Chapter –2

REVIEW OF RELATED LITERATURE

Research takes advantage of the knowledge which was accumulated in the past as a result of constant human endeavour. It can never be undertaken in isolation of the work that has already been done on the problems which are directly or indirectly related to a study proposed by a researcher. A careful review of the research journals, books, dissertations, theses and other sources of information on the problem to be investigated is one of the important steps in the planning of any research study. A review of the related literature must precede any well-planned research study.

According to Aggarwal J.C, “It’s right in stating that the study of related literature implies locating, reading and evaluating reports of research as well as reports of observation and opinion that are related to the individual’s planned research project”.

2.1 Role of Related Literature

The knowledge of related research enables investigators to define the frontiers of their field. Researchers review literature for the purpose of finding a link between one’s study and the accumulated knowledge in one’s field of interest. A careful review of the literature can help researchers to revise their initial question, so that it can be investigated. The synthesis of critical reviews often leads to insight into the reasons for contradictory results in an area. Through studying related research, investigators learn which methodologies have proved useful. A thorough search through related research avoids unintentional replication of previous studies. The study of related literature places researchers in a better position to interpret the significance of their own result.

2.2 Purpose of the Review Studies
Review of the related studies, besides allowing the researcher to acquaint herself with current knowledge in the field or area in which she is going to conduct her research, serves the following specific purposes.

The review of related studies enables the researcher to define the limits of her field. It helps the researcher to delimit and define her problem. The knowledge of related literature brings the researcher up-to-date on the work which others have done and thus to state the objectives clearly and concisely.

By reviewing the related studies, the researcher can avoid unfruitful and useless problem areas. She can select those areas in which positive findings are very likely to result and her endeavours would be likely to add to the knowledge in a meaningful way. Through the review of related studies, the researcher can avoid unintentional duplication of well-established findings.

The review of related studies gives the researcher an understanding of the research methodology which refers to the way the study is to be conducted. It helps the researcher to know about the tools and instruments which proved to be useful and promising in the previous studies. The final and important specific reason for reviewing the related studies is to know about the recommendations of previous researches listed in their studies for further research.

In the present study the investigator made her target towards the works of researchers, which have employed CAI and CL strategies for the process of teaching and learning. The investigator could procure only 28 studies conducted in India and 55 studies conducted abroad.

2.3 CLASSIFICATION OF REVIEW

The review of related literature is classified into two groups. They are:

(i) Studies conducted in India

(ii) Studies conducted Abroad
2.3.1 STUDIES CONDUCTED IN INDIA ON CAI

The following are the Indian review studies which seem to be relevant to the present research. The investigator could collect 21 studies conducted for more than a decade (2000-2013). They are arranged in reverse chronological order.

**Khasnis (2013)** conducted a study on “Enhancement of Mathematics Learning through CAI”.

The major objective of the study was to find out the effect of CAI on learning Mathematics. In this study the investigator adopted parallel group experimental design. The sample for the study consisted of 100 students studying in the IX Standard of PDJ high school in Bijapur city, Karnataka. The tools used by the investigator were achievement tests and CAI software prepared by the investigator on four topics of IX Standard geometry. Mean and Standard Deviation were used for the analysis and interpretation.

The results of the study showed the positive outcomes on the IX Standard students’ immediate achievement in Mathematics, attitude towards Mathematics and computer-assisted learning. Therefore, it was revealed that computers could be integrated into Mathematics education system.

**Tholappan and Krishnakumar (2012)** conducted a study on “Attitude of Secondary Grade Teachers towards Computer Assisted Instruction”.

The aim of the study was to find out the attitude of secondary grade teachers towards computer assisted instruction. The researcher adopted the survey method for this investigation. Data were collected from 300 government school teachers who were undergoing B.Ed programme in distance mode and who were residing in Salem district. For this study, the investigator used the stratified random sampling technique. The investigator developed an attitude scale which was Standardized by subject experts. This tool consists of two parts, namely personal information part (Part A) and attitude of secondary grade teachers towards CAI part (Part B). Obtained scores were
analyzed by descriptive and inferential analysis to estimate the attitude of secondary grade teachers towards CAI.

The findings of the study were, the level of the attitude of male teachers towards CAI was found to be higher than that of the female teachers. The level of the attitude of teachers who belong to an urban residential background was found to be higher than that of the teachers with a rural background. The level of the attitude of teachers belonging to science discipline was found to be higher than that of the teachers of arts discipline. The level of the attitude of teachers who are having computer knowledge was found to be higher than the teachers who are not having computer knowledge. The level of the attitude of teachers belonging to a young age group was found to be higher than that of the other categories. The level of the attitude of teachers with a post graduate degree and M.Phil degree was found to be higher than that of the teachers with a graduate degree.

Sonawane and Padmini (2011) conducted a study on “CAI: An Effective Instructional Method for Secondary School Low Achievers”.

The major objectives of the study were (i) to find out the effective instructional method suitable for low achievers and (ii) to study the effect of CAI on the achievement score of the secondary school students. The investigator had adopted experimental method using single group pre-test treatment and post-test design. The effectiveness of the software prepared was tested. Mean of pre-test scores was compared with the mean of the post-test scores. Seventy students from the selected schools comprised the sample. Tools and Techniques of the collections are textbook based computer multimedia software package and first term end examination marks from school records.

It was revealed from the study that learning through computer media software package was more effective as compared to traditional method. Students learnt better at own pace, speed and
interest, as the software is based on psychological principles and due to motivation, students get much success and interest in learning.

