CHAPTER III

REVIEW OF RELATED LITERATURE
CHAPTER III
REVIEW OF RELATED LITERATURE

INTRODUCTION 47
STUDIES ON COMPUTER ASSISTED INSTRUCTION 47
STUDIES ON SELF-REGULATED LEARNING 56
DISCUSSION 67
CONCLUSION 71
CHAPTER III

REVIEW OF RELATED LITERATURE

INTRODUCTION

Proper understanding of the problem and the procedure of research is the prerequisite for any successful investigation. Such an understanding will be possible only when the investigator gets himself familiarised with the related literature. Hence, before launching an investigation it is most essential for a researcher to make a survey of the studies made earlier, which are pertinent to the topic on hand. The time spent in the study of related literature is said to be a wise investment.

The literature review in a research study accomplishes several purposes. It shares with the reader the results of other studies that are closely related to the study being reported. It relates a study to the larger, ongoing dialogue in the literature about a topic, filling in gaps and extending prior studies. It provides a framework for establishing the importance of the study as well as a benchmark for comparing the results of a study with other findings. In the light of earlier researches the problem can be viewed in a different perspectives and hence the investigator is able to choose the right way to proceed in with the envisaged objectives.

In this chapter, an attempt is made to present a review of studies related to Computer Assisted Instruction and Self-Regulated Learning. After a thorough analysis of the related studies a discussion is made and the conclusion is arrived at the end of the chapter.

STUDIES ON COMPUTER ASSISTED INSTRUCTION

Massaoudi (1983) conducted a study to find out the effect of an interactive video computer programme compared to a similar traditional approach. It was found that the experimental group performed significantly better than the control group. Students of the experimental group perceived the interactive video computer programme as a positive experience and a more effective learning tool.
Porinchak (1984) made an attempt to find out the impact of CAI on the development of reading skill at the secondary level. It was found that there was a significant difference with regard to the learner preference towards the mode of instruction wherein the computer was preferred. The results also revealed that CAI and Lecture Method appeared to be equally effective for the average students.

Chevrette (1987) conducted a study to compare the college students' performances with alternate simulation formats under cooperative or individualistic class structures. The results of the study indicated that cooperative classroom structure significantly increased cognitive gains. The objects of the study indicated a preference for the computer and pair conditions.

Legenstein (1988) conducted a study to find out the effects of varied instructional strategies in facilitating student recall from visually complemented text in computer-based instruction. It was found that the presence of elaborated text increased recall performance at both low and high cognitive levels.

Lowery (1988) made an attempt to compare the two teaching strategies viz. computer-assisted instruction (CAI) and traditional lecture discussion (TLD) and to find out the relationships among student achievement, cognitive styles and teaching strategies. This study identified that CAI promoted mastery of course content regardless of student's cognitive styles. It saved time for student and the faculty. Also, it was found that no interaction between cognitive styles and teaching strategies.

Capozzi (1989) made an attempt to examine the effect of a cooperative and individual task structure on concept learning within a computer-based instructional environment. It was found that groups in both treatment conditions would have greater liking for the computer-based instruction than individuals. Also, students in the non-interdependent treatment condition were significantly more likely to have their request for information ignored by other group members.

Hooper (1989) made an investigation into the effects of cooperative group composition and performance contingency on learning, interaction and performance during computer-based instruction. The results of the study indicated that the low ability
students interacted more, progressed through the instruction more efficiently and demonstrated higher achievement in heterogeneous groups. It was found that only a small difference exist between achievement and cooperation groups.

**Kacer Barbara (1989)** conducted a study to find out the impact of small group instruction upon attitude and achievement of students learning of computer applications. This study revealed the efficacy of grouping students who are learning computer applications. The results showed that there was virtually no difference in achievement and attitude between groups and individuals.

**Lee Miwha (1989)** conducted a study to find out the patterns of peer interaction that takes place when students work cooperatively in small groups within a computer-based learning environment and to examine the effects of gender of the student and gender composition of the group on peer interaction in such a situation. The results showed that the students tended to interact quite frequently overall with their group members and their interactions were primarily task-related, collaborative and positive. Also, the male and female students had position with regard to the specific categories of interaction as well as the total interaction.

**Repman (1989)** made an investigation to find out the cognitive and affective outcomes resulting from the use of varying levels of structured peer collaboration in a computer based learning environment. The results of the study revealed that training was an effective means of increasing the frequency of giving explanations with collaborative learning groups. Also, students in the structured groups reported that they felt more control of the processes within their collaborative learning groups and had greater freedom to set their own instructional pace.

**Al-Rani (1990)** made an attempt to identify and examine the students' attitude toward the learning about computers, using computers and to correlate their attitude scores with their achievement scores in computer classes. The results revealed that even though the students' attitude toward computers were positive, their achievement level was low. This substantiates that factors other than attitude influence students' achievement.
Driscoll (1990) conducted a comparative study between the effectiveness of micro-computer assisted instruction and conventional instruction for the teaching of reference skills to the seventh grade students. It was found that micro-computer assisted instruction would be an effective method for teaching reference skills to the seventh grade students.

