Chapter II

Review of Related Studies
An Analytical review of the research evidence related to the problem has been presented in this chapter with a view to seek some guidelines from the previous researches which could be helpful in formulating the present investigation and to understand the intricacies of the problem and enabling formulation of hypotheses and get insight into variables.

The present investigation was aimed at exploring the relationship of acquisition of biological concepts with two different strategies as related with intelligence and cognitive style. The review is presented under the following major heads –

- Teaching Strategies
- Intelligence
- Cognitive Style

2.1 TEACHING STRATEGIES

Time to time many research studies related to different strategies and their effectiveness relating to psychological processes and support variables have been conducted. Some findings of studies having relevance to the present study are given below.

Jamison et al. (1974) suggested that even when there were no differences in achievements, computer Assisted instruction did produce some saving of time. They also found that Computer Assisted instruction resulted in improvement in terms of achievement when used in small amounts with slower students.

Edwards (1975) developed two computer based simulations were tested to teach problem solving in legal education. He applied and
documented an instructional design system model, incorporating techniques of simulation design and of computer Assisted instruction design. Students who completed both simulation felt that computer simulation method was superior to the case method. Attitude towards the content of the simulation was far more favourable after simulation experience than before.

**Jackson (1976)** found that the effectiveness of computer assisted instruction and programmed instruction are equal.

**Sevenson (1977)** In his study of learning process and strategies involving eighty first year education students, found that the distinction between holistic and atomistic cognitive approaches was consistent over different occasions when the students were asked to recall their knowledge of two texts in experiments.

**Hunt (1980)** found no observable differences in computer managed instruction classes in respect of achievement of students.

**Montiel (1980)** found that the students achieve better in terms of subject matter content mastery when taught with psychological strategies using a personalized system of instruction mastery based model.

**Ann Stephanie Steno (1981)** studied “A relationship between teaching techniques and students achievement of high cognitive level question asking skill”. He reported that feedback and corrective responses enhance learning.

**Barnato and Barret (1981)** found that computer simulation can do wonders in the field of science especially in laboratory where through simulations students can do experiments normally considered impractical or impossible to conduct otherwise.

**Tillema (1982)** studied the relationship among sequencing of text material and information processing strategies. Data analysis showed
that ‘web’ condition resulted in better performance on various dependent variable than the ‘Linear’ condition.

**Tarrant (1982)** concluded that high motivation and interest in computers may make it easier to take advantage of drill and practice programs for the disadvantaged learners.

**Levy (1982)** found that the traditional reading method was more effective than perspective method and computer assisted method.

**Austin (1983)** found that a computer assisted instruction lesson was effective for teaching a geometry concept attainment exercise.

**Cameron, R.K. (1983)** in his study “The effect of two instructional treatments on eighth grade students attitudes towards animal life” found that the media based instructional group showed greater change in the positive attitude toward animals.

**Elg, Thomas (1983)** found that the computer simulation experience seems to have provided a cognitive motive which the students could apply to the learning of problem solving.

**Bradley (1983)** concluded that computer assisted instruction has been effective in mathematics, science and social studies. This showed improvement in achievement for both boys and girls, using computer assisted instruction to study American history.

**Heilman (1983)** revealed that computer simulation practice helped students reinforce rule-using behaviour as well as increase verbal learning.

**Vezquez (1983)** showed that the computer assisted instruction was effective in chemistry, science achievement at secondary school level.

**Dechow R.R. (1984)** studied “A comparison of team games tournament and traditional class room methods in high school biology”. His findings are that team games tournament has no significance effect
Hinterthuer, Rick James (1984) studied “The relationship of development of college students learning styles of computer assisted instruction and programmed instructions”. The investigation was to determine the relationship between preferred learning styles to develop attitude towards computer assisted instruction and programmed instructions of students. A parallel treatment design was used to match each of the four learning styles, as determined by Kolb's learning style inventory (LSI) with a state of art computer assisted instruction and traditional programmed instruction. There was a significant relationship between learning style and mode of instruction preferred.