Dhar (2010) had made an investigation on “Effectiveness of Teacher mediated Computer Learning Package in Botany for Teaching Higher Secondary School Students”.

The major objectives used in the study were (i) to develop computer learning package in Botany and (ii) to find out the effectiveness of the teacher mediated computer learning package in Botany for teaching higher secondary school students. The investigator used experimental method for the study. The experimental design adopted for the investigation was pre-test, post-test parallel group design. The investigator used Computer Mediated Learning Package for the experimental group and the control group was taught by lecture method. The sample consisted of 62 students of Standard XI from Government Higher Secondary School, Marthandam, Kanyakumari District, Tamil Nadu. The tools used were achievement test and intelligent test. Mean, Standard Deviation, t-test, ANCOVA were the statistics used in the study.

The investigation showed that the post-test achievement scores of experimental group and control group indicated that the two groups differ significantly in their achievement i.e., the Computer Learning Package was found suitable for teaching Botany at Higher Secondary Level. Analysis of the post-test achievement scores of experimental group with regard to the variables sex and locality revealed that there was no impact on the variables viz., sex and locality on the achievement of the students.

Gnanalet and Ramakrishnan (2010) conducted a study on “The Effectiveness of Multimedia Programmed in Teaching Environmental Education”.

This study was aimed to find out the effectiveness of multimedia teaching material in environmental education. Experimental method was used for the study. The sample consisted of 60 students studying in the ninth Standard under the matriculation syllabus in Chennai District, Tamil
The sample included both boys and girls. The tool used for the study was a multimedia programme developed by the investigator for the teaching of concepts in environmental education included in the IX Standard syllabus. An achievement test in environmental education was constructed and validated by the investigator. The statistical techniques used were Mean, Standard Deviation and t-test.

The findings of the study were that the students learning with the help of the multimedia programme fared better in the environmental education than the students learning through the conventional method. The multimedia programme helped the students to score more marks in the post-test.

Bavana (2010) conducted a study on “Effectiveness of Using Programmed Learning Materials in the Teaching of Map Marking in History”.

The main purpose of the study was (i) to develop programmed learning materials in the teaching of map marking in history and (ii) to find out the effectiveness of using programmed learning materials in the teaching of map marking in history. A test, post-test method was adopted using 35 samples from City Corporation Higher Secondary School and 32 from a Matriculation School. Simple Random Sampling method was adopted. The tools used were CAI package which consisted of lessons of the hills, rivers and routes. Their mean scores were compared to determine the effectiveness of CAI.

The results revealed that the CAI method was a more effective one for teaching maps and information about discovery of sea routes of the world. When students were made to view the resource form they were able to visualize the location of the hills, rivers and routes. So, it is evident that CAI can be used effectively for teaching certain concepts in history.

Ramesh and Sumathi (2010) conducted a study on “CAI in Learning Voice English Grammar among Eighth Standard Students-an Experimental Study”.
The major objective of the study was to study the effect of CAI in learning English grammar among eighth Standard students. The investigator had adopted experimental method for the study. Purposive sampling technique was employed in the study. The sample obtained for the study was 89 VIII Standard students of three Matriculation schools in Mecheri taluk in Salem district. The identified students were allotted randomly for two groups such as control group and experimental group. The investigator had developed and standardized a CAI package on Tutorial mode. T-test was employed for analyzing the data.

The finding of the study was that the students had not gained the substantial amount of achievement due to the manipulation of the content.

Barad (2010) conducted a study on “The Effectiveness of CAI for Science Teaching in Urban Area”.

The major objective of the study was to find out the effect of CAI on teaching science in urban area. The experimental method was used for the study. Multi-staged sampling technique was used by the researcher in the study. One school in urban area was selected to conduct the experiment. The total sample for the experiment consisted of 120 students. The independent variable was teaching method. The dependent variable was the Main Criterion Test. The statistical techniques used were Mean, Standard Deviation, t-value and ANOVA.

The findings of the study showed that science teaching through CAI programme was more effective for high IQ students than low IQ students.

Singh (2010) conducted a study on “Effectiveness of Different Modes of Computer Assisted Instruction in Teaching Science”.

The major objectives used in the study were (i) to find out the effect of Computer Assisted Instruction in teaching science and (ii) to compare the CAI and traditional method of teaching science. The method used was Quasi Experimental Design. Three groups each of 40
students studying at Standard IX in three different schools were taken as the sample. CAI mode like Tutorial was adopted in experimental group-I, Drill and Practice in experimental group-II and Simulation to the experimental group-III. Software packages in different modes of CAI like Tutorial, Drill and Practice and Simulation in the content area “States of Matter” in Science for Std. IX had already been developed and validated.

The findings of the study revealed that the CAI in Simulation was more effective than the Tutorial and Drill and Practice modes on teaching Science at Standard IX.

Patel (2009) made an investigation into “Development and Implementation of CAI to Teach English Grammar to Standard VIII Students in Different Modes”.

The main purpose of the study was (i) to develop CAI packages for teaching English grammar to Standard VIII students in different modes (ii) to implement the CAI packages for teaching English and (iii) to find out the effectiveness of CAI in teaching English for VIII Standard students. The sample used for the study was selected purposively from two schools of Vadodara namely, Bright Day School and Kelvani School during the academic year 2008-09. From the selected schools 26 Standard VIII students of only one division VIII-A of Kelvani School were taken as the Control group and 62 Standard VIII students of Bright Day School were treated as the experiment group. The required data were collected with the help of pre-test, post-test and reaction scale which were constructed by the researcher. In between pre-test and post-test the researcher implemented the intervention programme in the form of CAI package for ten days for two hours per day on the experimental group. The researcher administrated the post-test after the span of fifteen days and the reactions of the students, based on teaching with CAI were taken into account for the analysis of data.