El-Shanhurry et al. (1990) made an investigation to find out whether computer or learner control of science instruction in a computer-based learning environment differentially affected the achievement and attitude of formal and non-formal learners. The results revealed that neither computer control nor learner control had specific differential effect on either the post or delayed achievement and attitude for a given reasoning ability group. It was also found that there was no association between skipping or repeating lesson sections and reasoning ability in the learner control group.

Whyte (1990) conducted a study to determine whether cooperative computer assisted instruction is an effective approach and to examine the interactive effects of individual cognitive style on cooperative computer-assisted instruction. It was found that students in a group performed significantly in the learning situation. The manner in which individuals are paired by individual cognitive style also made a significant difference in individuals achievement test scores.

Barbara (1991) made an attempt to find out the relation between learning styles and computer-assisted instruction. The variables, one independent (instructional design) and one moderator (learning styles) were considered. The dependent variable was the learning outcome as measured by the scores on a post test. The results showed significant main effects for instructional design. It was also found that there was no main effects for learning styles and no effects for the interaction of instructional design and learning style.

Delvin (1991) made an investigation of sex role self-concept and attitude toward computers. The main aim of this study was to determine the extent to which attitudes toward computers (i.e. anxiety, confidence, liking and usefulness) and sex role variables (i.e. masculine and feminine) might explain this bias among high school students. The
results indicate that attitude and sex role variables can be used to differentiate the type of computer users. It was found that male programmers tend to have more positive attitude than their counterparts and female programmers tend to balance both masculine and feminine attributes.

**Harrison (1991)** compared the achievement differences of subjects of varying ability who worked on computer-based tutorial in individual and cooperative group condition. It was found that subjects in individual and cooperative group learned verbal information, concepts and rules with the same level of proficiency. High and middle ability subjects in the individual condition and cooperative condition differ in their learning. Time spent on instruction showed a negative correlation to achievement on post test scores of the individual subjects.

**Housman (1991)** attempted to assess whether students who monitored their own learning using the computer were able to construct meaning for themselves thereby over-seeming their own comprehension. The results of this study shows that self-monitoring enabled an increased understanding of the metacognitive processes involved in learning and an expanded use of the computer to help students improve their personal learning performance.

**Kim young (1991)** conducted a longitudinal study to find out the interaction between gender, computer anxiety, math anxiety and test-anxiety in a college level computerized testing situation. It was found that no gender differences exist for the computer attitude; computer anxiety in testing situation exist for both genders. It was also found that gender and interaction effect were not significant for test anxiety and test anxiety was the most important predictor of math anxiety.

**Orr (1991)** made an attempt to find out the implications of cooperative group instruction and learning style for the design of computer-based instruction. It was found that there was no significant main effect for instructional delivery or learning style on performance. It was also found that there was no interaction between the two variables performance and attitude. The consideration of cooperative learning and learning style in combination does not appear to have a significant effect on either performance or attitude.
Purushothaman and Stella (1991) conducted a study to find out the effectiveness of Computer Assisted Instruction programme on learning Set Theory at the eighth standard level. They found that the experimental (CAI) group has significantly performed better than the control group taught by the traditional method irrespective of sex. They concluded that CAI was a more effective method than the conventional method in teaching 'Set Theory'.

Schultz (1991) conducted a study to determine the effectiveness of using examples and feedback when teaching a procedure using computer-based instruction. It was found that feedback was not significant on either the immediate or delayed post test. It was also found that examples were not significant on the immediate post test but it was significant on the delayed post test.

Gordon (1992) conducted a survey study to identify, categorize and validate the characteristics of interactivity based upon established principles of learning that reflects teachers' opinions about the importance and value of interaction in instructional software. It was found that teachers may use the dimensions of interactivity as a criteria for the pre-valuation of instructional software in Mathematics of Reading/Language, Arts, but should consider the differences of interactive requirements between grade level clusters before software selection is made.

Ko, Chih-En (1992) made an attempt to find out the interactive effects of timing of feedback and learners' prior knowledge on the achievement and retention of a computer-based mathematical work. It was found that immediate feedback was superior to delayed feedback for immediate achievement but not delayed retention.

Thaipakdee (1992) attempted to investigate the relationship of word processor use by foreign college writers and their attitude towards writing, writing revision practices, writing quality, attitude towards the use of computers and time spent on computers. The results of the study indicate that students' attitudes towards writing and their perceptions of computer usefulness significantly affected their writing quality. Students with more positive attitude towards writing and usefulness of computers tend to produce better quality of writing. It was also found that students' levels of computer
anxiety, computer confidence, computer linking and their writing revision practices did not significantly affect the quality of their writing.

Tsai (1992) made an attempt to find out the effects of different systems of positive reinforcement on computer-based learning. The findings of this study suggested that computer-based learning of this type made be effective in improving student achievement. It was emphasised that positive reinforcement need not be provided for every correct response. It was suggested that software designers should emphasize the quality of instructional content rather than entertaining the student.

Mahajan (1994) made an attempt to find out the effectiveness of CAI for teaching singular and plural at II grade. The study made a comparison between traditional lecture method and the CAI. It was found that the CAI was effective for teaching singular and plural as compared to traditional method.

Balasubramanian (1995) made an attempt to find out the cognitive attainment of pupils in computer education specifically in computer literacy, range of computer applications and computer programming. It was found that pupils studying in the higher standard have more computer literacy and higher cognitive attainment in computer applications when compared to those studying in lower classes.

