Review of Literature
CHAPTER II

REVIEW OF RELATED LITERATURE

Every piece of ongoing research needs to be connected with the work already done, to attain an overall relevance and purpose. The review of literature thus becomes a link between the research proposed and the studies already done. It tells the reader about aspects that have been already established or concluded by other authors, and also gives a chance to the reader to appreciate the evidence that has already been collected by previous research, and thus projects the current research work in the proper perspective (Kumar, 2009).

In this study too, a lot of time and tremendous amount of effort was put forth for reviewing the existing literature thoroughly. This acquainted the researcher with up-to-date knowledge and statistics and also with the techniques relevant to the work. It has helped the researcher to perceive knowledge gaps as avenues for the study as well as for comparing the results of a study with other findings to help guide and develop this study.

Key components of this chapter include an exploration of the growth and use of technology in education whether in the form of use of computer mediated instructions (CAI, CBI, CMI) in science or online instructions or hybrid instructions in cooperative or individual settings. Further literature was reviewed to see how instructions can be used to impart life skill education in relation to students’ approaches to learning.

The research literature reviewed has been reported under the following heads-

- Research studies related to Hybrid Instructions and Computer Mediated Instructions
- Research studies related to Cooperative Learning
- Research studies related to Life Skills
- Research studies related to Learning Approaches
2.1 Research Studies Related to Hybrid Instructions and Computer Mediated Instructions

Nalley (1991) conducted an analysis to identify variables present in computer-mediated science education research that tend to explain the variation in results. The major goals of the analysis were to determine the mean difference in effect-sizes between experimental and control groups, to determine if evidence of an aptitude-treatment-interaction exists, and to explain the variation in the reported effect-sizes. This analysis accumulated the results of 26 studies in computer-mediated science instruction. The methods included variations on computer-based instruction, computer-managed instruction, computer-assisted instruction, and computer-based laboratories. Effectiveness was measured as a z-score difference between mean achievement scores for the experimental and control groups. Data analyses included: (a) descriptive statistics, (b) regression analysis, (c) 90% confidence intervals, and (d) fail-safe-n independent variables. The analysis concludes that computer-mediated instruction tends to have a positive effect. The positive effect can be associated with an aptitude-treatment-interaction, the modes of computer-mediated instruction, the aptitude levels of the students, and whether or not the experimenter is involved in the instructional design and delivery process.

Zeitz (1992) investigated the effects of using Computer Based Formative Concept Mapping (CBFCM) on student learning in a high school biology classroom. The study was conducted on below-average, tenth-grade biology students in an urban high school in northwestern USA. The students in the experimental class received instruction on computer based concept mapping and then used CBFCM as a learning strategy for all eight weeks of the intervention. Both quantitative and qualitative data were collected. Quantitative data included scores from: (a) quizzes (b) concept maps (c) attitude inventories and (d) learning style inventories. Qualitative data included information from: (a) questionnaires (b) interviews and (c) classroom observations. Major findings of the study were: with respect to student achievement, there were no significant differences between the experimental and control groups’ mean scores on teacher-produced quizzes. With respect to student attitude, both groups felt positive towards science throughout the study, however the experimental group exhibited a more negative attitude towards CBFCM due to frustration over computer difficulties.
Nishino (1993) found the relationship between multimedia computer based science learning environment and gender differences on achievement and attitude and interests of students in an eighth grade science classroom. The study employed an exploratory investigative approach which utilized a quantitative $2 \times 2$ experimental factorial design on the population of 160 eighth grade students from two schools in Southern California. The control group received instruction based upon traditional science teaching methodologies while the experimental group received instruction using a multimedia computer based science learning environment. The following relationships were found: (1) Students in the experimental classroom had a significantly higher posttest mean score in "self-concept" than the students in the traditional science classroom. (2) Female students in the experimental classroom had a significantly higher posttest mean score on "self perception as a student" than both the males and females of the traditional science classroom and the males of the experimental classroom. (3) Students in the experimental classroom had a significantly higher posttest mean score on the Computerized Interactive Test in Science than the students in the traditional science classroom.

Wade (1994) found the effects of traditional teaching methods, laboratory experiences, and computer-assisted instruction integrated with appropriate laboratory experiences on the development of science process skills among ninth grade biology students. Science process skills measured in the study were controlling variables, defining operationally, hypothesizing, modeling, and interpreting data. Attitudes of ninth grade biology students included in this study toward learning science were also assessed at the conclusion of the study. The sample consisted of 116 ninth grade biology students attending schools in one city school district and one county school district of Delta. These students were taught biological topics designed for this study using traditional teaching methods (Group 1), laboratory experiences (Group 2), and computer-assisted instruction integrated with laboratory experiences (Group 3) for nine weeks. Data indicated that ninth grade biology students can develop the process skills if they are taught using traditional teaching, laboratory experiences, and/or computer-assisted instruction. However, this study reported that group 3 students were more positive in their attitudes toward learning science when compared to the attitudes of students in Group 1 and Group 2.
Burchfield & Gifford (1995) in his study developed a CAI module designed to improve the integrated science process skills (include basic skills like observing, inferring, measuring, communicating, classifying, and predicting, as well as integrated skills like controlling variables, defining operationally, formulating hypotheses, interpreting data, experimenting, and formulating models) as measured by students’ pre- and post-CAI scores on the Test of Integrated Process Skills (TIPS). The CAI module included two tutorial programs and two laboratory simulations. The student sample consisted of 92 students enrolled in General Biology I for Science Majors (at a small, rural community college located in the southeastern United States), equally divided into a control group and an experimental group. The control group had the opportunity to use commercially produced tutorials designed only to improve knowledge of biology content, while the experimental group used the CAI module for improving integrated process skills. The use of ANCOVA revealed no significant difference between the mean gains of the control group and the experimental group (0.05 to 0.07), although the experimental group did show a more marked improvement on the individual subtest involving graphing and data interpretation. Nor did the effectiveness of CAI seem to be influenced by a student's academic aptitude or gender.

Werner (1997) investigated the effects of learning strategy and summarization within a computer-based chemistry and physics program on achievement, enroute performance, attitude, time-on-task, and cooperative interaction behaviors. Total 78 ninth grade students of High school in Southwest Arizona participated in posttest control group study. A 2x2 factorial design was employed. The study includes four different treatment groups: cooperative-summary (N= 20), cooperative-no summary (N=18), individual-summary (N=20), and individual-no summary N=20). ANOVA was conducted on posttest and enroute performance while attitude score and instructional and practice time were analyzed using MANOVA. The findings revealed no significant effects for any condition on posttest performance. Results also indicated no significant enroute performance difference between those working in cooperative dyads and those working alone. Further, the students in no-summary condition performed better on enroute practice items than those who summarized. Students enjoyed using the computer program and liked to use computer program more often. Summary condition had a significant effect on time-on-task than
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those who did not summarize. Cooperative pairs in the summary condition spent less time on practice items than the individuals. The t-tests on interaction behaviors revealed that subjects in the cooperative-summary condition exhibited more helping behaviors and task-related behaviors than those in cooperative no-summary condition.

Williams, Hemstreet, Liu & Smith (1998) examined the effect of the computer-supported Problem-Based learning (PBL) environment on seventh grade students' learning of science concepts in context to (1) achievement of middle school students (2) attitudes toward science and (3) the relationship between students' math ability and reading ability and their achievement in the PBL environment. The treatment consisted of three groups: computer-supported PBL, paper-based PBL, and a control group. The sample consisted of 100 students (computer group, N = 50, paper group, N = 32, control group, N = 17). Results of ANOVA indicated that: both the groups that used the computer-supported and paper-based PBL significantly improved their achievement scores, while the increase for the control group was not significant; there was no significant difference between the computer-supported and paper groups. Students' reading ability is a better predictor for students' achievement in a PBL environment than their math ability; and students' attitude toward learning science was not affected by the introduction of PBL.

Huxford (1999) examined the relative efficacy of computer-assisted instruction (CAI). An experimental design was outlined incorporating the use of 3 teachers instructing 3 separate sections of volunteer students on a topic. The design measured the differences between affective learning, cognitive learning and student perceptions of teacher nonverbal immediacy. Participants were randomly assigned to a class, which utilized either: lecture, handout or the use of CAI. Results showed significant differences between teachers and a slight difference in perceived immediacy in instruction. The findings suggest that the use of CAI may not be as useful in the instructional context as was previously believed.

Brush, Armstrong, Barrow, and Ulintz (1999) researched the use of Integrated Learning Systems (ILS) on improving students' academic skills. In this study, two variations of Integrated Learning System (ILS) software were made available to teachers and students. One type of software (“foundations”) was designed to provide students with an individualized learning environment where students could
complete computer-based reading activities at their own pace, receive feedback from the computer, and move on to the next set of activities. The other type of software ("explorations") was designed as a more open-ended environment, where teachers selected specific activities for students (or groups of students) to complete. Using 776 third, forth, and fifth grade students, they found that students using either the exploration or a combination of the foundation and exploration software experienced a higher success of academic achievement than those students how used the foundations systems alone. The difference in success was attributed to the increased teacher control and flexibility within the exploration software. In addition, the exploration software had the ability to fit into classroom lessons by either introducing or reinforcement of the topic. Moreover the students who used the explorations software had more positive attitudes toward reading than students who used the foundations software.

Soyibo & Hudson (2000) investigated whether the use of the combination of the lecture, discussion and computer-assisted instruction (CAI) significantly improved the students' attitudes towards biology and the computer/CAI and their understanding of reproduction in plants and animals. The sample comprised 77 Jamaican XI grade female students from two traditional high schools in Kingston. Attitude towards biology questionnaire, attitudes to the computer/CAI questionnaire and a biology achievement test (BAT) were used for data collection. The results indicated that the experimental subjects' posttest attitude to biology and the computer/CAI were significantly better than those of the control group subjects taught with the lecture and discussion methods; the experimental subjects significantly outscored the control group subjects on the posttest BAT; there were significant differences in their posttest BAT means based on their attitudes to biology in favour of experimental subjects with highly favourable attitudes to biology, but there were no significant differences in their means attributable to their posttest attitudes to the computer/CAI; there was a positive statistically significant but weak relationship between the experimental subjects' posttest attitudes to biology and their posttest BAT scores.

McCray (2000) found utility of on-line learning environments in traditional classes both as an efficient means for executing activities previously tethered to the classroom setting and as a means to allow the pursuit of higher levels of learning.
Cotton (2001) conducted a meta-analysis of 59 research reports that compared the effects of CAI/CBI alone with those produced by conventional instruction alone. Here, results are too mixed to reach some conclusion. Some studies have found CAI superior, some have found conventional instruction superior, and still others have found no difference between them. Some results showed that while both traditional and computer-based delivery systems have valuable roles in supporting instruction, they are of greatest value when complementing one another. The use of computer based instructions as a supplement to traditional, teacher-directed instruction produces achievement effects superior to those obtained with traditional instruction alone. The finding holds true for students of different ages and abilities and for learning in different curricular areas.

Grable & Curto (2001) reviewed the literature primarily from the 1990s in his study on the use of computer-related technologies in middle school mathematics and science settings of north California. These technologies include CD-ROMs, hypermedia and websites, calculator-based laboratories (CBLs), and microcomputer-based laboratories (MBLs). The study reported that overall, the use of these technologies has led to positive results in the classroom. CD-ROM software packages with multimedia and hypermedia software share characteristics with incidental learning and discovery learning. There is unplanned learning that can take place and opportunities can be provided for learners to explore alternatives and study relationships. The technologies used for data collection can serve as a vehicle for integration of math and science topics. Professional development for teachers can lead to successful technology integration in the classroom if issues of administrative support, classroom management, and access to computers are addressed.

Tuckman (2002) evaluated the effectiveness of a hybrid instructional model, called ADAPT (Active Discovery And Participation through Technology) that combines the important features of traditional classroom instruction (classroom, instructor, textbook) with those of computer-mediated instruction (learning by performing rather than listening, frequent assessment and feedback) in the Ohio State University. In combination, the model is distinguished from either distance or traditional instruction, and can be employed in campus computer labs. The number of students involved in the evaluation study was 452 college students: 74 (classroom...
version of the course), 189 (computer-mediated –ADAPT) and 189 did not take the course in either format. Both the ADAPT model and the traditional approach were used to teach 10-week study skills course, the objective of which was to improve students' academic performance, as measured by grade point averages. Over the course of the 10-week term, students engaged in 200 computer-mediated performance activities relating to the specific subject-matter being taught. The performance activities were designed to engage students in self-reflection, skillful problem solving, and independent thinking. Students also learned to work in teams - one form of assessment, called “applications,” was always done in a paired-student configuration. Results of using the two approaches and comparing them with one another and to a matched control group experiencing neither yielded an overall significant difference as well as significant differences between each condition. The results of this evaluation study showed that students taught study skills using the combined classroom/ computer-mediated ADAPT instructional model improved significantly more in academic performance than students taught the same material by the conventional classroom approach. Moreover, this performance difference was not simply a function of either prior differences in achievement or grade in the course. In addition, both instructional models affected academic performance more favorably than no instruction at all. The hybrid nature of the ADAPT model seemed to provide students both structure and opportunity for involvement in the learning process.