The findings showed that there were: (i) achievement of the students in English Grammar taught through CAI was found higher than that of the students taught through traditional
method; (ii) the achievement of the students taught through CAI with repetition and CAI with Discussion was found significantly higher than the achievement of their counterparts who were taught through traditional method. Hence, it was found that the CAI was an effective tool to teach Grammar.

Saraswathi and Chandra (2009) conducted “A Study on Effectiveness of Multimedia Teaching Material in Environmental Education”.

The aim of the study was (i) to develop multimedia material in Tamil and English and test its efficacy in classroom situation; (ii) to find out the effectiveness of multimedia teaching material in environmental education and (iii) to develop right attitude towards environment. It is an experimental study. The researcher developed self-made tools to measure the cognitive and affective domains in environmental education. Data were gathered from a sample of 137 VIII Standard students before and after treating with the multimedia material. The independent variables taken into consideration were locality of school, type of school management, gender, and medium of instruction. Data were analyzed on the basis of scores in cognitive aspects and attitude with reference to the independent variables. Pre-test, post-test design was followed.

The findings of the study showed that the multimedia instructional material was significantly effective in teaching-learning of cognitive aspects and in developing right attitude towards environment.


The purpose of the study was (i) to find out the effectiveness of teaching Physics through CAI and (ii) to compare the CAI with traditional method. Multistage sampling technique was used by the researcher in the study. The pre-test - post-test control group design was employed. Two schools, one in rural and another in urban area were selected to conduct the experiment.
The sample for the experiment consisted of 30 students each in traditional and experimental groups. Time duration was 28 days for both groups with two chapters of class XI Physics text book for the experiment of the study. The tool used was an opinionative for students of both groups. Opinions of the expert and subject teacher were invited by an evaluation sheet. For the analysis and interpretation of the data the statistical techniques such as mean, S.D., t-test and chi-square test were employed.

Findings of the study showed that the teaching of Physics through CAI package was found significantly effective for the students of Standard XI. It was also found that the usage of the CAI package was equally effective in teaching boys and girls. Both students and teachers revealed a favourable opinion towards CAI programme.

Ponraj and Nellaiyapen (2008) had done a study on “Computer Assisted Instruction in Teaching Zoology”.

The major objectives of the study were (i) to find out whether there was any significant difference between the control group and the experimental group and (ii) to find out the effectiveness of CAI in teaching the topic nucleus for XI Standard students in Biology. Experimental method was used for conducting this study. Pre-test, post-test, experimental group and control group design were used for the study. The sample of the study was 300 students. A well developed and Standardized CAI package was used. Post-test materials were prepared and validated by the investigator. The personal data of the sample were collected through a questionnaire. Statistical techniques served the fundamental purpose of the description and inferential analysis. ‘t’ test was applied to analyze the differential hypotheses.

The findings of the study revealed that the teaching of the topic nucleus in Zoology by using CAI was more effective than the traditional method. From the findings it was clear that there was significant difference in achievement between the variables such as boys and girls, rural
and urban area students. There was also no significant difference between the achievement scores of hostel and day scholar students with regard to CAI in teaching the topic nucleus in Zoology.

**Singh (2005)** conducted a study on “Effectiveness of Computer Assisted Instruction for Teaching Biology”.

The objectives used were (i) to find out whether there was any significant difference between the control group and the experimental group and (ii) to find out the effectiveness of CAI in teaching Biology. Experimental method was used for conducting this study. Pre-test, post-test, experimental group and control group design were used for the study.

The sample selected was 28 students (14 in control group and 14 in experimental group) of class IX by random sampling from the students studying in Ramanujan Public School. An achievement test was constructed to measure students’ learning about cell and tissues. It consisted of 60 items designed to measure knowledge, understanding and application. Mean, Standard Deviation and t-ratio were calculated to analyse the data.

The result obtained was that the lecture method was more effective than CAI for teaching cell and CAI was more effective than the lecture method for teaching tissues.

**Jothikani and Thiagarajan (2004)** conducted a study on “Effectiveness of Computer Assisted Instruction in Mathematics among BSc Degree Students”.

The major objective of the study was to find out the effectiveness of the CAI on the Mathematics achievement among BSc Degree students. The technique used for the study was that the control group was taught through the traditional lecture method and experimental group was taught through CAI. Two equivalent groups each in I year, II year and III year of Mathematics students were formed based on their achievement scores in the previous year. The responses given by the students in pre-test and post-test were the vital data required for analysis. ‘t’-test was
applied in order to test the significance difference between the mean scores of pre-test and post-test of conventional and experimental groups.

The results revealed that there was no significant difference between the mean scores of pre-test for the control and experimental groups in all six units with reference to the objectives such as knowledge, comprehension and application. The mean scores of post-test of control group were significantly higher than that of the experimental group in all the six units with reference to the objectives and their level of achievement in both the years 1999-2000 and 2001-2002. Hence, it was concluded that the conventional method was more effective and efficient than CAI method.