Mahapatra (1995) conducted a study to examine the effectiveness of a software package developed for teaching chemistry to ninth standard students. It was found that the package was effective in terms of achievement of the students in the criterion - referenced tests. The developed software package was found superior to the traditional method in terms of higher mental abilities in science when their mean scores and overall achievement scores were adjusted with respect to intelligence.

Rangaraj (1995) conducted an experimental study to find out the effectiveness of Computer Assisted Instruction in Teaching Physics at the Higher Secondary Stage. It was found that CAI serves as an effective agent in achieving the instructional objectives in teaching Physics at Higher Secondary Level. It was also found that CAI as a support system to teachers in the classroom instruction was more effective when compared to conventional lecture method and CAI as individualised instruction.
Ruberg et al. (1996) conducted a case study to find out the student participation, interaction and regulation in a computer-mediated communication environment. This study showed that the CMC-based activities offered an alternative pattern of interaction which differed from the face-to-face pattern. It was also found that the CMC discourse encourages experimentation, sharing of early ideas, increased and more distributed participation and collaborative thinking. This study suggested that the successful use of CMC activities requires a classroom social environment that encourages peer interaction.

Bernard (1997) used meta-analysis to examine several questions concerning gender differences in computer related attitudes and behaviour. It was found that boys exhibited greater sex-role stereotyping of computers than girls. It was found that gender differences in computer-related behaviours were small and did not differ as a function of the study population in terms of both current behaviour and prior experience with computers.

Christmann et al. (1997a) made an attempt to compare the effects of computer-assisted Instruction on the academic achievements of secondary students to the traditional approach. This study employed a meta-analytic technique. It was found that students receiving traditional instruction supplemented with CAI attained higher academic achievement than those receiving only traditional instruction.

Christmann et al. (1997b) made a comparative study on microcomputer based computer-assisted instruction in different subject areas. The meta-analysis compared the academic achievement of students across eight curricular areas. It was found that students receiving traditional instruction supplemented with CAI attained higher academic achievement than the traditional instruction group. Among the eight content areas, students receiving instruction in science showed higher mean effect size.

Jehng (1997) made a study on "The Psycho-social process and cognitive effects of peer based collaborative interactions with computers. It was found that the students who had participated in three collaborative learning environments demonstrated superior program generation abilities on the post test compared to those who had learnt to solve problems individually."
Anandan (1998) made an attempt to find out the effectiveness of CAI in teaching Economics at the XI standard level. It was found that CAI method has produced significantly positive effect on the achievement of the students compared to the traditional method. It was also observed that significant difference in achievement between CAI method and traditional method even after controlling the intelligence and socio-economic status of the students.

Kelvin et al. (1998) made a comparative study between human-like versus machine-like interactional styles of computer interfaces. They have measured the role of computer feedback. It was found that computer feedback had considerable impact upon reflected appraisals (participants perceptions of the computer's evaluations of their performance and ability) as well as upon their self-appraisals of performance and ability. Also, it was noted that the reflected appraisals were more influenced by computer feedback than self-appraisals.

Mark and Danielle (1998) made an attempt to examine the degree to which computer and test anxiety had a predictive role in performance across three computer-administered placement tests (math, reading and written English). Results showed that age and test anxiety were significant predictors for math performance. When reading was the outcome variable, age and computer anxiety were statistically significant performance predictor. There were no predictors which were statistically significant for the written English. The results of this study suggested that what we considered as computer anxiety may in fact be a manifestation of test anxiety.

Muhammad and Al-Jabri (1998) made an attempt to measure and analyze the relationships between computer attitude and its components (anxiety, confidence, linking and perceived usefulness) and utilisation of computers within the context of a major educational institution in Saudi Arabia. It was found that the overall attitude towards computer is strongly related to computer utilization. In addition it was found that all the four attitude components were significantly correlated with computer utilization. Also, the degree of liking significantly affects the degree of computer utilization.
Shinde (1998) conducted a study to find out the effectiveness of CAI packages for teaching English Grammar to the IX standard students. The results revealed that CAI packages are more effective than the traditional method in teaching English Grammar. The students of the experimental group have shown positive opinion about the CAI and they felt that CAI packages were useful.

STUDIES ON SELF-REGULATED LEARNING

The initial work on self-instruction/self-learning provided a base for self-regulated learning. Social cognitive researchers viewed self-regulation as an achievement of socialization processes. The interest on the topic "SRL" was developed from the Social Learning Theory of Albert Bandura (1986). Zimmerman (1986) traced the origins of self-regulatory competence. Initially, the researchers in self-regulation worked on the topics 'Self-efficacy', 'Self-motivation' and 'Goal setting' of the students. Further, the role of self-reward, punishment on behaviour, need gratification and learning from modelling have also been studied. Later the self-regulatory processes and strategies have been identified using the triadic view about self-regulation. Some of the studies on self-regulation are discussed here.

Bandura and Schunk (1981) conducted a study to find out the effect of self-motivation on self-efficacy. The results indicated that when students can gauge their goal progress, the perception of improvement enhances self-efficacy. It was suggested that assessing progress toward a distant goal is more difficult and uncertainly about one's learning will not instill high self-efficacy for improving one's skills. Further, the results indicate that goal setting students displayed greater intrinsic interest.

