investigated the views and perception of elementary teacher on different aspects of inclusive education. The data was taken from 200 elementary teachers of two districts of Himachal Pradesh, India with the help of self-developed scale and a questionnaire for teachers’ attitude towards inclusive education. The data were analyzed with the help of percentage analysis and responses to open ended questions were interpreted with the help of content analysis technique. The results revealed that majority of the teachers possessed moderately favourable attitude for different (psychological, social, curriculum, and administrative) aspects of inclusive education.

It is noted that the attitude of the parents and the teachers are gradually changing towards positive side of the inclusive education. Hence the participation for inclusive education is increasing.

Inclusion of children with special needs started after implementation of National Policy on Education (1968) in India. Initially, focus was given for children with physical impairment, visual impairment, and hearing impairment. Due to complications of behaviour and poor adjustment of such (children with mental retardation) children, they were taken to mainstream of education much
later. Literature on use of various strategies for development of skills for children with mental retardation and use of strategies that help inclusion of such children in regular class is limited. One of the modern strategy i.e. use of computer for developing skills in children with mental retardation in India is within two decades. No study reported about its use in helping the children with mental retardation in the regular class but some of the study reported its use in developing skills in such children.

2.6: Summary:

From the above discussion, it can be suggested that a numbers of research reports support various methods used for promoting inclusive education for the children with disabilities and specially, for the children with mental retardation. The computer assisted instruction has been effective in teaching various skills to the children with mental retardation and other children with disabilities. The review conducted so far can be summarized with the following observations.

1. Peer tutoring has been a supportive method to the teacher in encouraging the children with disabilities to be included in the regular classroom. This supplementary method is useful for the children as a) they receive more time for individualized learning, b) direct interaction between students promotes active learning, c) it reinforces their own learning by instructing others, d) students feel more comfortable and open when interacting with a peer, and e) peers and students share a similar discourse, allowing for greater understanding.
2. Cooperative learning has been used across the globe to promote inclusive education for the children with various kinds of disabilities. The children with mental retardation get benefit out of this method as they were once most marginalized group of children in the world. Various methods of cooperative learning described by the researchers such as Clock Partners, Cooperative Learning Roles, Numbered Heads Together, Rally Coach, Talking Chips and Reciprocal Teaching are very useful in promoting inclusive education to the children with disabilities.

3. The computer assisted instruction has been effective in teaching language to the children with and without disabilities. The CAI is very much helpful to the learners to acquire language as it gives a self-pace of learning and gives a scope for self-correction. The CAI gives an opportunity to explore the varied level of language input to practice a lot. The children attend to the task of learning language for a considerable time.

4. The CAI is useful for learning science to the children. This has been useful for learning knowledge, comprehension, and application of the science knowledge. As the CAI explains the queries raised by the learners the students gets motivated and get involved in learning science with the help of CAI.

5. CAI is very much useful in learning mathematics at various levels of learners. This method is being used by all age groups of children and also by the children of various comprehension levels. The effectiveness of CAI is experimented by teachers, academicians, and researchers. Many of the researchers have found that this is an effective method of teaching mathematics as it helps for self-paced learning. It safeguards the dignity of the children.
6. Some of the researchers suggest that only CAI is not effective in teaching the children but when supplemented with other traditional techniques, it helps for better learning. They suggest that the CAI may be used as a supplementary to the other teacher directed instruction for enhancing skills to the children with or without disabilities. It is also revealed that the CAI is not effective in teaching compared to the teacher directed instruction in developing mathematics in the children with learning disabilities.

7. It revealed that the attitude of the parents and teachers is changing positively towards inclusive education for the children with disabilities. The teachers are able to understand the needs of the children with disabilities after inclusion the classroom leading to appropriate support to them.

8. Finally it is revealed that the CAI has played an effective role in enhancing other instructional methods, including peer tutoring, reciprocal teaching, effective teaching principles, and direct instruction models on the achievement of elementary students with mild disabilities. The CAI is useful for both developing skills as well as encourages children participation in the classrooms. The reviews are predominantly conducted in western countries.

Inclusion is a recent trend in India and various methods are being experimented to find out successful inclusion model. So far, the inclusion of children with hearing impairment, physically impairment and visual impairment have been successful due to advancement of technologies required for these children to adapt to the demanding situation in the classroom and other places. The inclusion of the children with mental retardation in the regular classroom is at the beginning stage. The complex behaviour of the children
with mental retardation and the nature of their learning are challenges to the teachers, parents and researchers to establish the best possible methods for inclusion such children in the regular classrooms, though it is known that only children with mild and moderate mental retardation will be included in the classroom. Considering the gravity of the problem and need of the subject the researcher felt the urgent need to conceptualize the framework of the study.

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