The major objectives were (i) to develop CAT material in higher secondary students and (ii) to bring out the effectiveness of using CAT materials. Experimental method was used for the study. A pre and post-test design was used in the study. The sample consisted of 162 (72 males and 90 females) eleventh Standard students from 3 higher secondary schools of Thiruvananthapuram district. Out of 162 students 113 were from rural area and 49 were from urban area. Statistical technique used was mean, S.D. and t-test.

The results revealed that the CAT method was found superior to the lecture method. It was also found that there was no gender difference in the scores obtained.

Vasanthi and Hema (2003) conducted a study on “Effectiveness of Teaching Chemistry for 1st year B.E Students through Computer Assisted Instruction”.

The purpose of the study was (i) to find out the effectiveness of CAI on achievement of Chemistry first year students and (ii) to compare the achievement of boys and girls who were taught through CAI approach. A pre-test and post-test parallel group experimental design was used. The sample consisted of 60 students who were selected from 220 students of Sivnathi Aditnagar
College of Engineering, Tiruchendur in Thoothukudi District on the basis of marks. Those students were divided into two equal groups of 30 each on the basis of the marks obtained in the class test. One group was taken as the control group and the other group was taken as the experimental group. Statistical techniques like Mean, S.D and t-test were used to analyze the data collected.

The findings of the study showed that there was significant difference between the mean gain score of the control group taught through TTM and the experimental group administrated by the CAI in all units put together. Hence, it was revealed that using CAI was more effective than the traditional lecture method in teaching Chemistry.

**Joy and Manickam (2002)** conducted a study on “Computer Assisted Instruction: Attitude of Teachers and Correlates”.

The purpose of the study was (i) to find out the effectiveness of CAI on the achievement of the students and (ii) to correlate the attitude of teachers towards computer. The sample consisted of 50 high school science teachers of the Thiruvananthapuram revenue district, Kerala was randomly selected with the help of purposive sampling. Of these, only 25 teachers formed the experimental group, while the control groups consisted of 25 primary school teachers who were undergoing B.Ed Course and were selected randomly with the help of purposive sampling. The tool used was constructed on knowledge and attitude. Computer Assisted Instruction Questionnaire was used.

The findings of the investigation showed that there was no significant difference on the teacher competency in the pre and post-test scores or between the experimental and control groups. But teacher competency was positively related to post knowledge in CAI of the experimental group. There was significant difference between the groups in their attitude towards computer education. There was significant difference in the pre and post scores of the experimental group on knowledge in CAI and attitude towards use of computer.
Patel (2001) made an investigation into “A Study of Learning through Computer Assisted Learning Material (CALM)”.

The objective of the study was to find out the effectiveness of the CAI in terms of achievement of students. The method used for the study was of experimental type. In order to study the effectiveness CALM pre-test post-test single group design was used. A single group of thirty students was selected purposely as a sample for the present study.

There has been significant gain through interaction with the CALM on Solar system and Magnet in the Standard VIII through the computed correlated t values. The status of the CALM in terms of production variable and contiguity, achievement has been found quite higher, except on a few teaching points where there was need to improve upon graphics, mode of presentation, spatial contiguity of text and animation and temporal contiguity of animation and narration.

Dalwadi (2001) carried out a study on “Development of Computer Assisted Instruction in Science for the Student of Standard IX”.

The objectives of the study were (i) to develop CAI package in Science for Standard IX; (ii) to study the effectiveness of CAI in terms of achievement of students and (iii) to study the opinions of the Science teacher and students regarding the effectiveness of the developed CAI. A pre-test and post-test parallel group experimental design was used. The sample taken was two groups of each having 35 students selected through probability sampling method. The researcher conducted this study on the unit of ‘Light’. As a tool the researcher prepared Computer Assisted Instruction materiel and Questionnaire for collecting the data.

The findings showed that i) CAI was found to be effective individualized instructional technique for teaching science to Standard IX students. It helped the students to learn the topic ‘Light’ and clarified the concepts. ii) Student’s opinion towards the CAI was found to be favourable as far as the statement related to the interest, mode of presentation and content.
Meera (2000) had done a study on “Relative Effectiveness among different modes of Computer-based Instruction in relation to Students’ Personality Traits”.

The objective of the study was to find out the effect of Computer-based Instruction in relation to students’ personality traits. Quasi-experimental method as well as qualitative and quantitative approach was adopted for the study. Different modes of Computer based Instruction, viz. Drill, Practice and Simulation were adopted. The sample taken was four groups of each having 35 students selected through probability sampling method. Cluster sampling technique was adopted in the study. The tools used in the study were Cattell’s 16 P.F inventory for students, CRT developed by Raymond B and Achievement test.

The findings of the study were that i) there was significant difference among the different modes of CBI (Computer-based Instruction), viz. Tutorial, Drill and Practice and Simulation in terms of their effectiveness in enhancing the retention of cognition as revealed by the learner’s performance in the retention test and ii) there was significant difference among the different modes of Computer-based Instruction in enhancing retention of what have been already learnt.

2.3.2 STUDIES CONDUCTED ABROAD ON CAI

As far as the abroad studies concerned, the investigator could collect 28 studies on CAI conducted for more than a decade (2001-2014). All the studies have been arranged in reverse chronological order.

Hussain et al. (2014) made an investigation into “A Gender Based Comparative Study of Teaching Physics through CAI and Ordinary Lecture Method”.