Moin (2003) in his study compared between hands-on (HO) and computer-mediation (CM) instructions in relation to immediate and delayed achievement (measured as concept understanding, problem solving, and total learning) and conversations of small groups of students (blocked as high, medium, and low achievers) under each condition. Two-way ANOVA revealed a disordinal interaction between treatment and achievement level: computer mediated instruction resulted in more learning gains for low achievers and hands-on instruction was more effective for high achievers. The computer facilitated completion of the “experiments” were more quick and hence allowed low achieving students more time to engage with practice tasks, an activity closely monitored and supported by the classroom teacher.

Crowther, Keller and Waddoups (2004) conducted a study on usability testing to evaluate ‘Chemistry 105’, an online courses, to improve its quality and
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effectiveness. The CID has designed and developed ‘Chemistry 105’ with a hope that course modules would replace both the textbook material and the face-to-face classroom experience. The usability team performed 10 usability tests with students concurrently enrolled in a section of Chem 105. The participants spent 45 minutes moving from the beginning of the chapter through several animations and interactive objects. Along the way, the team recorded participants’ verbal and non-verbal feedback and questions. The team found that though students were initially excited about the flexibility and options the CD-based chemistry course offered them, they quickly became frustrated with the confusing demands of navigating through the course. Few students thought the modules could replace a lecture here or there, not one of the test participants agreed that the computer-mediated approach could effectively replace the entire course experience. Instead, they saw the modules as a supplement to the textbook and in-class sessions, not as a replacement for them. Through a detailed case study, they found usability testing improved the quality of a computer-based chemistry course and facilitated a clearer analysis of the learning effectiveness of this course. They further mentioned that unlike traditional classroom teaching, which is generally accepted as sufficiently effective, institutions developing computer-mediated instruction have to ‘prove’ that their products can be at least as effective as traditional classroom techniques.

Chittipun (2004) conducted an experimental study entitled multimedia software programmes for On-line Instructions and remediation in relation to cognitive style of high school students using $2 \times 2$ factorial design. The sample consisted of $N=96$ in experimental group and $n=93$ in control group, selected from private schools in Chandigarh. The major findings of the study were: Multimedia On-line instructions (MMO) resulted into higher gain means as compared to conventional group learning (CGL). Field-Independent students achieved higher gain mean scores as compared to their Field-Dependent counterparts, through MMO and CGL. Field-Independent and Field-Dependent students getting MMO yielded higher gain means as compared to those of Field-Independent and Field-Dependent students getting CGL. Further difference in performance as measured by achievement scores through MMO and CGL were not independent of cognitive style.
**Mahmood (2004)** examined the effect of computer assisted instruction on student achievement in general science as compared to traditional method of instruction. An experiment was conducted with 40 students of 9th class paired on intellectual basis, studying general science at Government Central Model High School, Lahore. Students of the experimental group (N=20) received Computer Assisted Instruction, for a period of nine weeks in the computer laboratory of the school and the control group (N=20) studied general science in their class as usual. Posttest was an achievement test comprising one hundred multiple-choice items, measuring knowledge, comprehension and application components of achievement in three types of the selected content area i.e. Biology, Chemistry and Physics. The result revealed that the experimental group outperformed the control group in all achievement areas i.e. overall, by levels of cognitive domain and by type of content. Achievement scores by the intellectual capacity grade. Students liked the CAI program and were benefited from it. They found it better mode of instruction than the traditional method.

**Basturk (2005)** in a quasi-experimental design compared learning outcomes of participants in an introductory statistics course that integrated CAI to participants in a Lecture-only introductory statistics course. The students were then registered for the introduction statistics course without Computer-assisted learning Sample consisted of N= 140 (Lecture only) N = 65 (Lecture-plus-CAI) graduate level students at Carnegie Research University, Turkey. Reviews of participants' identical midterm and final exams scores demonstrated that participants in Lecture-plus-CAI section obtained higher averages on midterm and final exams than participants in the Lecture-only sections and these higher averages likely were because of their better performance on concepts and practices that were taught in both regular lecture and CAI course. Findings suggest participants' learning capacity of the introductory statistics could be improved successfully when CAI used as a supplement to regular lecture in teaching introductory statistics course.

**Cain (2005)** conducted a study to examine if the use of technology, computer mediated conferencing (CMC) tools (i.e., email and electronic discussion boards) and computer aided instructional (CAI) resources (i.e., use of the computer and the Internet), contributes to student learning outcomes and student engagement activities,
above and beyond student demographic variables. The sample was 2000 college students, which were randomly drawn from the 2003 College Student Experience Questionnaire database. Frequency of online interaction for this study includes two types of interaction: student-to-instructor and student(s)-to-student(s). For the data analysis, eight multiple regressions were conducted on student learning outcomes and student learning engagement. The findings revealed that the use of technology resources does contribute to student learning, above and beyond student's background variables. The model inclusive of technology variables explained 4% to 7% of the gains in student learning, while student background variables contributed .03% to 2% of the gains. The findings suggest incorporating the use of technology can aid students in the learning process, though the effect size was fairly modest in most cases. The use of computer mediated conferencing and computer assisted learning tools should be used in combination with traditional classroom instructions to have the best effects.

Tawfik (2005) studied the effects of traditional instruction and computer mediated instruction on achievement and retention rates of freshmen community college students in mathematics. It looked at how mathematics anxiety, computer anxiety, level of course, college placement test score, age, gender, and ethnicity affect achievement and retention rates. The subjects (N=104) used in the study were predominantly white students in on three campuses of a suburban community college in Suffolk County, New York. The findings showed that students exhibited higher retention rates as the level of mathematics course increased in difficulty, and that as age increased, so did the final scores. Students exhibited higher mathematics anxiety when taught in the traditional instruction methods than when taught in the computer mediated instructional environment.

Faryadi (2006) conducted information analyses on various studies related to integration of technology and multimedia in classrooms. This review aims at merging state of the art technology to our poorly and methodologically unsound traditional classrooms for the benefit of all knowledge lovers. He mentioned that our verbal-only paradigm of teaching is on its way out. Interactive multimedia instructions have enabled learners to go forward smiling. Learners are motivated and encouraged by the evolving interactive multimedia to learn cooperatively and above all to learn meaningfully. Integration of interactive multimedia and technology in our classrooms
help learners to acquire significant skills and to be productive. Learners gain respect in a constructivist environment. There is a bond between students and teachers in the constructivist classroom. They all have one common purpose, to be engaged in meaningful dialogue with each other.

Grover (2006) studied the impact of teacher monitored on-line Instructional programme (Science) on various Life Skills and academic stress of secondary school students. Total 133 students of class IX were selected from three schools of Distt. Abohar, Punjab. Six skills were studied: Skill of Acquiring Knowledge, Problem Solving, Decision Making, Creative Thinking, Communication and Social Skills. Data was analysed using ANOVA. The main findings were: Students studying Online Teacher Monitored, OTM (exp. group 1) and those studying Online without teacher Monitored, OWTM (exp. Group 2) gain equal scores on Physics and Chemistry but in Biology OTM performed better. On life skills, OTM group performed better than OWTM on skills of Problem Solving, Decision making, Communication while for skill of creative thinking and social skills both groups were same on gain mean score. Both experimental groups were better than conventional group (CGL) in achievement and all selected life skills. Further, the study reported that OTM was more effective as compared to OWTM and CGL for enhancing learning of students.

Tutty & Klien (2007) investigated the effects of collaboration mode and group composition during a computer-mediated collaborative (CMC) program on individual posttest performance, group project performance, collaborative interaction behavior, and attitudes towards the instruction. Participants for this study were 120 undergraduate pre service teachers enrolled in a computer literacy course at a state university in the northwestern United States. In this quasi-experimental, posttest-only control group design six intact sections of a computer literacy course were assigned to either a face-to-face or a virtual, online collaboration treatment condition. Groups consisted of homogeneous lower-ability, homogeneous higher-ability, or heterogeneous-ability pairs. Results indicated that virtual dyads exhibited significantly more questioning behaviors and significantly better project performance than those who collaborated face-to-face. By comparison, students in the face-to-face condition performed significantly better on the individual posttest than those in the virtual online condition.
McFarlin (2008) in his study evaluated the effect of Hybrid lecture-online format on students’ academic performance in undergraduate exercise physiology course as compared to traditional lecture format. Data was collected from 658 students (traditional: 346, hybrid: 312). The hybrid online portion was delivered using WebCT Vista, enhanced with various instructional technologies. The hybrid design used included 1.5 h/wk online and an additional 1.5 h/wk in a traditional classroom setting. The key objective of the online component of this course was to provide students the opportunity to prepare for in-class lectures by watching online lectures in a self-paced format. PowerPoint files were used to distribute in-class lectures in both formats of the course. Grade data analyzed using a 2 x 3 ANOVA, revealed that final student grades were 9.9% higher (83% of the increase due to an increase in the exam grade) when the course was administered in a hybrid format ($P = 0.01$), which translated to a one letter grade increase on a standard grading scale. Transition from a traditional lecture format to a hybrid format significantly enhanced student learning; presumably, this increase is due to the fact that students were able to increase their exposure to course content via access to material on WebCT. He also reviewed informal student feedback from course evaluations and found that students who took the hybrid format of the course preferred its self-paced nature and ability to review course content as often as they liked. The study reported that the major drawback of online instruction is an inability to confirm the identity of a student who is completing an assignment. Another drawback for the instructor is the amount of time that is required to author online course materials.

Moosav (2009) in a comparative study using an ex-post-facto design compared the mathematics achievement of college students taught by CAI with the students taught by traditional lecture instructional method without the use of CAI. Total of 246 students at a public university in Alabama participated in this study and were taught using one of three instructional methods: CAI-1 (Thinkwell software), CAI-2 (MyMathLab) and traditional teaching. The two software packages are very similar in content and approach to teaching. An ANOVA was conducted to examine the effect of the three teaching methods on the overall course grade. The results indicate that students perform better in traditional classes than in CAI classes regardless of the CAI curriculum used.
Tekbiyik & Akdeniz (2010) performed meta-analysis to determine the overall effectiveness of computer assisted instruction on students’ academic achievement in science education from 2001 to 2007 in Turkey. The study reported the results of 65 effect sizes (ES) included in 52 studies. Grand mean for 65 ESs was found to be 1.12. This effect size can be interpreted as an average student’s achievement moved from the 50th percentile to the 87th percentile in science learning when computer assisted instruction was used. In addition, two variables (grade level of subjects and instruction method of comparison group) had a statistically significant impact on the mean of ES.

Buckley, Pitt, Norton & Owens (2010) in his study examined the relationships between students’ approaches to study, conceptions of learning and judgments about the value of networked technologies. For the project 144 first-year students of Bangor and Liverpool Hope University in UK, completed the 52-item of Approaches and Study Skills Inventory for Students (ASSIST), and a series of focus group interviews was used to assess attitudes towards the use of networked technologies within a blended curriculum. Significant positive associations were found between both deep and strategic approaches to study and students’ perceptions of networked learning, and negative associations with a surface approach. Students were positive about the incorporation of technology but had some concerns about the time needed to become sufficiently competent. They demonstrated a reflective approach and exhibited a broad view of the ways in which knowledge might be interpreted. The online forum was viewed as a site where they could benefit from sharing of personal experiences. They recommended designing of blended curriculum.

Kember, McNaught, Chong, Lam, & Cheng (2010) investigated the effectiveness of the twenty-one courses with significant use of the Internet, but with face-to-face teaching as the predominant instructional mode in course management systems on the attainment of learning outcomes relating to approaches to learning, communication skills and understanding of content. Five hundred and ninety-five students taking these 21 courses completed a questionnaire which gave feedback on the extent of use of and quality of implementation of internet features, as well as their perception of the attainment of outcomes. A confirmatory factor analysis of scales
pertinent to information presentation and constructive dialogue features showed a very poor fit to the data, indicating that the two types of function did not act in coordination. Structural equation modelling was used to test instructional models in Presage-Process-Product format for "information" and "dialogue" features. The findings showed that the use of Internet for presenting information in a blended environment does not seem to effectively help students achieve learning outcomes. Using features which promote constructive dialogue and interactive learning activities encourages a deep approach to learning, the development of communication skills and enhanced understanding of content.

Soon & Umar (2010) investigated the effects of the instructional methods using web-based instruction (WBI) and Cooperative Learning (CL) on listening and speaking skills for Mandarin learning among non-Chinese learners at MARA University of Technology, Terengganu, Malaysia. A quasi-experimental study with posttest only design was applied in the study consisting of 195 students as the sample. Three types of instructional methods, namely individual learning in an unstructured use of WBI (USLG), individual learning in a structured use of WBI (SLG), and Cooperative Learning with WBI (COOP) were applied. The treatment lasted for five weeks. The results of the analyses showed that there were no significant differences in terms of listening skills and speaking skills among the COOP, the SLG as well as the USLG groups. However, the descriptive statistics reveals that the COOP group performed slightly better than the SLG group, and the SLG group performed slightly higher than the USLG group for both listening and speaking skills.