Narthasilpa, Amnay (1984) studied “The effect of micro-computer instruction of knowledge in computer programming and attitude of science education students”. The purpose of the study was to determine the relative effect of micro-computers instructions on science education, Student's knowledge in computer programming and their attitudes towards micro-computers. The results showed that there was no significance difference in the mean scores T-I and T-2 on groups either knowledge of computer programming or attitudes. At the completion of treatment it was found that the knowledge of micro-computers does not effect the attitude of science education students.

Carnest Ernest. R. (1985) studied “Micro-computer tutorial physics programme with advance organizers using various size group”. The findings of the study pointed out that student working in group of 3-4 on computer tutorials has significantly better rates of learning than working alone. While no significant differences in achievement or retention was observed.

Marsh, Merle Miller (1985) found that the computer using group scored significantly higher on total score of the post test and on sections
of the test which involved the use of factual comprehension and application type thinking skills. There was no statistically significant differences in scores on sections of the test which featured synthesis, analysis or evaluation type thinking skills.

**Summerville, Lorelei Jannet (1985)**, studied “The relationship between computer assisted instruction and achievement levels and learning rates of secondary school students in first year chemistry.” It was found that the mean gain scores of computer assisted group were greater than those of the control group. Further, that the gain scores for students with low mathematical ability also improved with the introduction of computer assistance.

**Hawley (1985)** indicated that adjunct micro-computer assisted instructions significantly improved the mathematics concepts, maths problem solving, total math and computer literacy of grade three and five students.

**Stefen (1985)** found that computer assisted instruction is more effective over traditional instruction in improving bowling skills at the college level.

**Thomas (1985)** found that computers have the effect in learning accounting skills.

**Madison (1985)** recommended for applications of the findings emphasized increased use of micro-computers in accounting institutions. Recommendations were also made for further study in the area of computerized instruction.

**Girdhari Lal (1986)** found that learning packages was most effective mode of instruction out of three modes i.e. learning packages as a mode of instruction, Lecture method and instruction through branching program.
Fox (1986) concluded that a computer based individualized instructional delivery system for educating students in a general education science course was not as effective as a lecture based instructional delivery system.

Collard, Gerald Lilyd (1987) investigated, “The effectiveness of the personalized system of instruction to the traditional lecture discussion method in relation to student achievement, attention and attitudes”. The findings are (i) there was no significant main effects and interactional effects in achievement between the control and experimental group. (ii) there was no significant difference in attitude or attendance (drop out) rates between two groups.

Hayden (1988) found that 80% of students reported that they understood how to do the assignment, when the net-working system was used, as compared to 58% when it was not. 75% of the handicapped students understood how to do the assignment when the system was used as compared to 25% when it was not.

Vanlegen (1988) did study to examine the possible relationship between computer programming instruction and increased general problem solving ability. No significant difference in general problem solving ability was obtained.

Tilidetzpe (1989) found that software package was as effective as classroom instruction on the three topics used in the study.

Paul, B.H. (1989) conducted a study to examine the impact of computer loaded Biology course on students achievement and student attitudes toward science and found the computer loaded biology curriculum appears to offer promise in secondary education in regard to achievement and attitudes.

Reeve's (1989) study was to determine the effect of teacher assisted computer instruction versus traditional teaching techniques for
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pre-school children. The results indicated that computer assisted instruction significantly improved scores on the four subset measures at .001 level.

**Drexel (1989)** indicated that students can learn selected English grammar principles as effectively on the computer with an individualized packages as students can learn these same grammar principles in the traditional class room setting.

**Wise (1989)** A recent meta-analysis was done on the effect sizes of using computers in science instruction. Fifty one effect sizes were found ranging from -0.62 to + 1.21 with the overall effect size being +0.34. This implies that students who received computer based instruction exhibited achievement superior to that of students, who received traditional instruction by one-third standard deviation.