The major objectives of the study were (i) to determine the effect of CAI and traditional lecture method on students' achievements and interest in Physics and (ii) to determine the gender differences on the Academic achievement, and Interest of the student. A sample of total 144 students (80 female and 66 male) was randomly selected from two Schools (University Wensam College and St. Helens High School) of Dera Ismail Khan. Pre-test – post-test equivalent groups design were used for the study. The achievement tests and interest inventory were used for the purpose of data collection. Standard Deviation and t-test were used for analysis of the data.

The result showed that there was significant difference between the two groups. The experimental group outperformed the control group on academic achievement and interest score. The Gender differences were also observed; the Female outperformed the male on academic achievement while male performed significantly better than female on interest inventory.

Achor and Ukwuru (2014) conducted a study on “An Examination of the Facilitative Effect of the Computer Assisted Instruction (CAI) in Students’ Achievement in Chemical Reaction and Equilibrium”.

The objective of the study was to find out the effect of the Computer Assisted Instruction (CAI) on senior secondary school students’ achievement in chemical reaction and equilibrium. The study employed a pre-test, post-test non-randomized control group design. The sample size of the study comprised of 128 male and 112 female students (n =240). Simple random sampling was used to assign intact classes to experimental and control groups, while purposive sampling was used to select 10 public senior secondary schools in Oju LGA of Benue State. Standard deviation and ANCOVA was used to analyse data.

The finding of the study showed that there was a significant difference between the mean achievement of students taught chemical reaction and equilibrium using CAI and those taught same
using conventional strategy Conversely, there was no significant difference in mean achievement between male and female students taught chemical reaction and equilibrium using CAI strategy.


The specific objective of the study was (i) to compare the performance of learners exposed to the use of Simulation Games and those exposed to Computer Assisted Instruction in Basic Science and (ii) to study the effectiveness of simulation games and computer assisted Instruction on teaching basic science at the lower primary school. The study adopted a pre-test - post-test experimental control group design. All the 512 private nursery and primary schools in Lagos State, Nigeria constituted the research population. Out of these schools, three schools were purposively selected from three local government areas of the State for the study. A total number of 150 pupils were actually used for the study. Intact class of 50 pupils each was used from each of the three selected schools as the experimental group A, experimental group B and the control group. Science Achievement Test (SAT) and Computer Interactive Skill Package designed by the researcher were used as the tool for the study. The data collected were analyzed using t test and analysis of co-variance (ANOVA).

The findings showed that simulation games can be very useful in improving teaching and active learning or learning by doing especially when there are minimal facilities for computer assisted instruction.

Sharma and Jain (2013) conducted a study on “Using Computer Assisted Instruction (CAI) as an Instructional Strategy for Enhancing Achievement of 7th Grade Students in Mathematics”.

The purpose of the study was to study the effect of Computer Assisted Instruction (CAI) on the achievement of 7th grade students in Mathematics. To carry out the study, Experimental
Method with pre-test post-test Quasi Experimental Design was employed. A sample of 80 students studying in 7th class in J.K.M. Sr. Sec. School, Kalanaur was divided into two groups of 40 students each viz. Experimental Group and Control Group. Data were analysed using various statistical techniques like mean, SD and t-value.

Results of the study indicated that the experimental group was found to be better in achievement than the group who was not given any exposure to CAI.

Toman and Gurbuz (2013) conducted a study on “The Views of Science and Technology Teachers about Computer Assisted Instruction”.

The purpose of the study was to study the views of the teachers of Primary Science and Technology course about computer assisted instruction. Qualitative research was used in the study. In qualitative researches, the sampling group is small in order to examine the sampling in-depth. Semi-structured interviews were used in the study as data collection tools. The interviews were carried out with the teachers of Science and Technology Course. The participants were chosen from the primary schools located in the city centre of Bayburt. Then the findings of the study, which aimed at revealing the views of the teachers of Science and Technology Course about computer assisted instruction, were examined.

It was revealed from the study that the teachers had basic knowledge about the benefits of computer assisted instruction practices. It was also found that most of the teachers did not use computer assisted instruction practices in their lessons. Therefore, extended studies in the long run and covering many courses are required. Individualized instructional strategy was better than the conventional method of teaching. The sex variable did not influence the achievement in the selected content unit in the teaching – learning process.

Akram and Ali (2011) conducted a study on “The Influence of Computer Assisted Instruction (CAI) in Chemistry on the Students’ Achievement at Higher Secondary Level”.
The major objectives of the study were (i) to find out whether there was any significant difference between the control group and the experimental group and (ii) to find out the effectiveness of CAI in teaching Chemistry. The pre-test, post-test control group design was developed for the study in both government and private sectors of Bahawalpur City. The achievements of forty (40) students were recorded through pre-test and then students were divided randomly into two groups of twenty (20) in each group.

The findings indicated that there was significant influence of CAI on the student’s achievement in both, government and private sectors. However, CAI influence was found to be more significant in private school than government school. Computer-assisted instruction in teaching Chemistry proved better than the conventional instruction.

Tayseer and Sharaideh (2011) investigated the “Impact of using Computer-Assisted Programmes for Teaching National Education in Jordanian Schools”.