Bawaneh (2011) investigated the link between the students’ use of online resources within the course website and students’ performance in the final exam of undergraduate computerized accounting course. The treatment included providing course materials through a combination of a teaching approach where a variety of online resources are provided in addition to face-to-face classroom sessions. The size of sample was 208 students. The findings indicated a positive association between the number of online files viewed by students, the number of online discussion messages posted by them, and their performance. A significant relationship was not found between students’ performance and the amount of time spent on the subject’s website, the viewing of links to websites that were not of utmost importance core to the course.
being studied, or the passive reading of discussion messages. These findings support the benefits to be gained by providing course materials online and encouraging both faculty members to use online in providing course materials and students to access the materials posted and to actively participate in online discussion.

Trends

The literature review in this section indicated that the results concerning the effectiveness of computer-mediated instruction in science education (if used alone) have been mixed. Some studies have reported positive effect on various learning outcomes like achievement, retention, aptitude, attitude, self-concept, time-on-task, cooperative interaction behaviour (Nalley, 1991; Nishino, 1993; Williams et al., 1998; Mahmood, 2004; Tekbiyik & Akdeniz, 2010). However, despite the rich possibilities, CMI has not been shown consistent outcomes superior to those of traditional instruction as some studies have reported either less than significant results (Cotton, 2001) or an overall negative effect also (Zeitz, 1992; Burchfield & Guilford, 1995; Huxford, 1999; Moosav, 2009). Many researches are being conducted to evaluate the impact of hybrid learning on various learning outcomes and it proves to be very effective as compared to traditional teaching or use of technology alone (Soyibo & Hudson, 2000; McCray, 2000; Grable & curto, 2001; Tuckman, 2002; Bastruk, 2005; Mcfarlin, 2008; Soon & Umar, 2010; Bawaneh; 2011).

2.2 Research Studies Related to Cooperative Learning

Rysavy and Sales (1991) published a review in which they summarized the results of 13 studies on Co-operative Computer Based Instruction (published between 1982 and 1988). The findings were related to achievement and motivation. In ten of these studies the achievement of students was explored and in six of them, the computer-based co-operative condition resulted in better learning, whereas in four studies there were no significant differences. Motivation was considered only in two studies and both reported positive effects.

Bak (1992) studied meta-analytic integration of the relationship between Cooperative Learning and Achievement. The purpose of the current study were to re-evaluate the effect of Cooperative Learning (CL) on students’ achievement using Hedges’ meta-analytic approach, to extract the essential components of CL, and to
identify the moderators of CL. First, CL methods were effective for the students’ achievement. Second, analysis of essential components of CL showed that it would be desirable to implement Cooperative Learning. Third, analyses of moderators’ shows that publication bias data exists, the Learning Together method is most effective, a large control group is more effective than a small control group and studies with high quality designs report larger effect sizes. Analysis of experiment-wise moderators’ tells us that CL is more effective for science subjects, high-level tasks, 1-2 months’ duration, 4-5 member group size, presentation situation, group leader situation and upper-middle heterogeneity level.

Samsek (1993) conducted a study to examine the effects of instructional control and group composition on performance, interaction, and attitudes during a computer-based cooperative science lesson. A sample of 152 fifth and sixth grade students, working in pairs with partners of similar or dissimilar abilities, completed the instruction either under the learner control (LC) or the program control (PC) treatment. In the LC treatment, pairs exercised collaborative control over the amount, review, and sequence of instruction. Pairs in the PC treatment followed a fixed instructional path. At the end of the lesson, all students individually completed an achievement posttest and an attitude questionnaire. An identical test was administered two weeks later to measure retention. Time on task for each group and interaction in representative groups were also recorded. Results showed that both heterogeneous grouping and learner control had significant effects on learning, time on task, verbal interaction, and attitudes. Those working in heterogeneous groups indicated higher levels of confidence than those working in homogeneous groups. High-ability students scored better than low-ability students on all outcomes, except attitudes.

Shermon (1994) investigated the effects of verbal interaction cues and ability grouping within a cooperative learning computer-based instructional science program on performance, time, enroute behavior, and attitudes towards the instruction. Sample of 231 junior high school students enrolled in eighth-grade science class were blocked by ability and randomly assigned to one of three different types of dyads. These dyads consisted of homogeneous lower-ability, homogeneous higher-ability, or heterogeneous mixed-ability student pairs. Each dyad was then randomly assigned to a computer program that either did or did not contain verbal interaction cues designed
to facilitate summarizing and explaining between partners at various points throughout the program. Results indicated that both higher and lower-ability students who used the cued version of the program performed significantly better on the posttest than students who used the non-cued version. Dyads assigned to the cued version also performed significantly better on the practice items, spent more time on interaction screens than dyads assigned to the non-cued version. Direct observation of student interaction indicated that students in cued dyads exhibited significantly more summarizing behaviors and helping behaviors than students in the non-cued dyads. Ability grouping did not significantly influence summarizing or helping behaviors. However, students in higher-ability dyads exhibited significantly less off-task behavior than students in mixed-ability and lower-ability dyads.

Fontenot (1995) conducted a study to determine if participation in a science program of cooperative learning methods in conjunction with traditional lecture methods would result in a statistically significant difference in science achievement scores of the experimental groups when compared to those of the control groups. An additional purpose was to investigate the relationship between achievement and the variables of gender, race, socioeconomic status and the general level of academic science achievement of the students. The sample for this study consisted of 423 students, enrolled in a seventh-grade Earth Science class of school district in south Mississippi. The experimental group, with 232 students, was taught an earth science unit on renewable and nonrenewable resources using Cooperative Learning methods in conjunction with traditional lecture methods. The results of the study indicated seventh-grade science students who received instruction in a Cooperative Learning environment in conjunction with a traditional lecture scored higher on the variable of science achievement than did seventh-grade science students who had been instructed in a traditional lecture-type fashion. The study also indicated that this achievement was not related to the variables like gender, race, socioeconomic status, or general level or prior science achievement.

Singh (1996) in a study investigated the effects of studying in heterogeneous and homogeneous ability groupings on the achievement and self-efficacy of high and average ability students in data analysis skills in mathematics and science. This study also prescribed and implemented conditions for utilizing cooperative groupings in
computer-based instruction. Sample consisted of 131 students of grade seven studying in Toronto, Canada. Using Canadian Cognitive Abilities Test (CCAT) scores, students were classified as being of high or average ability and randomly assigned to three cooperative dyads: homogeneous high ability, homogeneous average ability and heterogeneous or mixed ability. Each treatment group received the same training which focused on: skills in Cooperative Learning, science content and use of the Microsoft (Ms) Works- word processor and Spreadsheet application programs. The results of this study suggest that heterogeneous ability groupings with computer-based instruction can be beneficial to average ability students without being detrimental to the high ability students. Analyses showed that high ability students and average ability students in heterogeneous groupings achieved significantly better than their peers in homogeneous groupings. The results of the analyses also show that average ability students acquire significantly higher judgment of own self-efficacy in heterogeneous rather than in homogeneous groupings where as high ability students' in heterogeneous groupings, did not differ significantly from their peers in homogeneous groupings on judgment of self efficacy.

Brush (1997) examined the effectiveness of the Jostens computer mathematics integrated learning curriculum when employed within the context of a Cooperative Learning environment in a pretest, posttest control group design. Sixty-five Caucasian students attending one of three 5th-grade math classes at a single elementary school served as subjects in this experiment. Two of these math classes (Cooperative) emphasized Cooperative Learning activities, while the third class (individual) emphasized traditional, individualized learning activities. All classes used the Jostens mathematics curriculum, with each student (either alone or working in a group of two) receiving a total of 550 hours of instruction, divided into eleven 50-minute sessions. After analyzing the final results with the use of ANCOVA, it was found that those students who used the Jostens mathematics curriculum within a cooperative-oriented educational environment showed superior performance on standardized math inventories, showed better attitudes towards math, towards the Jostens computer math lessons, and towards group activities in general as compared to those students who used the Jostens curriculum within an individual-oriented educational environment. Based on computer lab observations, social interactions
between cooperative students and teachers tended to be more content-related or discipline-related than the traditional class learning.

Saengammongkhol (1998) conducted a study related to combined effects of cooperative learning and instructional package on the learning of logarithms of first year students in teaching of vocational subjects. The experimental group studied the materials via cooperative learning instructional package designed by the researcher. A teacher who used the same curriculum under the traditional method of teaching taught the control group. The results indicated that the students who learned via cooperative learning and instructional package performed significantly better than students in the control group.

Klein & Cavalier (1999) in their study investigated the effect of implementing Cooperative Learning and objectives with Computer Based Instruction (CBI). Subjects were 125 fifth and sixth grade students. Cooperative dyads and individuals worked through a CBI Earth Science program that contained either instructional objectives, advance organizers, or no orienting activities. In this 2 x 3 factorial design, data was analysed using MANOVA. Results indicated that students who received instructional objectives performed significantly better on intentional posttest items than the students who received either advance organizers or no orientation activities. Results also revealed that dyads who received objectives exhibited significantly more on-task group behaviors, more helping behaviors, and fewer off-task behaviors than dyads in the other orienting activity conditions.

Johnson, Johnson & Stanne (2000) conducted a meta-analysis of 164 studies done on Cooperative Learning. They found that Cooperative Learning is one of the most widespread and fruitful areas of theory, research, and practice in education. There has never been a comprehensive review of the research on the effectiveness in increasing achievement of the methods of cooperative learning used in schools. An extensive research found 164 studies investigating eight Cooperative Learning methods. The studies yielded 194 independent effect sizes representing academic achievement. All eight cooperative learning methods had a significant positive impact on student achievement. When the impact of Cooperative Learning was compared with competitive learning, Learning Together (LT) promoted the greatest effect, followed by Academic Controversy (AC), Student-Team-Achievement-Divisions
(STAD), Teams-Games-Tournaments (TGT), Group Investigation (GI), Jigsaw, Teams-Assisted-Individualization (TAI), and finally Cooperative Integrated Reading and Composition (CIRC). When the impact of cooperative lessons was compared with individualistic learning, LT promotes the greatest effect, followed by AC, GI, TGT, TAI, STAD, Jigsaw, and CIRC. The consistency of the results and the diversity of the Cooperative Learning methods provide strong validation for its effectiveness.

Baldes, Cahill & Moretto (2000) implemented and evaluated action research project program to motivate students to learn through Multiple Intelligences, Cooperative Learning, and positive discipline. The targeted population consisted of students in kindergarten, fourth grade, and sixth grade at two grade school and one middle school sites in Illinois. During the 16-week intervention, the teachers implemented teaching strategies consistent with cooperative learning, multiple intelligences, and positive discipline to create a child-centered, motivating, positive, safe, and trusting environment. During the intervention, students participated in pre and post intervention interviews, weekly student inventories, and anecdotal record keeping. Data indicated that the program reduced inappropriate behaviors and increased student motivation. Teacher/researchers’ time correcting misbehavior was reduced, leaving more time available for academic instruction and resulting in student academic and personal growth.

Haapala (2001) in a study compared the two strategies, computer-mediated versus face-to-face Cooperative Learning to investigate the effectiveness of interactive technology in improving food safety knowledge and self-reported food handling behaviors in one-month intervention. The sample consisted of 178 students of middle school students of America. Instruction consisted of studying food safety with an interactive CD-ROM (dyads) and with a cooperative Jigsaw-type assignment (groups of four) with either printed materials or the Internet. Significant increase in knowledge after the CD-ROM study (5%, p = .04) was indicated for the entire experimental group (CMC in particular) with significant further gain in knowledge for boys in the FTF cooperative study (10%, p = .05), but a significant loss for boys in the CMC (12%, p = .04%) and non-significant gains for the girls. The treatment it self reported food handling behaviors was significant for both groups although the gain in knowledge was significant only for the girls in FTF group but for the boys neither was
effective. Variables associated with learning outcomes included prior computer experience, interest in studying food safety, perceptions related to food safety, and satisfaction with the cooperative assignment as a helpful learning tool, all of which favored the girls. These findings indicate that CMC can be considered a viable medium for school-based health education in Cooperative Learning environments in middle schools with ample access to computers and the Internet.

Lou, Abrami & D’Apollania (2001) quantitatively synthesized the empirical research on the effects of social context (i.e., small group versus individual learning) when students learn using computer technology. In total, 486 independent findings were extracted from 122 studies involving 11,317 learners. The results indicate that, on average, small group learning with technology had significantly more positive effects than individual learning on student individual achievement (mean ES =+0.15), group task performance (mean ES = +0.31), and several process and affective outcomes. However, findings on both individual achievement and group task performance were significantly heterogeneous. Through weighted least squares univariate and multiple regression analyses, it was found that variability in each of the two cognitive outcomes could be accounted for a few technology, task, grouping, and learner characteristics in the studies.