Mosatche and Bragonier (1981) made an observational study on preschool children about their social comparisons. They found that the preschoolers' social comparisons primarily involved, establishing how one was similar to and different from others. It was seen that the competition seemed to be based on a desire to be better than others and it does not involve self-evaluation.
Schunk (1981) made an attempt to find out the modelling and attributional effects on children's achievement. It was found that both the cognitive modelling and didactic instruction led to significant increases in self-efficacy, skill learning and persistence. But, modelling resulted in significantly greater division skill learning compared to the didactic treatment.

Zimmerman and Ringle (1981) studied the effect of both vicarious and direct outcomes of problem-solving which affected young children's perceptions of self-efficacy as well as their subsequent motivation. The results indicate that the self-efficacy perceptions generalized to a new problem-solving tasks.

Davidson and Smith (1982) conducted a study to find the effect of modelling. It was found that children who observed a lenient model rewarded themselves for lower scores more than did children who observed a stringent model. The result of the study suggest that age similarity may have led children to believe that the standards adopted by the peer are the most appropriate for them.

Schunk (1983a) made an attempt to test the effect of goal difficulty on the achievement of the children. It was found that difficult goals enhanced motivation and it led to higher post test division skill. Also, direct goal attainment information promoted self-efficacy.

Schunk (1983b) made an attempt to find out the effect of reward contingencies on self-efficacy. It was found that performance-contingent rewards led to the greatest task motivation and the highest post test division self-efficacy and skill. Offering rewards for participation led to no benefits compared to merely providing instruction.

Schunk (1984) compared the effects of performance-contingent rewards to those of proximal goals. The subjects received division instruction and practice over session. It was found that the three forms of conditions led to equally high motivation during the sessions. But it was found that, comprising rewards with goals resulted in the highest self-efficacy and division performance.

Schunk and Hanson (1985) made an attempt to find out the role of peer models on children's achievement. It was found that mastery and coping models increased
self-efficacy and subtraction achievement better than that of the control group. Student's self-efficacy for learning aided better by observation of similar peers.

Elliot-Faust and Pressley (1986) conducted a study to find out the effect of self-instruction training. It was found that the self-instruction training enhanced the youngsters' reading comprehension. Also it fostered the students' continued use of the comprehension strategy.

Zimmerman and Martinez-Pons (1986) conducted a structured interview for assessing students' use of self-regulated strategies. The sample of the study consisted of 80 students of 10th grade, 40 of each from high and low achievement track. Fourteen categories of self-regulation strategies were identified from student answers that dealt with learning contexts. It was found that high achieving students displayed significantly greater use of 13 categories of SRL. The result of this study suggest that the critical conceptions of students as initiators, planners and observers of their own instructional experiences have empirical and practical merit.

Zimmerman and Martinez-Pons (1988) made a validation study about a strategy model of student self-regulated learning using student interviews - teacher ratings and achievement test outcomes. Students' reports of using self-regulated learning strategies during a structured interview correlated (0.70) with the obtained teachers' rating factor and were negatively related to student verbal expressiveness and achievement factors.

Howard and Cynthia (1989) conducted a study to examine the SRL model proposed by Como and Mandinach (1983). Como's model proposes specific variations in students' approaches to complex learning tasks depending on the strategies available to them, their self-management skills and the demands of the task. The components cognitive processes of this model are categorized as either acquisition processes or transformation processes. The acquisition processes are labelled as attending, rehearsal, monitoring and strategic planning. The transformation processes are labelled as selectivity, connecting and tactical planning. The four forms of cognitive engagement proposed in this model are defined by use of high levels versus low levels of acquisition and transformation. From the
study it was found that, two different measures of the component processes labeled strategic planning and connecting were correlated with pre-test measures of ability and motivation. This may serve as some evidence that these two cognitive processes are important to SRL regardless of variations in task demands.

Schunk and Hanson (1989) made an attempt to find out the role of self-modelling on children's learning. It was found that students' who have seen performance (by video tape) were displayed higher self-efficacy motivation and self-regulated strategy use than the others. The results of the study suggests that teachers must use the social and instructional supports and encourage the students to work on their own, so that the students may achieve an imitative level of competence.

Zimmerman and Martinez-Pons (1990) conducted a study to find out student differences in self-regulated learning, relating Grade, Sex and Giftedness to self-efficacy and strategy use. It was found that, boys and girls differ in their use of self-regulated learning strategies. Gifted students, made greater use of self-regulated learning strategies. The use of a number of self-regulated learning strategies relate to students' grade level in school. Students with increasing age and grade level shows more self-regulation.

Yang (1991) conducted a study to examine the relationship between the level of self-regulatory skills and the type of instructional control in a computer based instruction. The results of the study shows that learner control group was more affected by the level of students self-regulatory skills than the programme control group. With embedded questions, learner control group used high self-regulatory skills. The results of the study provided empirical evidence that students self-regulatory skills play a critical role in effective exercise of learner-control strategy in computer based instruction.

Sawyer et al. (1992) made an comparative study to find out the effects on the composition skills and self-efficacy of students with learning disabilities. This study emphasizes the use of Self-Regulated Strategy Development (SRSD) model for the students with learning disabilities. From the study it was confirmed that the self-regulation procedures are not costly in terms of time or materials. It was also found that
learning the story, grammar strategy through SRSD had positive effects on the compositions of students with learning disabilities.