The purpose of this research was to investigate the effect of using computer-assisted programmes for teaching National Education on students' achievement in Jordanian schools. To achieve the purpose of the study, a pre/post-test was constructed to measure students' level in National Education. The sample of the study consisted of 129 tenth grade students; (60) male students from Yaser Bin Ammar school for boys and (69) female students from Zain Al Sharaf school for girls during the second semester of the academic year 2010-2011. The subjects of the study were distributed into two groups (experimental and control). The experimental group was taught National Education using computer-assisted programme while the control group was taught using the conventional way. Descriptive statistical analyses were done (means and Standard deviation) for the pre and post-tests of students' achievement in national education. Analysis of covariance was done to make a comparison between the control and the experimental groups and gender variable (male and female).
The findings of the study indicated that there were statistically significant differences in the post-test between the control and the experimental groups in favour of the experimental group, and there was no statistically significant difference in the students' performance due to gender.

Serin (2011) made an investigation into “The Effects of Computer-Based Instruction on the Achievement and Problem Solving Skills of the Science and Technology Students”.

This aim of the study was to investigate the effects of computer-based instruction on the achievements and problem solving skills of the science and technology students. This study was based on the pre-test/post-test control group design. The participants of the study consisted of 52 students; 26 in the experimental group, 26 in the control group. The achievements test on “the world, the sun and the moon” and the Problem Solving Inventory for children were used to collect data. In the analyses of data, the independent group’s t-test was used at the outset of the study to find out the whether the levels of the two groups were equivalent in terms of their achievements and problem solving skills and the Kolmogorov-Smirnov single sample test to find out whether the data followed a normal distribution and finally, the covariance analysis (ANCOVA) was done to evaluate the efficacy of the experimental process.

The result of the study revealed that there was a statistically significant increase in the achievements and problem solving skills of the students in the experimental group that received the computer based science and technology instruction.


This prime aim of the study (i) to find out the effect of computer assisted instruction (CAI) on secondary school students’ performance in Biology and (ii) to find out whether there was any significant difference in achievement at the gender level. The research was a quasi experimental
involving a 3 x 2 factorial design. The sample for the study comprised 120 first year senior secondary school students sampled from three private secondary schools, in Oyo State, Nigeria. The students’ pre-test and post-test scores were subjected to Analysis of Covariance (ANCOVA).

The findings of the study showed that the performance of students exposed to CAI either individually or co-operatively were better than their counterparts exposed to the conventional classroom instruction. However, no significant difference existed in the performance of male and female students exposed to CAI in either individual or co-operative settings.

Akengin (2010) conducted a study on “Comparing Traditional and Computer Assisted Education in the Teaching of Colour to 6th Grade Students and Determination of its Retention”.

The purpose of the study was (i) to compare the CAI and traditional method of teaching of colour to 6th grade students and (ii) to study the retention power of the students. In this study, informing 6th grade students on the subject of colour was taught using traditional and computer assisted education methods. Colour information was taught by the researcher for 5 weeks in order to specify the influence of both methods on students. The permanence of the training has been determined by applying the same test again to the students two months later.

The findings of the study showed that the knowledge of the students receiving through computer-assisted education was higher than the students receiving through traditional education and that this same high score was maintained in the retention test applied two months later.

Spradlin and Ackerman (2010) conducted a study on “The Effectiveness of Computer-Assisted Instruction in Developmental Mathematics”.

The major objectives used in the study were (i) to find out whether there was any significant difference between the control group and the experimental group and (ii) to find out the effectiveness of CAI in teaching developmental Mathematics. The non-randomized control group
pre-test – post-test design was used for this quasi-experimental study. SPSS was used to run descriptive statistics on the data. The sample size, mean, and Standard deviation were tabulated.

The findings of the study showed that there was significant difference in the post-test scores of females and males in both modes of instruction. The literature and the findings of the study revealed several interesting observations concerning developmental Mathematics and computer-assisted instruction. The results of this study indicated that developmental Mathematics students learn equally well with or without computer-assisted instruction.

**Alshawa and Alhayek (2009)** conducted a study on “The Effect of Teaching Method via Computer on Students’ Anxiety”.

The purpose of this study was (i) to examine the effects of teaching method via computer on students’ level of anxiety and (ii) to find out whether there was any significant difference in achievement at the gender level. The sample consisted of 40 students (21 females and 19 males) from the faculty of Physical education at the University of Jordan. The participants who enrolled in a required undergraduate course of methods of teaching Physical education class during the second semester of 2003/2004 were selected purposely.

The results of data analysis indicated that teaching method via computer reduced Student’s level of computer anxiety from pre-tests to post-test; they scored significantly lower in the post-test. The results also indicated that there were no significant differences between male and female students on computer anxiety tests. In addition, regarding students experiences, students with more than one year of computer experiences had lower level of computer anxiety than students with less than one year of Computer experiences and students without computer experiences in pre and post-tests. Students with more than one year of computer experiences scored significantly lower; furthermore, students with less than one year of experiences scored significantly lower than students without computer experiences in pre and post-tests.
David and Myra (2008) carried out a study on “Computer Aided Instruction: A Study of Student Evaluations and Academic Performance”.

The major objectives used in the study were (i) to find out the effect of Computer Aided Instruction on the academic performance of the students and (ii) to examine the Evaluation technique in the study. Data were obtained from student course evaluations, homework scores, and final exam scores for the principles of micro-economics and the principles of financial accounting courses. The total number of micro-economics sections in the data set was 17 (6 sections before CAI and 11 after CAI). The total number of accounting sections in the data set was 6 (2 sections before CAI and 4 after CAI). The sample size was 311 for the microeconomics course and 95 for the accounting course.