Webb (2002) studied benefits of cooperative learning in a multimedia environment. The research of this study was conducted by using several online resources of the Morris Library at Southern Illinois University, University of central Florida’s Library, and books at Southern Seminole County Public Library. The study concluded that: (1) Students learn together in groups so that they can perform better as individuals; Cooperative Learning reinforces learning; (2) Of the three methods of computer-based instruction-individual, collaborative, and cooperative- cooperative, computer-based instruction appears to be the most effective. By using the five elements of Cooperative Learning, computer based instruction can be used to enhance learning. (3) Cooperative learning methods coupled with the flexibility of CBT, holds great promise for accelerating students’ attainment of high academic standards.

Balfakih (2003) in his study investigated the effectiveness of student team-achievement division (STAD) in teaching high school chemistry in the UAE and to find out which groups, gender, area, and ability benefitted most. The total number of
students' sample was 488 students, 133 males in experimental, 123 females in experimental, 114 males in control group, and 118 females in control from sixteen tenth grade classes. The experimental group teacher employed STAD where as control group was taught by conventional teaching methods. Results revealed that STAD was a more effective instructional method than the traditional approach. In addition, results showed that male participants benefited more than their female counterparts from the use of STAD as an alternative instructional technique.

Oshima, Oshima, Murayama, Inagaki, Takenaka, Nakayama & Yamaguchi (2004) conducted design experiments on two Japanese elementary science lesson units in a sixth-grade classroom supported by Computer Support for Collaborative Learning (CSCL) technology as a collaborative reflection tool. In the unit 'air and how things burn', they designed the unit where groups of students engaged in building theories on 'how a candle stops burning in a closed jar'. In the unit 'characteristics of various solutions', groups of students collaboratively constructed a pH scale as knowledge artefact. In both studies, the CSCL technology was implemented mainly for facilitating collaboration between groups. Results showed that: (1) students were more likely to engage in symmetric communication (i.e. between groups as well as within groups) in the second unit, and (2) they were also more idea-centred and more frequently shared their ideas in the second unit.

Shachar & Fischer (2004) conducted an experiment to examine the effects of the Group Investigation (GI) method of Cooperative Learning on students' achievement, motivation and perceptions of their experience. 168 students from five 11th grade chemistry classes participated for 2 months in an experiment. An achievement test and Harter's Motivation Questionnaire were administered before and after the experiment. Middle and low achieving students in the GI classes achieved higher scores, while motivation declined in the experimental group compared to the control group. Students' letters revealed that 41.7% of the comments were critical, 28.8% were positive, and 29.4% were suggested ways of improving the new method.

^Cortright, Collins & DiCarlo (2005) found that peer instruction is a cooperative learning technique that promotes Critical Thinking, Problem Solving, and Decision-Making Skills. Further, it enhances meaningful learning or transfer. The first factor that influences meaningful learning is the degree of mastery of the original
material. Importantly, peer instruction significantly enhanced mastery of the original material. Furthermore, the student's ability to solve novel problems was significantly enhanced following peer instruction. Thus, pausing two to three times during a 50-min class to allow peer instruction enhanced the mastery of the original material and enhanced meaningful learning, i.e., the student's ability to solve novel problems.

Yaibua (2005) conducted an experimental study to investigate the effectiveness of multimedia CAI through cooperative and Individualistic Learning conditions in teaching of vocational subjects using 3x3 factorial design. The sample consisted of 150 students selected from three technical colleges in the Uthaithani and Chainat provinces of central part of Thailand. The experimental group I (N=50) was taught with CAI in Cooperative Learning, experimental group II (N=50) was treated with CAI in Individualistic Learning and control group (N=50) was given no treatment. The results revealed that the multimedia CAI groups achieved significantly better than control group. Multimedia CAI in cooperative learning situation yielded higher gain means than CAI in Individualistic situation and Conventional Group Learning. Thus, multimedia CAI learning situations are favourable in Cooperative Learning than in Individualized situation. Further, the study revealed that minor differences in computer knowledge background have dissipated through Cooperative Learning. CAI in Cooperative Learning is not only economical but can prove to be sound strategy.

Lewis (2006) evaluated the role of peer leaders in peer led guided inquiry, that combines guided inquiry and cooperative learning for college chemistry teaching in a large class (greater than 100 students). These peer leaders’ facilitated cooperative learning groups during weekly guided inquiry activities in general chemistry. Sample consisted of 2838 students, of chemistry-I in the University of South Florida. The evaluation, using data collected over a 3-year period, had two main focuses: effective teaching and promotion of equity in the classroom. Both of these aims were evaluated using hierarchical linear models. The findings revealed peer-led inquiry to be effective than traditional method. In addition to this an inventory of student study approaches was also administered to understand further the students in this setting beyond cognitive factors. Three specific approach profiles were prevalent: surface,
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Surface achieving and achieving. Two less prevalent approach profiles, deep and deep achieving, were related to better understanding of chemistry.

Feyzioglu, Akcay & Pekmez (2007) studied the effect of Computer Assisted Collaborative (CACL), and Individualistic Learning (CAIL) in chemistry teaching on students’ achievement and attitudes towards Chemistry. The methods were applied to the sample of 114 first year undergraduate students in the department of both chemistry and science education in Turkey. A computer software program (Active Chemistry Education Package) was designed for both methods for the topic of chemical bonding. Additionally, worksheets were designed specifically for Computer Assisted Collaborative Learning environments. Results of this study show that Computer Assisted Collaborative Learning method is more effective on students’ achievement (for the subject of chemical bonding) than Computer Assisted Individualistic Learning method. CACL has also the same effect on students’ attitudes for chemistry.

Cline (2007) conducted a quasi-experimental quantitative study to explore the impact of three Kagan cooperative learning structures on the mathematical achievement of fifth grade students. Participants included 28 fifth-grade students in a southeastern elementary Taylor Ranch School. Mathematics instruction used for the treatment group included the Kagan cooperative learning structures-Rally Coach, Rally Table, and Timed Pair Share, while the comparison group was taught mathematics through direct instruction methods only. Data analyses were conducted by a t test for two independent samples to evaluate the mean difference over 16 weeks between the pretest and posttest scores of the treatment and comparison group. The findings from this study indicated a significant difference in the mathematical achievement of the experimental group as compared to control group. The study suggested that the expanded use of Kagan’s cooperative learning structures increases math achievement, employability and socials skills in order to prepare students for real world situations.

Faryadi (2007) in his article on enlightening advantages of cooperative learning has discussed the notion that cooperative learning enhances learners' emotional and social performance. It also observes the perception that cooperative learning dramatically improves students' academic accomplishment. The evaluation
further, converses the concept of learner-centered environment as a condition of cooperative learning. The analysis further examines the important principles of cooperative learning methods. In addition, this assessment outlines instructors' position and intervention in shaping students learning pattern. Cooperative Learning with computer mediated learning tools makes the group learning more efficient and enjoyable. Results showed that Cooperative learning promise to encourage students to learn actively and constructively. This method outlines its unique advantages to that of individual learning in the class.

Ragasa (2008) conducted a study to investigate the effect of CAI in cooperative learning in teaching basic statistics as compared to traditional approach. The samples for this study were the 53 undergraduate students of the University of the East. The CD-ROM prepared by Math Advantage (1997) served as the teaching medium for the experimental group. Two students shared one computer. They discussed the text they read in the monitor. Solutions to the problems were clarified between the two of them. When the two collaborating students did not understand the text of the CD-ROM or the solution to a given problem, they called the teacher for clarification. The results of the study, after using analysis of covariance (MANCOVA), show that the combination of computer-assisted instruction and collaborative work improves learning without a significant effect on attitude.

Christopher (2009) conducted a systematic review of 2,506 published and unpublished citations (1995-2007) identified in a literature search on science outcomes associated with cooperative learning in secondary and early post secondary science classrooms, as compared to traditional instruction. Adding more, a variety of moderator analyses were conducted in order to determine if particular study and participant characteristics influenced the effect of the intervention. A tri-level screening and coding process was implemented and identified 30 original, empirical studies that met the inclusionary criteria while yielding an overall effect size estimate. The results of this review indicated that cooperative learning improves student achievement in science. Moderator analyses on study participant characteristics gender and ability level were inconclusive based on the small number of studies in which data on these characteristics were disaggregated. If the intervention was structured in a particular fashion, the effect on student achievement was greater than
that for an unstructured intervention. The intervention showed a greater effect on student achievement in biology classes than in other science disciplines.

**Chester (2009)** conducted a quantitative study to investigate the impact of cooperative learning strategy on physics achievement by high school minority students (African American and Hispanic students). Independent learning, the traditional strategy, and cooperative learning dyads, the novel intervention, were the independent variables, and the dependent variable was achievement in physics. This study was limited to 32 minority students. Difference of scores obtained from the performances of the group as independent and cooperative learners was subjected to a repeated measures $t$ test. A significant relationship between cooperative learning dyads and physics achievement by high school minority students was found. By learning in small groups, students were able to help each other construct meaning and make sense of their learning.

**Ebrahim (2010)** in his study compares the effects of two methods of teaching—teacher-centered and Cooperative Learning on students’ science achievement and use of social Skills. The sample consists of 163 female elementary science students in eight intact V grade Classes in Kuwait. The samples were assigned to 2 instructional methods and were taught an identical science Unit by 4 classroom teachers. The students’ science achievement was measured by a researcher-designed achievement test given to students as a pretest and a posttest. Students’ social skills were determined by a researcher-designed survey administered as a pretest and posttest. Analysis of the achievement test scores and the social skills survey responses revealed that Cooperative Learning strategies have significantly ($p>0.05$) more positive effects on both students’ achievement and social skills than teacher-centered strategies.

**Badhe (2010)** conducted a study on a group of 45 D.Ed students of Pune to study the effectiveness of teaching ‘Image Formation’ through Cooperative Learning method in science subject. He found that all the students showed improvement in quantitative as well as qualitative evaluation. The use of work cards and cooperative learning method are effective for teaching the selected topic. Majority of students showed positive responses towards Cooperative Learning methods and the use of work cards. There was an improvement in the students of all streams.
Champion (2011) conducted a quasi-experimental study to examine the impact of Cooperative Learning assessment on secondary level Chemistry I students enrolled in a laboratory-based course in a small rural school system in West Tennessee. The study was aimed to determine the relationship between teacher-assigned/group-elected laboratory positions (Independent variable) and academic achievement (Dependent variable) while using the cards on the table approach of Cooperative Learning assessment. Results of ANCOVA analysis indicated no significance difference in the adjusted scores between teacher-assigned versus group-elected laboratory positions within structured laboratory groups on the academic achievement of Chemistry I students as measured by a standardized pretest/posttest while using the Cooperative Learning assessment. Conducting paired samples t tests revealed the group assigned students improved significantly from pretest to posttest while the teacher assigned students had no significant improvements.

Webb (2011) in quasi-experimental study examined the differential effect that heterogeneous grouping and homogeneous grouping have on low-ability, eighth grade students in the science content area. Independent sample t tests were used to examine differential achievement gains across heterogeneous/homogeneous group conditions. The analyses confirmed the there were significantly greater science score gains for low-ability students placed in heterogeneous-ability than for low-ability students placed in the homogeneous-ability groups. No significant differences in science score gains were observed when comparing all students placed in heterogeneous-ability to all students placed in the homogeneous-ability groups.

Trends

From the above review related to cooperative learning it is revealed that Cooperative Learning has many promising outcomes like better learning, time on task, better attitude towards studies, enhanced social skills, reduced inappropriate behavior and increased motivation. Further, on ability grouping mixed results were found but majority have reported that heterogeneous grouping is more effective than homogeneous grouping (Bak, 1992; Samsek, 1993; Singh, 1996; Webb, 2011). It was also found computer supported cooperative learning is more effective when it uses face-to-face interaction as compared to computer mediated communication (Haapala, 2001). The review also revealed that the knowledge of instructional
objectives enhances the learning outcomes as compared to group who receive no orientation to instructional objectives (Klien & Cavalier, 1999). Last but not least, different cooperative strategies have positive effect on learning outcomes (Johnson et al., 2000; Shachar & Fischer, 2004; Cline, 2007). Use of STAD in evaluation has significant effect on learning (Balfakih, 2003). Also peer instruction in group promotes various life skills like Critical Thinking, Problem Solving and Decision Making (Cortright, 2005).

2.3 Research Studies Related to Life Skills

Hammer & O’Bar (1989) investigated Growing Up Strong (GUS), a curriculum designed to develop strong mental and physical health in kindergarten through sixth grade students, with the objective of preventing subsequent substance abuse. This document contains a teacher's guide for using GUS in fifth and sixth grade classrooms (GUS 5-6) and duplication masters of materials that can be sent home with children to promote family involvement in GUS. Part I of the five-part teacher's guide provides background information about the program; the trademark cartoon characters Gus, Gussie, and their friends; GUS's multicultural approach and comprehensive prevention philosophy; and major components of the GUS 5-6 program and accessory materials. Part II includes information on using GUS, evaluating the program, and using the family involvement messages; and a sample message to families. Part III offers suggestions on classroom management and details classroom activities designed to reinforce refusal skills and activities designed to help children develop social and self-management skills. These activities relate to such topics as problem solving, brainstorming, cooperative learning, drug facts, life skills, and stress management. The materials designed for children to take home include information sheets for parents on accepting their children's friends, being a good role model, encouraging physical fitness habits, using techniques of stress management, giving accurate information about drugs, and daydreaming. Part IV provides lists of resources: 28 children's books, 24 books on cooperative learning for teachers, 4 publications for parents, and 31 organizational resources.