For video-disc based lessons, the effect size on parallel measures was +0.40; for micro-computer based laboratory lesson, the effect size was +0.76; for lesson specifically in the biological sciences, the effect size was +0.22; for the college level the effect size was +0.24.

Although, each of the studies analysed had their unique instructional context, this meta-analysis supports the hypotheses that computer based instruction is a productive approach to science education.

**Dungan (1990)** found that students who received traditional instructions and computer assisted instruction achieved at significantly higher level on reading than those students who received only traditional instructions.

**Webster's (1990)** findings indicated that computer assisted instruction as a supplement to teacher directed classroom instruction is as effective as traditional teacher directed instruction in providing mathematics achievement.
Mahajan (1993) indicated that the computer assisted instruction for teaching singulars and plurals was found to be effective in terms to achievement of students belonging to experimental group at 0.05 level.

Moselehopour, Saeid, Iowa (1993) found that computer simulation enhances the student knowledge of the subject matter.

Hamilton, William Alexander (1995), in his study “Meta analysis of the comparative research on computer assisted instruction and its effects on elementary and secondary mathematics achievement” employed a classic meta analysis methodology to quantitatively compare studies from 1982-1993 on the effectiveness of computer assisted mathematics instruction used as a supplement to traditional instruction on elementary and secondary students. Significant achievement differences were found for elementary and secondary crossing all ability levels.

Carter, F.I. (1999) found that the computer Assisted Instruction training program was superior to traditional program on vocational education among high school students.

Howerton, M.W. (1999) on developing and evaluating computer assisted instruction in smoking education for adolescents found that the type of instruction did not significantly effect student knowledge attitudes and behaviour toward smoking.

Ryan, R.E. (1999) compared classroom instruction and computer based instruction for a department of the Navy training course and found that experimental group rated, two areas under study, namely-perception of the quality of instruction and perception of the worth of the learning, significantly higher than did subjects in the comparison group.
2.2 INTELLIGENCE

Lalithamma, K.N. (1965) in her study “some factors affecting achievement of secondary pupils in mathematics”, found that the achievement in mathematics was positively co-related to intelligence.

Sinha, (1967) found that intelligence and academic achievement were significantly related.

Joshi, J.N. (1970) found that higher intelligence is positively associated with higher scores on the algebraic concepts.

Bhushan, A (1973) in his study revealed that the post-test scores (78%) were significantly co-related with intelligence.

Sodhi, G.S. (1977) found that intelligence acted as a redundant variable so far as overall achievement in taxonomic categories were concerned.

Malik (1977) found that positive and significant relationship exist between intelligence and academic achievement in chemistry.

Sansanwal, D.N. (1978) found out that the mean achievement score of students belonging to high intelligence group was significantly higher than that of average and low intelligence group students and also that the mean achievement of average intelligent students was significantly higher than that of low intelligence group.

Greitmeyer et al (1978) in their study, psychological test intelligence as the predictor of school grades reported that academic achievement in English, History, Economics, Mathematics, Biology, Chemistry and Physical education were in combination and also separately co-related positively and significantly with the score on the intelligence test.

Kaile (1981) found intelligence significantly and positively correlated with achievement in first language and second language.
Behal (1982) studied the relationship of intelligence with achievement at two Piagetian stages of concrete and formal thinking and found positive and significant co-relations between intelligence and achievement in social studies, science and first language at both stages.

Rajput (1984) has found that intelligence affects achievement of students in mathematics significantly at all the three levels i.e. high, average and low levels. The t-test showed the superiority of high intelligence group over the low intelligence group of students in their achievement in mathematics. It also showed that the students of average intelligence were better achievers in mathematics than the students of low intelligence.

Sandhu’s (1985) study involving hundred boys and hundred girls of X class also showed that the difference between the measure of achievements score of high intelligence group and low intelligence group was significant; both in case of boys and girls.

Bell (1986) studied the influence of age, intelligence and training on the acquisition of a formal operational concept and concluded that highly intelligent student had a greater frequency of concept responses.