**Wibrowski and Rocha** (1992) conducted a study to investigate the use of SRL possesses to achieve academic success by students who came from disadvantaged environment. The relationship between the variables viz. academic achievements, self-regulation outcomes and learning activities were examined in this study. Based on Zimmerman's model of social cognitive view, it was predicted that high achieving students would display more self-regulation to their teachers and would report more efforts to self-regulate their learning activities at their home and in classroom environments. The pattern of correlations among the self-regulated strategies used by high achieving students in inner city environments was also found.

**Winn** (1992) conducted an exploratory study to find out the implementation and student outcomes of instruction for self-regulation through mediated collaborative problem solving. It was found that assessment was possible in a wide variety of areas including the students declarative, conditional and procedural knowledge about strategies, their conceptions of reading and their understanding of text. Scaffolding decisions were found to be affected by the nature of scaffolding, the task utilized, the lack of a meta-script and the implementation which places the teacher in the role of a novice.

**Schunk and Swartz** (1993) conducted a study to find out the effect of feedback on self-efficacy, in the writing course attainment of the elementary school children. It was found that feedback about the students' performance increases their self-efficacy and motivation. Also, the process-goals and feedback helps the students retain the writing information for a long period than the others.

**Zimmerman and Bandura** (1994) made an attempt to find out the impact of self-regulatory influences on writing course attainment. It was found that verbal aptitude affected writing course outcomes only indirectly by its influence on personal standards. It was also found that perceived academic self-efficacy influenced writing grade attainments both directly and through its impact on personal goal setting. It was
concluded that the different facets of perceived self-efficacy played a key role in writing course attainment.

Caroline et al. (1995) made an attempt to assess the role of autonomous self-regulation as a predictor of academic procrastination. The results of the study indicate that self-regulation styles are associated with procrastination in an important real-life domain (i.e.) education - underscore the relevance of self-regulation in motivational problems common to everyday life.

Eunsook Hong (1995) made a comparative study between the state and trait self-regulation models. It was found that clear state-trait distinction does not exists in the cognitive domain whereas the state-trait distinctions found in affective personality domain. In both the measures, it was found that students who engaged more frequently in metacognitive activities and effort use in their mathematical problem solving performed better than those who did not. This study confirms that awareness, cognitive strategy, planning and self-checking were yielded by metacognition whereas metacognition and effort were yielded by self-regulation.

Feldmann et al. (1995) made an preliminary attempt to find the relationship among self-efficacy, self-regulation and collaborative verbal behaviour. It was found that more self-regulated students tend to display higher collaborative verbal behaviour than less self-regulated pupils. These findings, are consistent with social cognitive theory of Bandura and Zimmerman, in which self-efficacy and self-regulation play central roles in academic performance. The findings of the study suggest that self-regulation either influences the occurrence of the isolated forms of behaviour or influences the extent to which students can benefit from them when they come into play.

Roney and Sorrentino (1995) conducted a study to find out how the uncertainty orientation, self-regulation and performance was used to reduce the self-discrepancies. Three studies were conducted to find out these relationships. The results yield to the following inferences: Uncertainty orientation and achievement-related motives interact with the presence or absence of self-discrepancy in predicting performance, which leads to the conclusion that discrepancy engages uncertainty-oriented people, whereas
congruence engages certainty-oriented people. There was a close-relationship between the long-term self-discrepancies and the grades of the students. The discrepancy reduction is not necessarily the primary motivator for all people.

Therese et al. (1995) conducted a study to examine whether a relationship exists between types of goal orientation, self-regulatory processes and school performance among college students. It was found that there is a systematic relation between learning goal and self-regulation and academic achievement. More self-regulatory strategies were reported and higher academic performance was achieved by students having high concern with both learning and performance goals than by others. It was also found that the components of self-regulation viz. cognitive strategies, meta cognitive strategies, motivation and academic performance are positively and significantly correlated with the goal orientation.

Nola et al. (1996) examined the differences between Australian and Japanese secondary school students' conceptions of learning and their use of self-regulated learning strategies. It was found that the Australian students have a narrow, school based view of learning whereas the Japanese students view learning from a broader perspective. In spite of the differences in learning conceptualizations, the strategies used by students in a Western learning context are similar to those used by Japanese students.

Nola and John (1996) conducted a comparative study between Australian students, Japanese students at school in Japan and Japanese students studying in Australian schools. The main objective of the study is to compare the strategies used by the above three groups of upper secondary school students to regulate their own learning processes. It was found that students in the three groups used a similar range of strategies but the pattern of use for each cultural group varied. Variations in the pattern of strategy use were also associated with academic achievement. The Japanese students used memory strategies significantly more than did the Australian students. Also, it was found that Japanese students studying in Australian resembled their Australian counterparts more than their Japanese counterparts on many of the strategies.
Nordstrom (1996) made an attempt to find out the impact of self-regulatory processes on Interviewer Evaluations. It was found that participants high in self-regulation were more likely to alter their impression of a job candidate to take into account situational constraint information than were those low in self-regulation. Impression differences occurred despite the fact that both groups showed equivalent recall for situational constraint information. Result of this study suggest that this procedure may place differential processing demands on those taking part in a structured interview.