Orabuchi (1992) studied the effectiveness of using computers with interactive software programs to teach higher-order thinking skills. The effects of CAI
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(computer-assisted instruction) on affective domains were assessed, as well as the effectiveness of CAI with interactive software programs in the areas of making inferences, making generalizations, and math problem solving. Sixty-one first graders and 70 second graders inner-city elementary school in Dallas participated in the study, with an experimental group receiving CAI 30 minutes a week for four months. The statistical findings of this study suggest that (1) CAI with varieties of interactive software is an effective tool to teach higher-order thinking skills. (2) It is developmentally appropriate to expose first-graders to a computerized environment. (3) CAI is more effective in enhancing affective domains (such as attitude toward school, attitude toward computers, and skills students could do with computers) than cognitive domains. (4) The impact of CAI on students' overall academic achievement and self-concept was not statistically significant.

Moore (1993) implemented computer-assisted learning program, using INVEST Computer Assisted Learning System, to determine whether a heterogeneous group of adult learners could make significant gains in academic achievement over an 11-week period, and how such gains would compare to more traditional learning approaches in the Cumberland Campus of Nova Scotia Community College. INVEST is networked system of basic instructional software offering lessons in Reading, Writing, Mathematics, and Life Skills. In the project, student journals were used: One private journal to encourage writing and second to converse privately with the teacher. Results of standardized skills tests and evaluation questionnaires indicated the following (1) positive gains were made in all areas of reading and math, with gains of more than 1.5 years realized for mathematical concepts and problem-solving. (2) 73% of the participants felt the project should have been longer. (3) 80% indicated that they became more highly motivated. (4) 73% felt that they were better and more confident learners. (5) 80% indicated that they wanted more instructor input. The overall consensus was that there were many positive features to the program which could serve as a successful adjunct to traditional models.

Gregory & Clemen (1994) conducted a study on improving Students' Decision Making skills. Sample was drawn from secondary school teachers in the Eugene, Oregon 4J school district to bring elements of decision making into their existing curricula for IX- XII standard and development of educational modules by
incorporating eight themes of decision-making process. In each of six targeted schools, they implemented these curricula in co-operative learning situation. Through the course of the decision-skills curricula, students came across to see that they are making decisions all the time: in defining their values, in making of objectives, and in deciding how much information is necessary to do a credible job. Students begin to pay more attention. Teachers report showed clear evidence of the impact of decision-skills lessons on student performance. Teachers reported that students involved in the decision-making tasks become better listeners, demonstrate improved abilities to organize and structure subject-based tasks, and are better able to delegate responsibilities in a group setting. Some of the greatest improvements in student skills came from their enhanced ability to work as part of problem-solving groups and to engage in constructive negotiations with other class members.

Paul (1995) conducted a study of teacher preparation programme to assess the extent to which such programmes prepare conditions for teaching credentials to teach Critical Thinking and Problem Solving in the elementary and secondary schools. With assistance from Sonama State university interview protocols were designed for use for telephone interviews. Sample consisted of 38 public colleges and university and 28 private ones. The major objectives of the study were (1) to assess the current teaching practices (2) To identify exemplary teaching practice that enhances Critical Thinking skill (3) To develop policy recommendations based on the results of the study. The study reported that many teachers have no understanding of the basics of Critical Thinking and very few have a comprehensive sense of how to cultivate it while teaching the content subjects or discipline. It was also found that the students should be assisted to develop certain specialized concepts, give reasons for conclusions arrived at, make interpretation of data, travel implications, think in terms of others’ point of view and so on.

Wendie (1996) in a study on improving students Life Skills through classroom intervention and integrated learning, described a program for increasing skills necessary for learning and for living such as cooperation, perseverance, problem-solving, and friendship. The targeted population was elementary school students in a growing, middle class community. Review of curricula content and instructional strategies revealed an over emphasis on skilled subjects, leaving little or no time for
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life skills to be taught in the classroom. Three categories of intervention were indicated (1) An integrated unit to teach students basic Life Skill vocabulary (2) The development of a program to implement the use of Life Skills in the classroom and (3) A plan to connect the Life Skills throughout the entire school. Post intervention data indicated an increase in awareness of the Life Skill vocabulary, an improvement in using and understanding Life Skills, and the development of a foundation for future growth.

Householter & Schrock (1997) conducted action research project to evaluate a program for enhancing Thinking Skills to improve the Problem Solving and Decision Making of primary school students. Sample included 25 second and 22 third graders in regular education classrooms, but including students with special needs, located in two small middle class communities in central Illinois. The problem of Insufficient Problem Solving and Decision Making skills was documented by means of teacher-made tests of Thinking Skills (patterns, math problems, reading vocabulary word recognition, reading comprehension) and surveys of teachers, administrators, and parents. The intervention consisted of (1) Language arts and mathematics materials designed to foster Problem Solving and Decision Making such as deductive reasoning, analysis, and drawing conclusions, as well as activities including cooperative learning, social skills training, family homework activities, student journals of math problems, and cooperative activities with nursing home residents (2) Re-design of the language arts and mathematics curricula to reflect skill infusion into the curriculum. The teachers' role was to guide Thinking Skills and Decision Making through questioning and modeling. Teacher journals, charts, and a thinking skills posttest were used to document skill development. Post intervention data indicated an increase in student use of Problem Solving and Decision Making. Higher order thinking increased in the targeted mathematics and language arts skills. The majority of children improved in reasoning about time, estimates, patterns, mental math and money. The children who were very successful often served as models for others. Parents responded positively toward the family homework.

Brauer, Grady Matthews & Wilhite (1997) in action research project evaluated the impact of a program for enhancing interpersonal Problem Solving skills on Academic Achievement in elementary students in an industrial, urban Illinois
community. The lack of social skills and inability to think critically were documented through office referrals and teacher observations of Kindergarten, first grade, special needs, and reading classes. The resulting intervention consisted of (1) a peer mentoring program in which students in grades 4 to 6 were trained as mentors for teaching social skills, conflict resolution and critical thinking. (2) Cooperative learning activities to enhance student engagement, active listening, turn-taking, appropriate behavior and voice volume, and use of happy talk. (3) conflict resolution activities and children's literature to build a positive classroom climate and deal effectively with conflict and (4) Training in Critical Thinking, including categorizing, brainstorming, questioning, drawing conclusion, sequencing, and evaluating. To assess the effects of the intervention a pretest and posttest were given to check for appropriate social behavior, and teacher journals and checklists were kept throughout the intervention period. Findings, indicated an increase in student Critical Thinking skills, an improvement in interpersonal skills, and an increase in the use of conflict resolution skills. The amount of time spent teaching social skills and conflict resolution increased throughout the intervention.

**Coffey and Knoll (1998)** presented the general purpose of life skills programme to help person live more successfully and to function better in their multiple roles as member of a family, community and work force. Life Skills training was treated as an educationally programme emphasizing the world of work, practical living skills, personal growth and management, and social interpersonal skills.

**Waltemire (1999)** investigated 4-H program and identified the seven Life Skills as being essential for productive and happy lives i.e. Creative Thinking, Decision Making, Acquiring Knowledge, Responsibility, Communication, Understanding of Self, and Getting along with others. It provided the opportunity to teach these life-long skills. Result showed, students who were taken out for camps, get many opportunities for positive youth development for both campers and teens, which provides leadership at camps. It is an environment where, by designing and deliberately facilitating experiences teaches and help young people practice Life Skills.

**Powney, Lowden & Hall (2000)** investigated the Scottish and English young peoples’ view on important Life Skills, how they believe and develop them, and how
necessary they see them to their future lives. More than 200, 16 to 21 year olds examined photographs of events related to basic life tasks, family, close relationships, work or school and leisure activities and then identified skills involved. They considered the most important, essential life skills to be communication and interpersonal skills. Young people believed these skills were also those that employers consider essential, valued and saw employment experience as the major influence in developing Life Skills. They added creativity and aesthetic skills and physical and coordination skills to the traditional list of key skills. Further, they described wide applications of Problem Solving and Critical Thinking skills; and saw family, work, friends, and school as the main influences on skill development.

**Distel (2001)** conducted a study to determine whether the use of computer-assisted instruction increased the students' interest and time on task in mathematics. In the study six Life Skills students with varied mental disabilities at Eastern High School in a Pennsylvania school district received mathematics instruction through the use of a PLATO computer-assisted instruction program for mathematics. Results of observations and interviews of students suggests that the use of computer-assisted instruction clearly increased students' interest in mathematics.

**Suman (2002)** conducted a cross-sectional cum longitudinal study on college students (19-21 years), in five years (1991-96: five phases), with pretest and posttest quasi-experimental design. Study-I comprised of intervention programme on Time Sensitization for three years (1991-94) implemented in three phases. The study was conducted on 108 students. Experimental group (N= 44) was given treatment on time sensitization with different techniques, control-1 group (N=39), non-experimental treatment group, was given no intervention on time management but only techniques were implemented, control-2 (N=25) was given no treatment. The impact of intervention programme on time structure was apparent only in the phase three level. The experimental group when compared to the 2 control-groups showed a significant increase in their time structure scores with greater sense of purpose life, effective organization and persistence in tasks. Study II was planned for another two years (phase IV &V, 1994-96) for implementing a Life Skills programme to study the impact and positive transfer of learning in the areas of social functioning, namely self esteem, life perspective, future expectations, reactions to difficulties, well-being and
purposive structuring of time. Life Skill programme was developed in the areas of self
development, stress management, life planning, career goals, effective
communication, and social support system for the development of core skills of self
awareness, coping with stress, time management, communication, interpersonal
relationships, critical thinking and decision making. The experimental group (N=38, 
study I) and 14 students of control-1 group (study I) was given intervention on life
skills for 8 months where as 20 students of control-1 group and control-2 group (n=23, 
study I) were given no treatment. The findings, revealed that the Life Skills 
programme had a significant impact on the two treatment groups as compared to 
control group for the development of above mentioned life skills. The treatment-1 
group when compared to the other groups reported significantly higher gain in scores 
on all measures mentioned above. The feedback from participants revealed that it was 
helpful in building a knowledge base, skill acquisition, self-analysis and greater 
motivation in skill competence. The programme failed to show impact on the 
measures of life perspective and reactions to difficulties in the subject.

West (2003) studied contextual variability in the transfer of Problem Solving 
skills. The purpose of this study was to describe how individuals learn from examples 
and retrieve known problems to help solve new ones. Subjects who did not receive 
contextual variability in training but solved a simple transfer problem showed 
improved transfer and recognition of embedded principles.

Botvin, Griffin, Paul & Macauly (2003) in his study examined effectiveness 
of a substance abuse prevention program in preventing tobacco and alcohol use 
among elementary school students in grades 3 through 6. Program teaches social 
resistance skills and general personal and social competence skills. Findings indicate a 
school-based substance abuse prevention approach previously found to be effective 
among middle school students was also effective for elementary school students.

conducted a study to compare a standard Life Skill Training (LST) program with an 
infused (I-LST) approach. Nine small, rural school districts were randomly assigned 
to LST, I-LST and control group of grade seven. The LST program significantly 
reduced alcohol use, binge drinking, marijuana use, and inhalant use after one year for 
females. The I-LST program significantly reduced smoking, binge drinking, and
marijuana use for females. At the end of the second year the I-LST program continued to impact female smoking, but all other results were non-significant. There were no effects on males at either time point.

Shechtman, Levy & Leichtentritt (2005) evaluated outcomes and implementation processes of teacher training in the Life Skills Training (LST) program in Israel. LST, an education program that teachers administer to students, focuses on Life Skills in 4 major areas i.e. (a) Identity development or purpose in life (b) Problem solving or decision making, (c) Interpersonal relationships, and (d) Physical health maintenance. On the basis of the rationale that group training affects relationships, the authors hypothesized that such training would lead to improved perceptions of the work environment and higher levels of self-efficacy for teachers. Sample (N = 214) included 3 groups of teachers (a) Teachers who did not receive training (b) Teachers in their 1st year of training and (c) Teachers in their 2nd year of training. Results indicated that teachers with 2 years of training had significantly higher scores on work environment and self-efficacy measures than teachers with less training.

Malhotra (2006) conducted an experimental study to investigate the Impact of Quality Instruction (QI) with Home Based Remediation (HBR) and Parental Involvement (PI) on the Life skills in Science subject. Life Skills studied were: Skill of Acquiring Knowledge, Problem Solving, Creative Thinking and Communication Skills. The sample consisted of 160 (Boys & girls) students of class V, studying in public schools of District Solan (H.P). Researcher after employing 2x3 factorial analysis found that QI with HBR results in higher scores of all the selected life skills as compared to QI without HBR, which in turn is higher than conventional group Learning. HPI enhances student academic achievement, creativity and communication skills. For the skill of problem solving the results are same for HPI and LPI. Thus QI with HBR has enhanced the performance of the students on various Life Skills. Some specific activities in the classroom are favourable in the development of high life skills among children.