Khare (1986) concluded that intelligence was an important factor in achievement in all the seven areas of English i.e. spelling, comprehension, composition, pronunciation, applied grammar and vocabulary.

Gakhar (1986) investigated the relationship between intelligence and academic achievement of college students and found significant co-relation for science, commerce, arts and home science groups.

Mishra (1986) studied the relationship between creativity and problem solving ability at different levels of intelligence and found positive and significant co-relation between high intelligence and
problem solving ability, but insignificant co-relation between low intelligence and problem solving ability.

**Dutt (1987)** concluded that intelligence significantly affected the problem solving ability irrespective of the strategies of training. A bright child trained in any of the two strategies scored higher marks in problem solving test than a less bright student.

**Dutt, Sunil (1988)** found in his study, “The effect of problem solving strategies on problem solving ability in science of high school students in relation to anxiety level, cognitive style and intelligence”, that intelligence effect significantly in problem solving ability.

**Kohli O.P. (1988)** revealed that students who were from high intelligence group possessed high scores as compared to those of low intelligence group.

**Kumar (1989)** in his study of children’s curiosity, intelligence and scholastic achievement found positive and significant relationship between intelligence and achievement.

**Gill, T.K. (1989)** concluded that high intelligence group scored higher on originality as compared to low intelligence subjects but in case of fluency, flexibility and creative problem solving skill total scores were not affected by levels of intelligence.

**Russo, D.C.F. (1989)** in his comparative study of creativity and cognitive problem solving strategies of bright and average students found that there was no significant difference as such between problem solving strategy of bright and average children. He concluded that not I.Q. but problem solving ability and creativity underlies creative achievement.

**Shah (1990)** in his study “A study of relationship among intelligence, self-concept and academic achievement of pupils of standard X of semi-urban and rural areas of ‘Sihore Taluka’ found
positive and significant relationship between intelligence and achievement.

Devi (1990) in her study namely, “Pupil’s academic achievement in relation to their intelligence, neuroticism and locus of control” found positive and significant relation between intelligence and achievement.

Meena (1991) found positive and significant co-relation between intelligence and achievement in biology.

Gautam (1992) in his study, “A study of intelligence, adjustment, personal value and educational achievement of drug takers”, found positive and significant relation between intelligence and achievement.

Radha Rani (1992) in her study, “Study of intelligence, socio-economic status, achievement motivation and academic achievement”, found intelligence as a significant correlate of academic achievement.

Ratra, N. (1992) found that the students belonging to high intelligence group developed better conjuctive concept to that of students falling in low intelligence group.

Sawhney (1993) concluded that above average and average ability students secured significantly higher score than the below average students irrespective of teaching strategy.

Brigham, Mary Frances (1994) collected information about I.Q. test scores, achievement scores from student records. Through the use of analysis of variance, intelligence was found to be significantly affect achievement in all subjects areas.

Kumar (1994) also found positive and significant co-relation between intelligence and achievement in Biology.

Oh-Hwang, Youngjoo (1995) found that high levels of academic achievement were shown by students with higher intellectual ability.
Likewise positive and significant co-relations between intelligence and achievement in English have also been established (Rastogi, 1964; Reid, 1964; Vernon, 1970; Jha, 1970; Abraham, 1971; Kaur, 1973; Freeman, 1975; Joshi and Bajwa, 1975; Peterson, 1976; Carey, 1978; Sandhu, 1979; Mosley, 1979; and Kaile, 1981).

Contrasted from the positive and significant correlation between intelligence and academic achievement, there are studies which reveal that positive and even negative but insignificant relation exist between the two sets of variables. The studies of Green and Farquhar (1965), Khire (1971), Willie (1971), Black (1971), Sharma (1972), Pelechand (1972), Contractor (1977) show negative and insignificant co-relation between intelligence and achievement.

Gupta found negative (-.007) and insignificant co-relation between achievement in Hindi and intelligence.

Puri et al. (1986) in their study with X class students drawn from Government and Private schools of all the districts of Punjab showed the value of co-relation of intelligence with achievement in Biology and Mathematics to be -.04 and -.01 respectively. These negative values are however insignificant.