Zimmerman and Kitsantas (1996) conducted a study to find out the role of goal setting and self-monitoring on self-regulated learning of a motoric skill. The results of this study suggested that as strategic performing is being internalized, process goals enhance learning better than product goals.

Ana et al. (1997) made an investigation to find out the need to include explicit attribution retraining in a programme designed to teach reading comprehension strategies to children with learning disabilities. The programme had two versions viz. self-regulation procedures and self-regulation procedures with attributional retraining. The effects were assessed via attribution measures, cognitive and metacognitive reading comprehension tests. Results indicated that children from both training groups improved on measures of cognitive strategies, but their gains were very low on metacognitive measures. Regardless of training condition, students from both groups showed equally good attribution profiles.

Ablard and Lipschultz (1998) made an attempt to find out the relations to advanced reasoning, achievement goals and gender among the high-achieving students. It was found that advanced reasoning was not related to self-regulated learning. Performance goal orientation was related to self-regulated learning only in conjunction with mastery goal orientation. It was also found that the mastery goal orientation and gender were significantly related to SRL. As mastery goals increased, the use of SRL strategies increases. Girls reported greater use of SRL strategies involving personal regulation and also when engaged in reading and writing.
Christopher and Pintrich (1998) conducted a study to assess the mean level differences in students' task value, self-efficacy, text anxiety, cognitive strategy use, regulatory strategy use and classroom academic performance by gender and across the subject areas of mathematics, social studies and English. The results revealed mean level differences by subject area and gender in the motivation and cognitive strategy use of variables but not in regulatory strategy use or academic performance. The results also indicated that the relation among these constructs was very similar across the three subject areas examined.

Eunsook Hong (1998) made an investigation on differentiated stability of state and trait self-regulation in academic performance. Student who were enrolled in educational psychology courses and students taking courses related to research methods have been taken as the participant in this study. In this study structural equation modelling was used for the first time to investigate stability of state and trait self-regulation. The evidence of differential stability of state and trait self-regulation in academic performance was found in this study. It was found that trait self-regulation was more stable over time. Individual differences were also found in the state stability between the content areas. In the two content areas, state stability was mediated by trait stability which reveals that an individual with high trait self-regulation tend to exert high state self-regulatory behaviour.

Hirotsugu and Tanaka (1998) made an attempt to investigate the relations among autonomy, self-referenced beliefs and self-regulated learning among the Japanese elementary school children. The results revealed that the better self-regulated learning is positively correlated with the external regulation. Similarly, learning orientation and deep strategy processing in the intention learning mode of SRL are positively correlated with control self-referenced beliefs.

James et al. (1998) made a study on the perceived self-regulation and individual differences in selective attention. The purpose of the study is to investigate the role of conscious and unconscious suppression processes which are important for self-regulation. The study revealed the following results: Individuals who can effectively
initiate action forward goals (action-oriented) and better block over non-goal-relevant informative have higher levels of perceived self-regulatory success. Negative priming and action-state orientation, have strong theoretical links to self-regulation. Both conscious and unconscious inhibitory processes may influence perceptions of self-regulatory success.

Karen Haris et al. (1998) conducted an experiment to find out the effect of self-regulated strategy on the writing process. They have taken the students with learning disabilities and they taught the students with the self-regulated strategy development (SRSD) model. They assist the students to develop strategy for planning and writing essays. They provide all services to the students in a team-based inclusion setting. They found that the collaborative practice of the composition and self-regulation strategies appear critical for students with learning disabilities. It was found that, neither writing practice alone nor knowledge of a powerful writing strategy is sufficient for the students with learning disabilities. They also found that the scaffolded, collaborative use of the strategy appears to be critical to realizing the full potential of writing strategies for students who experience severe difficulties with writing.

Kathryn and Young (1998) made an attempt to examine the differences between the self-regulation reported by regular admission students and by underprepared (Developmental) students. The self-regulation processes in randomly selected developmental and regular admission college students were identified using a structural interview. It was found that the developmental and regular admission students differed significantly in their self-regulatory strategy deployment. The results suggest that self-regulation may be a distinguishing characteristic between some developmental and regular admission students.

Kevin Ford et al. (1998) made an attempt to establish the relationships of goal orientation, metacognitive activity and practice strategies with learning outcomes and transfer. From the analysis it was found that mastery orientation was positively related to the metacognitive activity of the learner. Metacognitive activity was also significantly related to knowledge acquisition, skilled performance and self-efficacy of the learners.
The three training outcomes were related to performance on the transfer task. This study provides the theoretically based insights for designing training to enhance performance in cognitively complex, dynamic environments.

Minna (1998) studied the development of self-regulation in school in a Vygotskian framework. The aim of the study was to analyze the progressive development of intra-psychological regulation in children's help seeking behaviour. The students were placed in a problem-solving situation and they had the opportunity to seek help from the experimenter, if needed. The results revealed that the self-regulation is influenced by both age and academic achievement. High-activity students exhibited advanced capacities of self-regulation. Also, the effect of age was found to be less important in the problem-solving situation.

Strage (1998) made an attempt to examine the relationship between family context variables and the development of self-regulation skills among the college students. It was found that the family background scales had been correlated with students' perceptions of the course as interesting and supportive. Both family background scales associated with time and effort management difficulties approached significance as predictors of such difficulties. The results support the conclusion that family background more specifically the quality of the relationships with parents indeed predictive of a number of aspects of college students' attitudes and behaviours relating to self-regulated learning.