Sharma (2006) conducted an experimental study to study the effect of individualised single feedback correctives in Mastery Learning of Life Skills in relation to learning approaches in Geography subject. Sample of 200 students,
2.4 Research Studies Related to Learning Approaches

Miller, Jeff & McKinley (1990) surveyed 1,119 college students to examine relationships among Learning Approaches (LAPs), motives, and Grade Point Average (GPA). Students completed 3 questionnaires to assess LAPs and motives, including the Inventory of Learning Processes. Compared with women, men seemed to have a slightly better profile of learning styles and LAPs, but were at higher risk and were in more need of learning assistance and counseling. Grades for both men and women seemed to be affected by learning styles, LAPs, and motives. Experiencing academic failure and not doing well academically tended to have negative effects.

Beckwith (1991) investigated relationships between approaches to learning, as measured by the Study Process Questionnaire (SPQ), prior knowledge of subject area, and performance on a multiple-choice test in basic psychology. Subjects were 105 first year tertiary students, of mean age 19.9 years, and predominantly female (82.9%). The main findings were approaches to learning were unrelated to assessment performance, and prior knowledge did not relate to a Deep Approach although it did predict performance.

Landine (1994) in his study aimed at examining the relationship between metacognition and certain personality variables and the role they play in academic achievement, used Biggs’ (1987) model of metacognition that suggests three distinct approaches to learning: Surface, Deep and Achieving. Measures of metacognition, motivation, locus of control, and self-efficacy were used to compare with students’ estimates of current academic average. These measures were administered to a population of 108 grade XII students in New Brunswick and Newfoundland. The results indicated significant positive relationships between metacognition, motivation, locus of control, self-efficacy, and academic average. An analysis of differences between the three metacognitive approach groups showed that the Deep and Achieving approach groups are related to academic success, but not the surface group. It was concluded that metacognition and these personality variables are related to academic achievement.

Jones & Kember (1994) in a study entitled Approaches to Learning and student acceptance of self study packages examined the attitudes of Physiotherapy students of Hong Kong Polytechnic towards the replacement of conventional lectures
Review of Related Literature

with self-learning packages. Attitude to use the packages were determined with a questionnaire, and student approaches to learning were measured with the ‘Study Process Questionnaire’. It was found that students with Deep Approach to learning were more likely to express a preference for self-study. Those with Surface Approach needed the lecture to define the course. There was tentative evidence that the use of a surface approach declined as more self-study packages were completed.

Anderson (1995) studied relationship between college students learning approach to their quality of learning outcomes. The focus of this study is to empirically test Biggs’s (1985) theoretical model of the relationship between specific predictors and criterion variables. It examined the inter relationship among the predictor variables of locus of control, approach to learning, and meta-cognition, and their relationship with the quality of learning outcomes (structural complexity and cognitive performance). Rotter’s locus of control scale, and Biggs’s study process questionnaire (SPQ) and Tobias’s assessment of meta-cognition were administer to 177 college students to measure the predictor variables. Essay answers to open ended questions based on three text passages were evaluated using the Structure of the Observed Learning Outcomes (SOLO Taxonomy) to determine structural complexity. The results of Pearson’s product moment correlation analysis indicate a positive correlation between internal locus of control, Deep and Achieving approaches to learning and meta-cognition. A negative correlation between Surface Approach and meta-cognition was indicated. No relationship between any learning approach and learning outcome was found.

Byrne (1996) in his study examined the relationships among instructional method (didactic and guided discovery), type of outcome (fact/recall and comprehension learning), and learning approaches (using Biggs’s Learning Process Questionnaire). In addition to quantitative analysis of test scores, the researcher qualitatively evaluated student cognitive processes via stimulated recall interviews. These interviews consisted of teacher/student discussions about videotape clips of previous classes. The students were asked questions about their thought processes and strategies during a particular class session. In contrast to some earlier researches which has found that instructional methodology and learning approach have a significant influence on learning, this study did not find statistically significant results
Review of Related Literature

with respect to achievement. Analysis showed small effects for learning approach and certain combinations of instructional methodology & learning approach, suggesting that perhaps larger sample sizes might produce significant differences. Two variables did have a significant (p <0.01) impact performance. Composite ACT scores correlated positively with higher achievement. Also, students performed better on fact/recall items than on comprehension items.

Chin (1997) conducted a study to (a) investigate the relationship between students' learning approaches and their conceptual understanding of some chemical concepts (b) describe the qualitative differences between a Deep and Surface learning approach to learning science and (c) identify the kinds of cognitive and metacognitive strategies that students use as they construct their conceptual knowledge. Sample consisted of 102 eighth grade students. The teaching of chemistry unit lasted for nine weeks. Six target students from one class were selected for more in-depth study. They worked in groups during hands-on laboratory activities and were audio taped or videotaped. The students were also interviewed individually both before and after instruction of the chemistry unit about their responses on the Chemistry Questionnaire and their thoughts and actions during the laboratory activities. Results showed no relationship exists between the students' learning approach and their conceptual change. Analysis of the target students' discourse and actions during the group activities and their interview responses revealed that the strategies associated with a deep learning approach included generating mental images and analogies, hypothesizing, thought experimenting and predicting possible outcomes, self-explaining and theorizing, invoking personal experiences and prior knowledge and applying them to new situations, asking questions, thinking of specific examples, and looking for coherence by seeking patterns and relating different aspects of the task. When students used Deep Approach, they also constantly monitored and self-evaluated the status of their comprehension, self-questioned, self-corrected their errors, attended to contradictory information, considered limitations in their own or others' ideas and criticized them. Students using Surface Approach gave explanations that were reformulations of the questions. Their questions also referred to more basic factual or procedural information.
Wong & Watkins (1998) conducted a longitudinal study to investigate the relationships among classroom environment, approach to learning, cognitive and affective variables through structural equation modeling in mathematics classroom. Sample consisted of 356 grade IX students in nine secondary schools of Hong Kong. Models that clarified the effects of classroom environment on how students learn and the outcomes they achieve were obtained. Numerous significant paths from prior learning experience to environmental variables were identified; the most salient path from classroom environment to learning outcomes was that between an enjoyable classroom environment and cognitive achievement. An enjoyable classroom environment mediated the casual relationship between a Deep Approach and high-level achievement. However, classroom environment did not seem to influence changes in approaches to learning.

Trigwell, Prosser & Waterhouse (1999) conducted a quantitative study aimed at investigating the relations between teachers' approaches to teaching and students' approaches to learning. The study made use of a teaching approach inventory derived from interviews with academic staff, and a modified approach to learning questionnaire. The conclusions were derived from a factor and cluster analysis of 48 classes (involving 46 science teachers and 3956 science students) in Australian universities. The results indicated that in the classes where teachers described their approach to teaching as having a focus on what they did and on transmitting knowledge, students adopted a Surface Approach to the learning of that subject. Where as in the classes where teachers adopted approaches to teaching that are more oriented towards students and in changing the students' conceptions, students adopted deeper approaches to learning. This study highlighted the importance, in attempts to improve the quality of student learning, discouraging teacher-focused transmission teaching and encouraging higher quality, conceptual change/ student-focused approaches to teaching.

Van Melle & Tomalty (2000) in their study examined the use of a multimedia CD ROM entitled Hyper Clinic: Interactive Case Studies in Microbiology in order to foster to learning for understanding in a first year microbiology course for nurses using a case study approach. Results of the Study Process Questionnaires showed that there was a significant shift in a deep approach to learning over the course of the term.
Student interviews revealed that the computer technology supported this shift by providing students with the opportunity to apply what they had learned in class to specific case studies. The extent of the impact, however, varied among different groups of students in the class. The results also showed that a surface approach to learning was an important aspect of learning for understanding, although only those students who were able to combine a surface with a deep approach to learning were successfully able to learn and understand.

Chin (2001) conducted a case study with a purposes to: (1) identify the types of questions that students ask during science learning (2) explicate the role of students' questions in the knowledge construction process (3) investigate the relationship between students' questions and approaches to learning and (4) discuss some emergent issues related to student questioning. Six eighth grade students from a school in mid-western university town were used to obtain rich, in-depth data from classroom discourse in small-group settings. They were observed during class activities for nine weeks and interviewed before and after instruction about related science (chemistry) concepts. Students' questions included basic information questions that were typical of a surface learning approach, and wonderment questions that were indicative of a deep approach. Unlike wonderment questions that stimulated students to hypothesize, predict, thought-experiment, and generate explanations, basic information questions generated little productive discussion. Problem-solving activities elicited more and a wider range of wonderment questions than teacher-directed activities. Although the students did not always ask wonderment questions spontaneously, they were able to generate such questions when prompted to do so.

Jones (2002) conducted a study on 48 undergraduate students enrolled in traditional (lecture and tutorial) and non-traditional (workshops and group projects) to examine the role of the teaching-learning environment on approaches to learning; range of personality (locus of control, sensing function, thinking function, intelligence) and demographic variables (age, gender, year of study) to assess which were good predictors of deep and surface approaches to learning. A series of 2x2 repeated measures MANOVA’s indicated students were likely to change their approach to learning based on their perceptions of the learning environment. However, those students identified as predominantly surface learners significantly
increased their deep scale scores in the non-traditional subject when compared to deep learners. A series of regression analyses identified age, sensing function and locus of control as significant predictors of the surface, surface-achieving-motive, and deep approaches to learning. Locus of control was found to be significant predictor of the deep approach to learning.

**Fowler (2003)** in a study compared non-traditional teaching and learning methods (involving project-based learning) with traditional methods, and examined their effect on students’ approaches to learning. The study also investigated the relative contribution of particular teaching, learning and assessment methodologies in project-based learning that enhance deeper approaches to learning. Seventy psychology students participated in the study. Of these 70 students, 50 completed pre- and post-Study Process Questionnaires (SPQ) (Biggs, 1987b) to measure for shifts in deep learning in a traditional and non-traditional course. Seventy participants completed a SPQ in the non-traditional course and rated the effectiveness of six teaching and learning components (field work task, field work supervision, a learning group contract, learning group working experience, lectures, and peer teaching sessions conducted by other students) and three assessment components (an applied essay, a peer teaching session, and a short answer examination) of the course. Results indicated that non-traditional teaching and learning methods, compared to traditional teaching and learning methods, resulted in an increase in deep motives, deep strategies and deep-related approaches to learning. In addition, results indicated a trend for surface learners, compared to deep learners, to move toward deep approaches to learning and a significant increase by surface learners in deep strategies for learning. Further, the results indicated that none of the individual teaching, learning and assessment methodologies examined in the non-traditional course were, on their own, predictive of deep motives, strategies or approaches to learning. The finding was interpreted as indicator that students perceived all teaching, learning and assessment methodologies to be equally effective in facilitating deep learning.

**Ellis & Calvo (2004)** studied student experience of learning through discussions in a blended environment. Third year engineering students studying e-commerce engaged in both face-to-face discussions and online asynchronous discussions as key aspects of their learning experience. Adopting a quantitative
methodology, questionnaires were completed by students at the end of their learning experience. The results suggest qualitatively different experiences of learning through discussions. The results showed that students who have a deep understanding of how the discussions are related to their learning outcomes tend to approach the discussions in more meaningful ways. In face-to-face context, their approach emphasizes learning through the experience of others and, in the online environment; their approach emphasizes reflecting on the problems discussed from a variety of perspectives.

Cope & Staehr (2005) reported a study aimed to improve the proportion of students using aspects of Deep learning approaches in an undergraduate Information Systems (IS) subject. To investigate the impact of the interventions, students' learning approaches were evaluated each year on the basis of responses to short written answer and Likert-scale questionnaire items. It was only in the fifth year of the study a statistically significant increase in the proportion of students using aspects of deep learning approaches was identified. Among a number of important learning environment factors, perception of workload appeared to be a key to encouraging the use of deep learning approaches. Through, gradually decreasing the workload in the subject each year, a point was reached where enough educationally critical content was covered to satisfy the subject aims, but significantly more students perceived they had enough time to apply deep learning approaches.

Struyven, Dochy, Janssens & Gielen (2006) investigated the effects of the learning/teaching environment on students' approaches to learning (i.e. combination of intention and learning strategies) and compares a lecture based to a student-activating setting within the first year of elementary teacher education. Data collection (N = 790) was carried out using a pretest/posttest method by means of the Approaches to Learning and Studying Inventory (ALSI). Though students' approaches were similar at the start of the course, a clear distinction was found after experiencing the lecture based and student-activating teaching/learning environments. However, the direction of change was opposite to the premise that student-activating instruction deepens student learning. Instead, the latter pushed students towards a Surface Approach to learning and students' Strategic Approaches suffered significant lowering.
**Gijbels & Dochy (2006)** studied the relationships between hands-on experiences with formative assessment, students' assessment preferences and their approaches to learning. The sample consisted of 108 university first-year Bachelor's students studying criminology. Data were obtained using the "Revised Two-factor Study Process Questionnaire" (R-SPQ-2F) and the "Assessment Preferences Inventory" (API). The study shows that differences in assessment preferences are correlated with differences in approach to learning. Students' preferences for assessment methods with higher-order thinking tasks are significantly lower after actual experience with a formative assessment. Moreover, students also changed their approaches to learning after hands-on experience with a formative mode of assessment. This change evinced a more "surface approach" to learning.