Chaudhry (1971) concluded that achievement and intelligence were not significantly related to each other.

Joshi and Bajwa (1975) found no significant co-relation between intelligence and academic achievement in Physics, Chemistry and Mathematics.

Sodhi (1977) investigated programmed learning in Chemistry in relation to taxonomy of educational objectives, intelligence and personality traits at the higher secondary level and concluded that intelligence acted as a redundant variable so far as over all achievement in various taxonomic categories was concerned.
Sood (1988) revealed in her study that intelligence levels acted as a redundant factor so far as learning of concepts in Hindi language were concerned.

Gill (1989) revealed that problem solving skill were not affected by levels of intelligence.

Sibia (1989) found no relation between intelligence and achievement in mathematics.

Brigham, Hary Frances (1994) studied the affect of mobility, intelligence and interaction of the two variables on sixth graders achievement test scores in the areas of mathematics, reading language and found no significant relation of intelligence with achievement in any of the areas.

Dianne (1994) studied the relationship of intelligence with academic achievement in language, Mathematics and reading language on gifted elementary school children and found no relationship of intelligence with achievement in any of the subjects.

2.3 COGNITIVE STYLE

Houston and Pilinar (1974) found that pupil’s taught in an open-ended style achieve more complex cognitive education objective more rapidly than those taught by other two methods.

Buch, William James (1976) showed that the unit mastery method was superior cognitive outcome, while seminar students liked their method the best and the method did not produce a differential result on other effective measures.

Witkin et al. (1977) have pointed that although cognitive style is not significantly related to overall school achievement, it is related to achievement in specialized areas whereas Mackie (1978) found that field-independent students had higher scores on all levels.
Shrock (1979) found the role of cognitive style in problem solving performance and concluded that field-independent contributed significantly to problem solving variance.

Van Duyne, S.C. (1980) explored the relationship among field-independence and field-dependence, achievement, withdrawal from the course and school-related attitudes under mastery method of instruction. The study revealed that field-independence/dependence, attitude toward the subject matter and attitude towards mastery method of instruction were also related to achievement.

Stone, Meredith Knight (1981) found that teachers adapted to student cognitive style, both across and within instructional contexts, by providing the field-dependent students with more teacher contact and more external structure and field-independent students with more independent learning opportunities. Teacher adaptation was related to positive student behaviour in both subject areas. None of the adaptations were significantly related to differential achievement for either the field-dependent or field-independent student groups.

Graffin, M.C. (1982) conducted a study entitled “An investigation of the relationship between students cognitive style on the field-dependence/ independence dimension and their writing process” and reported that field-independent subject obtained higher holistic scores than did field-dependent subjects.

Byrness, Marie Estella (1983) found that the cognitive process instruction method needs further development before it can be used as an effective instruction method for improving students reading comprehension skills.

Thumann (1983) investigated that students who exhibited reflective reasoning patterns achieved higher science achievement scores and studied interaction between two methods of teaching science and student cognitive style.
Walker, A.J. (1984) found that field-independent students performed at higher level of initial learning, retention and time on task behaviour. He suggested a significant main effect for cognitive style for the initial learning variables.

Peterson (1984) indicate that field-independent students perform better in mathematics than field-dependent students while later are better at learning material.

Mrosla (1984) investigated that low achieving mathematics students were more field dependent than high achieving Mathematics students in both traditional high school and in the high school for dropouts and that there would be a significant interaction on the achievement variable and the sex variable with respect to field-dependence in both schools.

Randolph, C.F. (1984) investigated the relationships among cognitive style, achievement in science, selected personality variables, and the sex of students and found significant correlations among field-independence and science achievement and self reliance and science achievement; no significant differences were found between the performance of males and females on the science achievement test.

Cogley, C.E. (1984) studied field-dependence/independence as a predictor of inferencing and problem solving abilities in community college students and found cognitive style as a minimal predictor of both. The results of ANOVA indicated significance (p<0.05) between highly field-dependent and independent regarding problem solving but non-significance (p>0.05) regarding inferencing ability among some students.