The findings of the study indicated that with instructor experience, the use of CAI may be more effective. Regression results indicated that CAI was not significant in explaining the responses to any of the 10 student evaluation questions chosen. This showed that the use of CAI, in and of itself, did not impact student perceptions of course quality. Alternatively, this may be due to the fact that the responses were not identified by student, so the aggregated data mask any effect of CAI on student perceptions of course quality. While the response differences were not large enough to be significant, at least for the microeconomics course, they generally were positive indicating a possible improvement from the use of CAI in student perceptions of course quality.

Stultz and Sherry (2008) conducted a study on “The Effectiveness of Computer-Assisted Instruction for Teaching Mathematics to Students with Specific Learning Disability”.

The major objectives of the study were (i) to find out the effect of computer-assisted instruction for teaching Mathematics to students with specific learning disability and (ii) to investigate the factors affecting the learning. An experimental study was conducted to study the effect. The statistical techniques used were Mean, Standard Deviation, t-value and ANOVA.
It was found from the result of the study that a statistically significant difference between the two methods of instruction didn’t exist. However, the data also indicated that individual students’ characteristics or other factors might indirectly influence the method of instruction at least when teaching students with specific learning disability. Since there is sparse educational research regarding the effectiveness of using computer-assisted instruction for teaching Mathematics to students with specific learning disability, the results of this study provided a starting point rather than a destination for future research on this subject.

Ragasa (2008) conducted a study on “A comparison of Computer Assisted Instruction and the Traditional Method of Teaching basic statistics”.

The objectives of the study were (i) to find out the effect of CAI on teaching statistics and (ii) to compare Computer Assisted Instruction and the Traditional Method of Teaching basic statistics. The research method used was the quasi-experimental, non-equivalent control group design. A class of 38 college students in the basic statistics taught with the use of computer-assisted instruction and another class of 15 students with the use of the traditional method from the University of the East, Manila were the sample for the study. The statistical tool was the Multiple Analysis of Covariance. The researcher made use of the CD-ROM prepared by Math Advantage (1997) to serve as the teaching medium for the experimental group.

The findings of the study revealed that the achievement post-test of the treatment group had higher estimated marginal means than the control group and it was reversed in the attitude post-test. Using Hoteling’s Trace for the multivariate test, the achievement pre-test, attitude pre-test, and the two groups had a significant effect on the dependent variables, achievement post-test and attitude post-test.

The major objectives of the study were (i) to find out the influence of CAI on teaching Mathematics (ii) to compare the mean scores of CAI and conventional method of teaching and (iii) to determine if there was a measurable difference in achievement on the Mathematics section of the state test for students \((n = 121)\) from a middle school in New Jersey. The method used was quantitative, quasi-experimental study. The sample used for the study was 121 students from a middle school in New Jersey who received computer-assisted instruction (CAI) in drill and practice computation related to the VIII grade Mathematics curriculum Standards and 163 students who did not receive the CAI as control group.

The findings showed that the CAI intervention did not improve student achievement significantly. In both the categories, students who received the CAI performed significantly lower than their peers in the comparison group.

Camnalbur and Erdogan (2008) conducted a study on “A Meta analysis on the Effectiveness of Computer-Assisted Instruction: Turkey Sample”.

The purpose of the study was to find out the effectiveness of computer-assisted instruction on the achievements of the students. In this research, quantitative studies comparing the effectiveness of computer-assisted instruction to the traditional teaching method was studied by Meta analysis. Seventy eight studies that had eligible data were combined with Meta analytical methods by coding protocol from the 422 master’s and doctoral degree and 124 articles.

The findings of the study showed that the Computer-Assisted Instruction method of teaching was very effective compared to the traditional method.

Tayyabakausar and Gujjar (2008) carried out a study on “Comparative Study to Evaluate the Effectiveness of Computer Assisted Instruction (CAI) versus Class Room Lecture (CRL) for Computer Science at ICS level”.

This study was aimed (i) to evaluate the effectiveness of CAI on teaching computer science at ICS level (ii) to compare the CAI and the traditional method of teaching and (iii) to evaluate the level of cognitive achievement of the students. The research was true-experimental in nature. The research design followed by the researcher was the Pre-test – Post-test Equivalent groups Design. The software used for CAI group was basically the combination of Discovery environment and simulation software however, the time for drilling and practice was given to students. It was designed to cover the all levels of cognitive domain described by B. S. Blooms.

This study concluded that the skills of knowledge, analysis and synthesis assured significant increase. The CAI proved to be very much effective in increasing the evaluation and application skills of students to experimental group. Findings of this research indicated total gain in cognitive domain through CAI was significantly superior to the total gain in cognitive domain by CRL teaching method.

**Barnett (2006)** studied the “Effect of Computer Assisted Instruction on the Reading Skills of Emergent Readers”.

The major objectives of the study were (i) to study the attitude of teachers towards computer and (ii) to find out the effect of Computer Assisted Instruction on the reading skill. Experimental pre-test post-test design was used. Factorial ANOVA was used to compare the scores.

The findings of the study showed that there were significant differences between the CAI and the traditional group on acquisitions of reading skills. Teachers’ attitudes towards computer positively affected students’ acquisitions of reading skills.

**Cepni and Kose (2006)** conducted a study on “The Effects of Computer Assisted Material on Students Cognitive Levels, Misconceptions and Attitudes towards Science”.