Taylor et al. (1998) conducted a study to explore the relationship among the mental simulation, self-regulation and coping. It was found that students who had simulated the process of studying for the examination during the week prior to their midterm benefited from their mental simulation. Mental simulations can have beneficial on self-regulation when they enable people to regulate their emotions effectively and engage their problem solving strategies.
DISCUSSION

From the review of the studies on “Computer Assisted Instruction (CAI)” it was found that CAI was found to be effective in promoting the mastery achievement / performance of the students compared with the traditional lecture method (Lowery, 1988; Driscoll, 1990; Purushothaman & Stella, 1991; Mahajan, 1994; Mahapatra, 1995; Rangaraj, 1995; Christman, 1997b, Anandan, 1998 and Shinde, 1998). Further, it was found that CAI is effective in teaching Reference skills (Driscoll, 1990), Set Theory (Purushothaman & Stella, 1991), English Grammar (Mahajan, 1994; Shinde, 1998), Chemistry (Mahapatra, 1995), Physics (Rangaraj, 1995) and Economics (Anandan, 1998) to the students of different age and grades.

Some of the studies revealed that CAI was very effective when it was supplemented with the regular classroom instructions (Rangaraj, 1995; Christman, 1997a). It was also found that CAI is effective for slow learners (Porinchak, 1984). It was suggested that if the computer based instruction is presented in elaborated text form, it enhances the recall performance of the learners at both low and high cognitive level (Legenstein, 1988). Further, it was found that students' perceive that interactive video computer programmes are the effective learning tool (Massoudi, 1983).

Computer-based co-operative instructions are found to be slightly more effective than that of others (Capozzi, 1989; Hooper, 1989; Harrison, 1991). It was also found that computer-based co-operative instructions are effective in increasing the cognitive gain/performance of the students (Chevrette, 1987; Lee Miwha, 1989; Repman, 1989). Further, studies on peer-based instructions revealed that computer-mediated communication activity requires a classroom social environment than encourages peer interaction (Lorena, Ruberg et al. 1996) and different computer-based collaborative learning environments produced different manifested psycho-social behaviour (Jehng, 1997).

Attitude toward computers and anxiety about the computers are considered as the factors affecting the performance of the individual in a computer-based learning environment. Studies on computer attitude revealed that computer-based learning environments influences the students attitude (El-Sanhurry et al., 1990) and the positive
attitude toward computers increase the achievement / performance (Al-Rani, 1990). Studies on computer anxiety revealed that computer anxiety may be a manifestation of test anxiety and the test anxiety was the most important predictor of math anxiety (Kim Young, 1991; Mark & Danielle, 1998). It was also found that computer attitude and computer utilization correlates significantly and the computer liking tendency affects the degree of computer utilization (Muhammad & Al-Jabri, 1998).

Studies on cognitive style and CAI revealed that CAI was effective when paired with the cognitive style of individuals upon the achievement (Whyte, Michael, 1990). Also, it was found that there was no main effect on performance of the students in the computer-based learning environments due to their learning styles (Orr, 1991; Barbara, 1991).

Studies on computer feed-back revealed that it has impact upon reflected appraisals (Kelvin, et al., 1998) and the feed-back provided by the computer was very much effective for the delayed post-test / retention test (Schultz, 1991; Ko, Chih-En, 1992). Further, it is noticed that positive reinforcements are effective in a computer-based learning environments and it is not essential to provide reinforcement for every correct response (Tsai, 1992).

Computer-based gender studies find that gender effect exists in a computer-related behaviour (Lee Miwha, 1989; Bernard, 1997) where as gender differences does not exist for the computer attitude (Kim Young, 1991).

The study of Housman (1991) found that the self-monitoring enabled an increased understanding of the metacognitive processes involved in learning and an expanded use of the computer in improving the learning performance of the students. Further, it was observed that pupil studying in the higher standards has more computer literacy and higher cognitive attainment in computer applications (Balasubramanian, 1995). From the review it was found that most of the studies suggested that computer-based instructions are used as a effective tool to enhance the learners' performance.

As already discussed, the initial work in the area of SRL were concentrated on the self-efficacy and self-motivation of the learners. It was found that the self-motivation / goal attainment promotes self-efficacy (Bandura & Schunk, 1981; Zimmerman &
It was also found that feedback about one's performance increases one's self-efficacy and motivation (Schunk & Swartz, 1993). Moreover, self-efficacy and self-regulation play central roles in academic performance (Feldmann et al., 1995).

Studies on metacognition indicated that metacognitive activity is important for the mastery orientation in learning (Kevin Ford et al., 1998) and it was useful for the better problem-solving in Mathematics (Eunsook Hong, 1995). It was also found that metacognitive activity is significantly related to knowledge acquisition, skilled performance and self-efficacy of the learners (Kevin Ford et al., 1998). But, it was found that, for the children with learning disabilities, the metacognitive gain was not significant (Ana et al., 1997). Hence, it was again understood that self-regulation is the higher order process in learning.