Dugger, C.R. (1985) compared the effects of two contrasting instructional approaches representing the field-dependence/independence cognitive dimension on the mathematical problem solving performance and found statistical differences in the math problem
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solving post test gain scores of the two treatment groups, receiving field-dependent and field-independence instruction, over the control group. The conclusion supported the assumption that the field dependence/independence cognitive dimension applied to teaching improved the students' performance in math problem solving.

Roessler-Jacoby (1985) investigated the role of field-independence using an Analogy based problem solving method and found that field-independent subjects scored significantly higher on the problem-solving task than the field-dependent. Field-independent subjects using an analogy scored significantly higher on the problem task than field-independent subject who did not use an analogy. Results from the study indicated that the cognitive style of subjects may influence successful use of analogy based problem solving strategies in the solution of new paradigm problems.

Atang, C.J. (1985) reported in his study that individuals' field-dependence/independence was not a significant factor in their performance in the pre-test and the post-test. Both the black and white subjects proved superior to the control group subjects in post-test scores. There was a significant relationship between pre-test and post-test time.

Fritz, K.M. (1985) reported in his study that neither locus of control nor field-independence/dependence was related to academic achievement in samples of gifted students; there was no difference in locus of control and field-independence dependence between male and female gifted students; and there were grade level differences in locus of control and field-independence/dependence among the 4th, 6th, 8th grade gifted students.

Nelson, P.A. (1986) studied the effect of field-independence/dependence cognitive style on achievement in a telecourse and found no significant differences between the attitude of field-dependent and field-
independent students enrolled in a telecourse. Students with a field-independent learning style scored higher grades than students with a field-dependent style. There was no association between field-independence/dependence and course completion.

Yore, L.D. (1986) investigated, “The effect of lesson structure and cognitive style on the science achievement of elementary school children.” His findings are: (1) High structure lessons resulted in higher achievement than the low structured. (2) Field-independent students achieved significantly higher science scores than field-dependent students.

George et al. (1987) found that field-dependent subjects scored significantly on Kohs Block design test than field-independent subjects.

Dutt, S. (1987) found that (i) Intelligence of the slower significantly affected the problem solving ability irrespective of strategies of training (ii) A bright child trained in any of the two strategies scored higher marks on problem solving ability test than a less bright student (iii) Cognitive style of learner was also found to be significantly contributing to the variance of problem solving ability scores, there by showing that cognitive style affected problem solving ability irrespective of training strategies (iv) The group having field-independent cognitive style scored higher mean than field-dependent group on problem solving ability test.

Bitterman, Joan Aseltine (1988) indicated that nine subject variables were significant in explaining variance in self-directed learning preference alone, and together accounted for 61 percent of the variance in self-directed learning preference. Achieving style was the most significant; and cognitive style, though significant, was the least significant of the nine. The interviews indicated that the self-directed learning reading scale was valid to measure self-directed learning
preferences, and achieving styles were reflected in the dialogue of the subjects.

Stoeltje, Yvonne Reppeto (1988) investigated the relationship between the field-dependent/field-independent dimension of cognitive style and reading performance. The result of this study support the idea that cognitive style is an important factor in school learning. Specifically, the field-dependent/field-independent dimension of cognitive style appears to be significantly related to reading performance in the lower elementary grades. Cognitive style tests could become important diagnostic tool for the classroom teachers.

Arrington, H.J. (1989) investigated the relationship between cognitive style visualization and problem-solving in eight grade males and females. He found that problem solving was positively correlated to cognitive style (0.53) and concluded that field-independent subjects were more proficient problem-solving than field-dependent subjects.

The study of Gill, T.K. (1989) resulted in (1) High intelligent subjects scored higher on originality than low intelligence subjects irrespective of training strategies. (2) The group having field-independent cognitive style scored higher on originality than field-dependent group on creative problem solving skill test. (3) Levels of intelligence, personality types, cognitive style and training strategies when paired among themselves did not show any interaction in terms of performance in creative problem-solving skills in mathematics and cerebral dominance.