**Meena (2006)** conducted an experimental study to see the Impact of Barnlund Transactional (BTMC) model of Communication on Life Skills of Secondary Students in relation to their Learning Approaches. The study was conducted on 296 students of X standard from four Govt. Model Schools of Chandigarh, studying Economics. The 2×2 factorial design of the study reported that students of BTMC achieved higher gain means than those studying in Conventional Group Learning on Skill of Acquiring Knowledge, Skill of Critical Thinking, Skill of Decision Making, and Communication Skills. Students with Deep and surface approach scored equal level of gain means for Skill of Acquiring Knowledge, Skill of Decision Making, and Skill of Communication. But on the Skill of Critical Thinking students with deep approach had scored higher levels of gain mean scores than with surface approach of learning. BTMC has enhanced the performance of the students. Quality of education can be raised by incorporating activities that boost various life skills of students.

**Watters & Watters (2007)** studied the epistemological beliefs and study habits of students undertaking first-year courses in Biological Chemistry and Biochemistry. The results showed that most students tend to adopt beliefs that knowledge and learning involves the accumulation of information and the capacity to reproduce on demand in examinations. Approaches to learning reflect these beliefs and are dominated by rote learning and preference for assessment by examination. Further, few students adopt strategies that emphasize the relationship of concepts to those already learnt or to applications relevant to biological science.
Lewis (2008) conducted a study using pre-post intervention, two-group research design to examine to what extent a classroom intervention would affect the rate and types of questions that undergraduate students ask in the classroom. The intervention allowed students to submit questions anonymously in writing at the end of each class, then receiving answers in a following class. Results of the study were mixed. Students did ask significantly more questions during the intervention. Further, there was a significant shift from baseline surface learning approach to deep learning approach among some students. However, the types of questions asked did not change.

Kember, Leung & McNaught (2008) conducted a study, based on the Revised Study Process Questionnaire, for those taking courses for new teachers to demonstrate that approaches to learning have a relational nature that they are influenced by the teaching and learning context. Participants recorded their Approaches to Learning in two contexts: how they currently studied as postgraduate students, and how they studied in their most disliked undergraduate course. Analysis of the results from this activity indicates that Approaches to Learning are markedly influenced by the teaching and learning environment. The data from the activity give quantitative evidence of the relational nature of Approaches to Learning. Further, there appears to be a discipline effect operating with the nature of the typical teaching and learning environment in the arts, humanities and social sciences being more conducive to students cultivating a Deep Approach to Learning.

Gijbels, Coertjens, Vanthournout, Struvy & Petegem (2009) investigated “Changing students’ approaches to learning: a two-year study within a university teacher training course”, in a pretest posttest design, and found the constructivist learning environments in both conditions differed in the amount of feedback students received. Paired-sample t-tests indicated that students did not change their approach towards a more deep approach. Multiple regression analysis on deep approach on the post-test showed no effect for change in learning environment. Further it showed that little alterations in the learning-assessment environment do not modify students' approaches to learning.

Parpala, Lindblom, Komulainen, Litmanen & Hirsto (2010) conducted a study to analyse combinations of approaches to learning among undergraduates in
2,509 students were clustered on the basis of their scores on different items measuring Approaches to Learning to explore the relationship between the clusters and both the disciplines of the students and their perceptions of the teaching–learning environment. The students were asked to complete an on-line questionnaire, which was a revised version of the Experience of Teaching and Learning Questionnaire. It included items covering approaches to learning and perceptions of the teaching–learning environment. The students were classified in four clusters. Results showed that there were significant differences in how the respondents from the 10 faculties were represented in these clusters. There were also differences in their perceptions of the teaching–learning environment in the different faculties. There was disciplinary variation in approaches to learning. Furthermore, the results indicated that both approaches to learning and the discipline have an effect on students’ experiences of the teaching–learning environment.

Ullah, Richardson & Hafeez (2011) conducted a survey of over 900 students at two Pakistani Universities to examine their approaches to studying and perceptions of their courses. Result was obtained for a deep approach, a surface approach and two aspects of a strategic approach. Their perceptions were based upon the instructional practices, the acquisition of generic skills, the appropriateness of the assessment and of their workload, and the available learning resources. A higher-order analysis revealed two broad dimensions of the student experience in Pakistan. Students who had positive perceptions tended to adopt a deep approach, prefer courses, teaching and assessment, that supported their understanding and to be engaged and reliable in their studies. However, students who had negative perceptions tended to adopt a surface approach and to prefer courses, teaching and assessment that reinforced this approach through the bare transmission of information.

Almeida, Teixeira, Martinho & Balasooriya (2011) conducted a study to analyse the approaches to learning in Chemistry undergraduates by investigating whether the teaching, learning and assessment strategies conceived and implemented in a higher education Chemistry course (intentionally designed to promote deep learning and understanding) promote the development of higher-order skills. This research was carried out in Chemistry classes for first-year science and engineering courses at the University of Aveiro, Portugal. At the end of the academic year, the 10
Chemistry students with the highest grades and the 10 chemistry students with the lowest grades were selected for interview. Data were also gathered by means of observation of Chemistry classes, documentary analysis and the administration of the Portuguese version of the Approaches and Study Skills Inventory for Students. The students with the better grades revealed a conception of learning emphasizing understanding, while the students with the lowest grades conceived learning as merely memorising and reproducing. The students with the highest grades diverged both in their learning approaches and in their preferences for teaching strategies. The students with the lowest grades adopted a surface or a combination of a surface and a strategic approach, and their preference for teaching matched their approach to learning. However, students perceived the purposes and the context of this course in different ways. Further, continuous feedback should be provided to students to orientate their learning and to try to diminish surface approaches to learning.

**Trends**

The review of literature related to Learning Approaches revealed that a student when confronted with the learning material tends to adopt different approaches. The approaches they follow are positively related to academic success, motivation, metacognition, self efficacy, and locus of control. Deep approach results in higher academic achievement (Bechwith, 1991; Landine, 1994; Wong & Wong, 1998; Almedia et al., 2011). Studies have reported that the approaches they follow are markedly influenced by teaching and learning environment as they have found positive relationship between teacher approaches to learning and students’ approaches to learning (Trigwell et al., 1999; Jones, 2002; Struyven et al., 2006; Kember et al., 2008). Teacher can shift student approach to deep approach by using formative assessment (Gijbels & Dolchy, 2006), prompting the students to ask wonderment questions (Chin, 2001), using technology and adopting those approaches and strategies that are more student-centered. Further studies (Meena, 2006 & Sharma, 2006) trying to explore learning of life skills in relationship to learning approaches students with DA and SA gain equally on skill of decision making, coping stress, critical thinking and communication while one reported that students with DA performed better on critical thinking (Meena, 2006).
2.5 Emergence of the Problem

From the perusal of the related literature quoted above, the researcher found variation in the research findings reported so far on the effectiveness of Computer Mediated Instruction in science education. A few researches have investigated the effectiveness between CMI and learning outcomes, yet the findings are contradictory as some studies have reported positive effect on various outcomes (Nalley, 1991; Nishino, 1993; Williams et al., 1998; Mahmood, 2004; Tekbiyik & Akdeniz, 2010) whereas others reported negative effect (Zeitz, 1992; Burchfield & Guilford, 1995; Huxford, 1999; Moosav, 2009). Therefore, no generalization can be made at this point.

The use of computer in teaching learning process has undergone many phases. Research studies conducted during the first phase i.e. integration of CMI in traditional teaching reported it to be effective. Though in the second phase when the researcher tried to compare the traditional methods of teaching over CMI they found some mixed results. But in the third phase with the initiation of concept of 24x7 assessable online learning with the aim of replacing a teacher, the researchers reported that human intervention is very important to achieve desired learning outcomes.

Taking this into consideration, the recent fourth phase is emerging out with the use of blending learning/ hybrid instructions that integrate the advantage of both technology and face-to-face classroom sessions in one way or other. Many researches are being conducted to evaluate the impact of hybrid learning on various learning outcomes from graduation level onwards. Within limited references of the present study, the researcher could not find hybrid instructions for secondary students more specifically in Indian circumstances.

Apart from intellectual skills, many more life skills are required by an individual to lead an effective life. A lot is being proposed and done by various educationists globally on the development of skills in children through our education system. But in India, Life skill training was still in the elementary stage until CBSE started with CCE where Life skills have been given a due place. Nothing much has been done for implementation of such training programmes. Research literature reveals that little has been done for the implementation of such life skills in education system in India.
Review of Related Literature

However, quality instruction that enhances thinking skills and life skills of students can be one of the vehicles that can lead us on the path of life skills development, which prepares a child for lifelong challenges. Thinking skills can be enhanced by training and practice. Cooperative situation where students interact face-to-face provides an ideal environment to them to learn and enhance thinking skills.

Thus, to provide quality instructions enriched with activities that can enhance life skills, investigator decided to design some unique kind of hybrid instructions for secondary students by integrating the advantage of both technologies (CMI) and human interaction of traditional classroom in cooperative settings. The present investigation of synchronicity applies only to human-human (F-T-F) interaction in classroom. The online instructions in this study have been provided in the form of computer mediated instructions in computer labs in constructivist environment, where students in heterogeneous groups studied, discussed and understood the content amongst them. The teacher played the role of facilitator and monitored to ensure that students have not only understood the concept but their life skills were also being polished. But how the life skills and approaches to learning are related with each other is relatively new concept and it appeared quite significant to do research on this topic to find out the approaches students adopt for learning these life skills.

The main purpose of the study was to ascertain whether hybrid instructions in cooperative situation would result into development of the selected life skills. Further, to explore which life skills would be affected most through these instructions and how students’ approaches to learning affect in attainment of various life skills.

2.6 Statement of the Problem

EFFECT OF HYBRID INSTRUCTIONAL MODEL IN COOPERATIVE LEARNING SITUATION ON LIFE SKILLS OF SECONDARY STUDENTS IN RELATION TO LEARNING APPROACHES
2.7 Delimitations of the Study

The present study has been delimited with respect to the following:

1. HYBRID Instructions has been operationalised in two ways: (1) Computer Mediated Instructions in Cooperative Learning (HI-CL) provided in School campus computer Labs; (2) Fusion of selected life skill training in science curriculum.

2. The study was confined to students of class IX studying in Govt. Model Senior Secondary Schools situated in the Union Territory of Chandigarh

   • Affiliated to CBSE.
   • English medium.
   • Co-educational.
   • Basic facilities of Computer Laboratory

3. The effect of treatment was studied on Achievement in science subject (Physics, Chemistry & Biology) only.

4. Only five Life Skills have been selected in the present study i.e.

   • Skill of Acquiring Knowledge
   • Skill of Problem Solving
   • Skill of Critical Thinking
   • Skill of Creative Thinking
   • Skill of Decision-Making

2.8 Objectives of the Study

The study is designed to attain the following objectives

• To develop and validate Hybrid Instructional modules in science (Chemistry, Biology and Physics) for secondary students.
• To compare effectiveness of Hybrid Instructional modules in Cooperative Learning (HI-CL) situation as against Cooperative Learning (CL) and Conventional Group Learning (CGL).
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• To study the effect of Hybrid Instructional Model in Cooperative Learning (HI-CL) situation on Life Skills namely Skill of Acquiring Knowledge, Skill of Critical Thinking, Skill of Decision-Making, Skill of Problem Solving and Skill of Creative Thinking.
• To study the effect of Learning Approaches on the selected Life Skills.
• To study interaction effect of Hybrid Instructional Model in Cooperative Learning (HI-CL) situation and Learning Approaches on the selected Life Skills.

2.9 Hypotheses

The study was designed to test the following hypotheses:

**Ho. 1:** The three treatment groups do not differ in respect of means of entry behaviour

**Skill of Acquiring Knowledge**

**Ho. 2:** HI-CL, CL and CGL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.

• **Ho. 2.1:** HI-CL and CL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.
• **Ho. 2.2:** HI-CL and CGL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.
• **Ho. 2.3:** CL and CGL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.

**Ho. 3:** Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.

**Ho. 4:** Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for the Skill of Acquiring Knowledge in Chemistry.

• **Ho. 4.1:** Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.
• **Ho. 4.2:** Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.
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- **Ho. 4.3:** Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.
- **Ho. 4.4:** For Deep Approach: HI-CL and CL yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.
- **Ho. 4.5:** For Deep Approach: HI-CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.
- **Ho. 4.6:** For Deep Approach: CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.
- **Ho. 4.7:** For Surface Approach: HI-CL and CL yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.
- **Ho. 4.8:** For Surface Approach: HI-CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.
- **Ho. 4.9:** For Surface Approach: CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Chemistry.

**Ho. 5:** HI-CL, CL and CGL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Physics.

- **Ho. 5.1:** HI-CL and CL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Physics.
- **Ho. 5.2:** HI-CL and CGL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Physics.
- **Ho. 5.3:** CL and CGL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Physics.