Goals are identified as one of the most important factors in self-regulation. Goal setting is a key process in which one sets a goal and plans to achieve the goals. It was found that there is a systematic relation between learning goal, self-regulation and academic achievement (Therese et al., 1995) goals are highly correlated with self-efficacy beliefs (Zimmerman & Kitsantas, 1996), goal setting students displayed greater intrinsic interest (Bandura & Schunk, 1981) and when mastery goal increased, the use of SRL strategies have also increased (Ablard & Lipschultz, 1998). Also, it was found that when the rewards are combined with goals it was resulted in the highest self-efficacy (Schunk, 1984).

According to the social learning theory (Bandura, 1986) modelling plays a vital role in enhancing the self-efficacy of the students. The studies on modelling revealed that cognitive modelling and self-modelling increases the self-efficacy and motivation of the students (Schunk, 1981). Also, models are effective in the increase of scores of the children (Davidson & Smith, 1982).

The study of Christopher & Pintrich (1998) suggested that the general models of self-regulated learning are being developed. The comparative study on state and trait self-regulation models (Eunsook Hong, 1995) confirms that awareness, cognitive
strategy planning and self-checking were yielded by metacognition and effort were yielded by self-regulation. Further, it was found that an individual with high trait self-regulation tend to exert high state self-regulatory behaviour (Eunsook Hong, 1998).

The study of Zimmerman & Martinez-Pons (1986) identifies the students' use of 14 self-regulatory strategies. It was found that the high achieving students displayed significant use of 13 SRL strategies and the self-regulated learning measures proved to be the best-predictor of achievement test scores.

Strategy model of self-regulation (Zimmerman & Martinez-Pons, 1988) suggests that structured interview was useful in assessing students' use of SRL strategies. It was also found that students' report of using SRL strategies during a structured interview highly correlated with the obtained teachers' rating factor. This study reveals that SRL is assessable. Further, it was found that students with increasing age and grade-level shows more self-regulation (Zimmerman & Martinez-Pons, 1990). Further, considerable evidence revealed that SRL enhances the performance of the students (Roney & Sorrentino; 1995; Nordstrom, 1996; Kathryn & Young, 1998).

Self-regulation is influenced by both age and academic achievement (Minna, 1998). Also, the family background-more specifically the quality of the relationships with parents affect the students' attitudes and behaviours relating to self-regulated learning (Strage, 1998). It was found that both conscious and unconscious inhibitory processes may influence perceptions of self-regulatory success (James et al. 1998). Further, it was found that mental simulations have beneficial effects on self-regulation when they enable people to regulate their emotions effectively and engage their problem-solving strategies (Taylor et al., 1998).

Studies on self-regulation and writing course attainment revealed that process-goals and feedback helps the students to retain the writing information for a long period of time (Schunk & Swartz, 1993) and different facets of perceived self-efficacy played a key role in writing course attainment (Zimmerman & Bandura, 1994). Also, it was found that the collaborative practice of the composition and self-regulation strategies appeared to be critical for the students with learning disabilities (Karen Haris,
et al., 1998). Studies on cultural differences in SRL revealed that cultural differences exist among the students' use of SRL strategies. It was found that Australian and Japanese students differ in their use of SRL strategies (Nola, et al., 1996) and the Japanese students used memory strategies significantly more than the Australian students (Nola & John, 1996).

The study of Yang (1991) provided an empirical evidence that students' self-regulatory skills play a critical role in effective exercise of learner-control strategy in a computer-based instruction.

CONCLUSION

The review of literature provides a clear picture about the present status of "Computers in Education" and the importance and effect of self-regulation in learning. From the studies, it was understood that recent research on students' academic performance stressed the need for effective learning. Self-regulation has now become a unifying concept in academic learning. Until recently there has been very little empirical evidence regarding how students become masters of their own learning.

Computers are everywhere, in all walks of life. Ability to use computer is a requirement or at least a major advantage for success in multiple disciplines. The common consequences or concomitants of computer use tend to be increased in students' motivation, increased peer interaction and a shift in teachers' role away from didactic whole class instruction toward more individualized and student-centered interaction (Schofield, 1997). The assessment of students' ability to use computers should be a central tenet of educational computer research. From the studies it was suggested that using computers can change students' control in the larger classroom environment and can influence their sense of control over the tasks they are performing (Schofield, 1995). Further, it was suggested that a high level of student control over CAI is more effective in promoting learning.

Currently, many educators and policy makers defend the view that a major goal of formal education should be to teach students self-regulatory skills. These, skills are
viewed as vital not only to guide one's own learning during formal schooling but also to educate oneself and up-date one's knowledge after learning from the school. Many educators and psychologists hope that psychological knowledge about how students become self-regulated learners and about successful instruction will be helpful for effective learning. Computers have a potential to regulate students learning and hence, it is interesting to find out the effect of computers on the students' higher order learning.

Schunk & Zimmerman (1997) suggested that peer-assisted learning may be useful in enhancing the self-regulatory competence, since the group members serve as a model for each other. Further, they have suggested that the social learning experiences can be planned and organized to accelerate children's self-regulatory development. Also, Schunk (1994) emphasized that research is needed on the effectiveness of classroom methods to train students to effectively regulate self-efficacy and attributions during cognitive skill learning.

Hence, in the present study, an attempt has been made to study the effectiveness of Computer Assisted Instruction in relation to Students' use of Self-Regulated Learning Strategies.