Jen, Chin, I. (1990) found no significant difference for the sixth and seventh graders. The regression analysis indicated that none of the selected cognitive style elements significantly predict mathematics achievement. The correlation analysis revealed that same of the selective cognitive style elements are significantly correlated with mathematics achievement. However, these finding should be interpreted with caution since the reliability and validity of the inventory are week.
Rogers, Randall Harvey (1990) found cognitive style was related to some higher order aspects of production mastery but not to others. Subjects who were more field-independent tended to demonstrate more sophisticated programming strategies than field dependent subject including the creation and debugging of fewer programming units, proportionately more use of the edit mode than the immediate mode. Field-dependence/independence was not related to any aspect of geometry knowledge gains. Logo command mastery, nor logo comprehension mastery. In addition, conceptual tempo was not significantly related to any of the learning outcomes in the investigation.

Rosa, Marc Honorato (1991) found that cognitive styles were manifested in certain aspects of reading comprehension of narrative and expository prose is likely to differ remarkably as a function of cognitive styles. The disposition to process information in a more articulated or less articulated manner is reflected in the reading comprehension of narrative and expository prose.

Bal, Nimret (1992) found that (1) The variables of intelligence had a significant effect on acquisition and retention of higher level writing skills in English. (2) The variables of cognitive style had a non-significant effect on acquisition; a significant effect on retention as measured by test totals and scores on supply type items but not when measured by scores on selection type items. (3) Intelligence and cognitive style had a non significant interactional effect on acquisition and retention of higher level writing skills in English.

Mitchell, Cristi (1992) found post-test assessment of the use of past tenses did not reveal any main effects of interaction between groups. There were no significant differences for cooperative versus individualized CAI environments, or between auditory and visual learners. A significant positive correlation was found between students age and the amount of time required to complete the task. The number
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of absences and achievement were found to be significantly negatively correlated.

**Yoon, Gwanmetic (1993)** results indicated that types of instructional control strategies interact with levels of prior knowledge and types of cognitive styles. This study suggests that instructional control strategies would be used differently based on students' aptitudes; also, instructional design should be considered with time on task.

**Lin, Chi-Hui (1993)** results were (1) The performance of subjects can be predicted by linking structure, cognitive style, and their interaction. (2) The performance of subjects cannot be predicted by the interaction of linking structure types and cognitive styles. (3) There is no difference in subjects' recall of verbal information when learning from hypertext systems incorporating different linking structures. (4) Field-independent subjects out performed field-dependent subjects overall. (5) The attitudes of the subjects can be predicted by linking structure type. (6) The attitudes of the subjects can be predicted by the interaction of linking structures and cognitive styles. (7) Students like hierarchical structures and hierarchical associative linking structures more than linear linking structures (8) Field-independent subjects tend to have better attitude about “Chinese Politics” than filed-dependent subjects.

**Krank, Hugh Mark (1993)** found no statistically significant predictive power for cognitive style or treatment condition. Pre-service teachers’ cognitive styles did not significantly contribute to enhanced critical thinking abilities. No significant differences were found for critical thinking performance between the three treatment conditions.

The suggestion was made that the implementation of the research design rather than an ineffectual treatment contributed to the non-significant results. Nothing was found to refute extensive research that supported the supposition that cognitive styles are sensitive to learning environment and nothing was found to refute extensive research that
predicted enhanced critical thinking abilities in environments that encourage dialogical encounters.

**Custer, Thomas Alan (1994)** indicated that students with strong independent learning styles showed significantly higher chemistry achievement and greater achievement gains.

**Moore, Thomas, F. (1995)** results reported that no specific cognitive style was identified. Pre-major in health education were relatively the least field independent while students majoring in Pre-medical, Physiotherapy, Occupational therapy, Optometry and Dental Hygiene were relatively the most field-independent.