**Ho. 6:** Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Physics.

**Ho. 7:** Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for the Skill of Acquiring Knowledge in Physics.

- **Ho. 7.1:** Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Physics.
- **Ho. 7.2:** Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Physics.
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- **Ho. 7.3**: Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Physics.
- **Ho. 7.4**: For Deep Approach: HI-CL and CL yield equal gain means for the Skill of Acquiring Knowledge in Physics.
- **Ho. 7.5**: For Deep Approach: HI-CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Physics.
- **Ho. 7.6**: For Deep Approach: CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Physics.
- **Ho. 7.7**: For Surface Approach: HI-CL and CL yield equal gain means for the Skill of Acquiring Knowledge in Physics.
- **Ho. 7.8**: For Surface Approach: HI-CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Physics.
- **Ho. 7.9**: For Surface Approach: CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Physics.

**Ho. 8**: HI-CL, CL and CGL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Biology.

- **Ho. 8.1**: HI-CL and CL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Biology.
- **Ho. 8.2**: HI-CL and CGL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Biology.
- **Ho. 8.3**: CL and CGL instructional modes yield equal gain means for the Skill of Acquiring Knowledge in Biology.

**Ho. 9**: Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Biology.

**Ho. 10**: Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for the Skill of Acquiring Knowledge in Biology.

- **Ho. 10.1**: Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Biology.
- **Ho. 10.2**: Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Biology.
• **Ho. 10.3:** Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Acquiring Knowledge in Biology.

• **Ho. 10.4:** For Deep Approach: HI-CL and CL yield equal gain means for the Skill of Acquiring Knowledge in Biology.

• **Ho. 10.5:** For Deep Approach: HI-CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Biology.

• **Ho. 10.6:** For Deep Approach: CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Biology.

• **Ho. 10.7:** For Surface Approach: HI-CL and CL yield equal gain means for the Skill of Acquiring Knowledge in Biology.

• **Ho. 10.8:** For Surface Approach: HI-CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Biology.

• **Ho. 10.9:** For Surface Approach: CL and CGL yield equal gain means for the Skill of Acquiring Knowledge in Biology.

**Skill of Critical Thinking**

**Ho. 11:** HI-CL, CL and CGL instructional modes yield equal gain means for the Skill of Critical Thinking.

• **Ho. 11.1:** HI-CL and CL instructional modes yield equal gain means for the Skill of Critical Thinking.

• **Ho. 11.2:** HI-CL and CGL instructional modes yield equal gain means for the Skill of Critical Thinking.

• **Ho. 11.3:** CL and CGL instructional modes yield equal gain means for the Skill of Critical Thinking.

**Ho. 12:** Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Critical Thinking.

**Ho. 13:** Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for the Skill of Critical Thinking.

• **Ho. 13.1:** Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Critical Thinking.
• **Ho. 13.2:** Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Critical Thinking.

• **Ho. 13.3:** Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Critical Thinking.

• **Ho. 13.4:** For Deep Approach: HI-CL and CL yield equal gain means for the Skill of Critical Thinking.

• **Ho. 13.5:** For Deep Approach: HI-CL and CGL yield equal gain means for the Skill of Critical Thinking.

• **Ho. 13.6:** For Deep Approach: CL and CGL yield equal gain means for the Skill of Critical Thinking.

• **Ho. 13.7:** For Surface Approach: HI-CL and CL yield equal gain means for the Skill of Critical Thinking.

• **Ho. 13.8:** For Surface Approach: HI-CL and CGL yield equal gain means for the Skill of Critical Thinking.

• **Ho. 13.9:** For Surface Approach: CL and CGL yield equal gain means for the Skill of Critical Thinking.

**Skill of Decision Making**

**Ho. 14:** HI-CL, CL and CGL instructional modes yield equal gain means for Decision Making Ability.

- **Ho. 14.1:** HI-CL and CL instructional modes yield equal gain means for Decision Making Ability.
- **Ho. 14.2:** HI-CL and CGL instructional modes yield equal gain means for Decision Making Ability.
- **Ho. 14.3:** CL and CGL instructional modes yield equal gain means for Decision Making Ability.

**Ho. 15:** Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for Decision Making Ability.

**Ho. 16:** Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for Decision Making Ability.
• **Ho. 16.1:** Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for Decision Making Ability.

• **Ho. 16.2:** Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for Decision Making Ability.

• **Ho. 16.3:** Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for Decision Making Ability.

• **Ho. 16.4:** For Deep Approach: HI-CL and CL yield equal gain means for Decision Making Ability.

• **Ho. 16.5:** For Deep Approach: HI-CL and CGL yield equal gain means for Decision Making Ability.

• **Ho. 16.6:** For Deep Approach: CL and CGL yield equal gain means for Decision Making Ability.

• **Ho. 16.7:** For Surface Approach: HI-CL and CL yield equal gain means for Decision Making Ability.

• **Ho. 16.8:** For Surface Approach: HI-CL and CGL yield equal gain means for Decision Making Ability.

• **Ho. 16.9:** For Surface Approach: CL and CGL yield equal gain means for Decision Making Ability.

**Ho. 17:** HI-CL, CL and CGL instructional modes yield equal gain means for Factors Influencing Decisions.

• **Ho. 17.1:** HI-CL and CL instructional modes yield equal gain means for Factors Influencing Decisions.

• **Ho. 17.2:** HI-CL and CGL instructional modes yield equal gain means for Factors Influencing Decisions.

• **Ho. 17.3:** CL and CGL instructional modes yield equal gain means for Factors Influencing Decisions.

**Ho. 18:** Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for Factors Influencing Decisions.

**Ho. 19:** Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for Factors Influencing Decisions.
Review of Related Literature

• **Ho. 19.1:** Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for Factors Influencing Decisions.

• **Ho. 19.2:** Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for Factors Influencing Decisions.

• **Ho. 19.3:** Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for Factors Influencing Decisions.

• **Ho. 19.4:** For Deep Approach: HI-CL and CL yield equal gain means for Factors Influencing Decisions.

• **Ho. 19.5:** For Deep Approach: HI-CL and CGL yield equal gain means for Factors Influencing Decisions.

• **Ho. 19.6:** For Deep Approach: CL and CGL yield equal gain means for Factors Influencing Decisions.

• **Ho. 19.7:** For Surface Approach: HI-CL and CL yield equal gain means for Factors Influencing Decisions.

• **Ho. 19.8:** For Surface Approach: HI-CL and CGL yield equal gain means for Factors Influencing Decisions.

• **Ho. 19.9:** For Surface Approach: CL and CGL yield equal gain means for Factors Influencing Decisions.

**Skill of Problem Solving**

**Ho. 20:** HI-CL, CL and CGL instructional modes yield equal gain means for the Skill of Problem Solving.

• **Ho. 20.1:** HI-CL and CL instructional modes yield equal gain means for the Skill of Problem Solving.

• **Ho. 20.2:** HI-CL and CGL instructional modes yield equal gain means for the Skill of Problem Solving.

• **Ho. 20.3:** CL and CGL instructional modes yield equal gain means for the Skill of Problem Solving.

**Ho. 21:** Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Problem Solving.
**Ho. 22**: Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for the Skill of Problem Solving.

- **Ho. 22.1**: Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Problem Solving.
- **Ho. 22.2**: Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Problem Solving.
- **Ho. 22.3**: Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Problem Solving.
- **Ho. 22.4**: For Deep Approach: HI-CL and CL yield equal gain means for the Skill of Problem Solving.
- **Ho. 22.5**: For Deep Approach: HI-CL and CGL yield equal gain means for the Skill of Problem Solving.
- **Ho. 22.6**: For Deep Approach: CL and CGL yield equal gain means for the Skill of Problem Solving.
- **Ho. 22.7**: For Surface Approach: HI-CL and CL yield equal gain means for the Skill of Problem Solving.
- **Ho. 22.8**: For Surface Approach: HI-CL and CGL yield equal gain means for the Skill of Problem Solving.
- **Ho. 22.9**: For Surface Approach: CL and CGL yield equal gain means for the Skill of Problem Solving.

**Ho. 23**: HI-CL, CL and CGL instructional modes yield equal gain means for the Higher Mental Abilities in Science.

- **Ho. 23.1**: HI-CL and CL instructional modes yield equal gain means for the Higher Mental Abilities in Science.
- **Ho. 23.2**: HI-CL and CGL instructional modes yield equal gain means for the Higher Mental Abilities in Science.
- **Ho. 23.3**: CL and CGL instructional modes yield equal gain means for the Higher Mental Abilities in Science.

**Ho. 24**: Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Higher Mental Abilities in Science.
Review of Related Literature

Ho. 25: Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for the Higher Mental Abilities in Science.

- Ho. 25.1: Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Higher Mental Abilities in Science.
- Ho. 25.2: Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Higher Mental Abilities in Science.
- Ho. 25.3: Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Higher Mental Abilities in Science.
- Ho. 25.5: For Deep Approach: HI-CL and CGL yield equal gain means for the Higher Mental Abilities in Science.
- Ho. 25.7: For Surface Approach: HI-CL and CL yield equal gain means for the Higher Mental Abilities in Science.
- Ho. 25.8: For Surface Approach: HI-CL and CGL yield equal gain means for the Higher Mental Abilities in Science.

Skill of Creative Thinking

Ho. 26: HI-CL, CL and CGL instructional modes yield equal gain means for the Skill of Creative Thinking-Fluency.

Ho. 27: Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Fluency.

Ho. 28: Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for the Skill of Creative Thinking-Fluency.

- **Ho. 28.1:** Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Fluency.
- **Ho. 28.2:** Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Fluency.
- **Ho. 28.3:** Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Fluency.
- **Ho. 28.4:** For Deep Approach: HI-CL and CL yield equal gain means for the Skill of Creative Thinking-Fluency.
- **Ho. 28.5:** For Deep Approach: HI-CL and CGL yield equal gain means for the Skill of Creative Thinking-Fluency.
- **Ho. 28.6:** For Deep Approach: CL and CGL yield equal gain means for the Skill of Creative Thinking-Fluency.
- **Ho. 28.7:** For Surface Approach: HI-CL and CL yield equal gain means for the Skill of Creative Thinking-Fluency.
- **Ho. 28.8:** For Surface Approach: HI-CL and CGL yield equal gain means for the Skill of Creative Thinking-Fluency.
- **Ho. 28.9:** For Surface Approach: CL and CGL yield equal gain means for the Skill of Creative Thinking-Fluency.

Ho. 29: HI-CL, CL and CGL instructional modes yield equal gain means for the Skill of Creative Thinking-Flexibility.

- **Ho. 29.1:** HI-CL and CL instructional modes yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 29.2:** HI-CL and CGL instructional modes yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 29.3:** CL and CGL instructional modes yield equal gain means for the Skill of Creative Thinking-Flexibility.
Ho. 30: Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Flexibility.

Ho. 31: Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for the Skill of Creative Thinking-Flexibility.

- **Ho. 31.1:** Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 31.2:** Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 31.3:** Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 31.4:** For Deep Approach: HI-CL and CL yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 31.5:** For Deep Approach: HI-CL and CGL yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 31.6:** For Deep Approach: CL and CGL yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 31.7:** For Surface Approach: HI-CL and CL yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 31.8:** For Surface Approach: HI-CL and CGL yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 31.9:** For Surface Approach: CL and CGL yield equal gain means for the Skill of Creative Thinking-Flexibility.

Ho. 32: HI-CL, CL and CGL instructional modes yield equal gain means for the Skill of Creative Thinking-Originality.

- **Ho. 32.1:** HI-CL and CL instructional modes yield equal gain means for the Skill of Creative Thinking-Flexibility.
- **Ho. 32.2:** HI-CL and CGL instructional modes yield equal gain means for the Skill of Creative Thinking-Originality.
- **Ho. 32.3:** CL and CGL instructional modes yield equal gain means for the Skill of Creative Thinking-Originality.
Ho. 33: Two Learning Approaches, Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Originality.

Ho. 34: Instructional modes (HI-CL/CL/CGL) and Learning Approaches (DA/SA) do not interact in respect of gain means for the Skill of Creative Thinking-Originality.

- **Ho. 34.1:** Through HI-CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Originality.
- **Ho. 34.2:** Through CL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Originality.
- **Ho. 34.3:** Through CGL: Deep Approach (DA) and Surface Approach (SA) yield equal gain means for the Skill of Creative Thinking-Originality.
- **Ho. 34.4:** For Deep Approach: HI-CL and CL yield equal gain means for the Skill of Creative Thinking-Originality.
- **Ho. 34.5:** For Deep Approach: HI-CL and CGL yield equal gain means for the Skill of Creative Thinking-Originality.
- **Ho. 34.6:** For Deep Approach: CL and CGL yield equal gain means for the Skill of Creative Thinking-Originality.
- **Ho. 34.7:** For Surface Approach: HI-CL and CL yield equal gain means for the Skill of Creative Thinking-Originality.
- **Ho. 34.8:** For Surface Approach: HI-CL and CGL yield equal gain means for the Skill of Creative Thinking-Originality.
- **Ho. 34.9:** For Surface Approach: CL and CGL yield equal gain means for the Skill of Creative Thinking-Originality.