The purpose of this study was to investigate the effects of a Computer assisted Instruction Material (CAIM) related to ‘‘photosynthesis’’ topic on students’ cognitive development,
misconceptions and attitudes. The study was conducted in 2002–2003 academic year and was carried out in two different classes by the same teacher, in which there were fifty two 11th grade high school students, in the central city of Trabzon in Turkey. An experimental research design including the photosynthesis achievement test (PAT), the photosynthesis concept test (PCT) and science attitude scale (SAS) was applied at the beginning and at the end of the research as pre-test and post-test. After the treatment, general achievement in PAT increased by 10% in favour of experiment group (EG) at (p < 0.05) significant level. Although the increase in cognitive development at knowledge level was 14.8% in the EG and 18.2% in the control group (CG), the development at comprehension and application levels were 19.8–18.5 in the EG and 1.75–0.86 in the CG, respectively.

This result showed that using CAIM in teaching photosynthesis topic was very effective for students to reach comprehension and application levels of cognitive domain. However, CAIM did not change major misconceptions related to photosynthesis topic in EG as expected. Meanwhile, same misconceptions in EG about source of energy for plants and their nutrition were decreased more than CG. It was also found out that there was little change about students’ attitude towards science education in both groups.


The purpose of this research was (i) to investigate the effects of the computer-assisted teaching method on the achievement of the students (ii) to find out the effect of computer-based instructional methods on student’s achievement and (iii) to study the attitudes of the students towards using computers. The participants were distributed into experimental and control groups by pre-test post-test design. The study, which was completed in 6 weeks, was carried out with 94 students studying in formal education programme of Primary Teaching Department of the
Education Faculty at Trakya University. A computer attitude scale, a level-designation test and a practice test were used to collect the data. To evaluate the data, t-test was used.

The findings of the study showed that the students receiving computer assisted instruction during their computer classes showed higher success on the practice test than the students taking classes with computer-based instructional methods. It was also found that the difference was not seen in the attitude of the students towards using computers.

Akcay and Durmaz (2006) conducted a study on “Effects of Computer Based Learning on Students’ Attitudes and Achievements towards Analytical Chemistry”.

The aim of this study was (i) to study the attitude of the students towards using computers and (ii) to compare the effects of computer-based learning and traditional method on students’ achievement in analytical Chemistry. Students from Chemistry Education Department at Dokuz Eylul University (DEU) were selected randomly and divided into three groups; two experimental (Eg-1 and Eg-2) and one control (Cg). In teaching analytical Chemistry topics, two different computer based methods - new analytical Chemistry learning software called HEHASit (Method A) and a Microsoft Excel program (Method B) - were prepared by the researcher and applied to Eg-1 and Eg-2, respectively. The last group (Cg) was taught by the traditional method (Method C). In the comparison of the effects of the three methods, an attitude questionnaire and an achievement test related to Analytical Chemistry were used. Students’ attitudes towards computers were also tested by a computer attitude test.

As a result of the study, significant differences between control group and experimental groups and between experimental groups on computer attitudes and analytical Chemistry attitudes were found. Furthermore, analytical Chemistry achievement in experimental groups was significantly higher than that in the control group.

The purpose of the study was (i) to determine the effects of Computer Assisted Instruction on the Mathematics achievement of ninth-grade high school students in the lower Rio Grande valley and (ii) to compare the learning abilities of students of control group and experimental group. A quasi-experimental pre-test and post-test control group design was used. The subjects were first time, non-exempted ninth grade students from two schools paired by ethnicity and percentage of socio-economically disadvantaged. The experimental group utilized a commercially available Computer Assisted Instructional programme in addition to instruction as described in the Academic Excellence Indicator System (AEIS) and according to instruction as the District curriculum guidelines. The control group utilized only instruction as described in its AEIS and according to the District curriculum guidelines. Spring 2003 eight grade Mathematics state assessment, Texas Assessment of knowledge and skills, served as the pre-test for both groups. Spring 2004 ninth grade Mathematics state assessment, Texas assessment of knowledge and skills served as the post-test for both groups. ANCOVA procedures were used to determine the statistical significance.

Findings of the study indicated that there was statistically significant difference between the Mathematics achievement of ninth grade high school students in the lower Rio Grande Valley who participated in Computer Assisted Instruction and those who did not participate in Computer Assisted Instruction. The analysis indicated that there was statistically significant difference between the Mathematics achievements of the two groups.

Cannon (2005) made a study on “Student success: A study of Computer Based Instruction versus Lecture Based Instruction in developmental Mathematics at a Tennessee Community College”.
The objectives of the study were (i) to explore the relationship between Computer Based Instruction and Lecture Based Instruction (ii) and to find out the achievement of the students of Tennessee Community College in Developmental Mathematics. Two groups of elementary algebra from Chattanooga State Technical Community College were used in this study. The lecture group consisted of 175 students where the computer group consisted of 208 students. One group was taught using a lecture-based approach and the other group was taught using a computerized instructional approach.

The findings of the study showed that there was significant difference in the achievement scores. The lecture students’ achievement rates were significantly higher than the students who received computerized instruction. Retention, persistence and success did not show any significant difference between the two groups.

Suwana (2004) researched on the “Effectiveness of Computer Assisted Instruction for Primary School Students: An Experimental Study”.

The objectives of the study were (i) to develop CAI material for primary school students and (ii) to bring out the effectiveness of using CAI in primary schools. The multistage sampling technique was used in this research. The investigator selected two cities by purposive sampling technique. 120 students were selected from two schools. The statistical technique t test was used to find out whether the mean scores of each group differed significantly or not.

The result was evaluated by teacher as a successful attempt. Opinions of students were found effective in presenting all the five topics of English and Thai language.

The major objectives used in the study were (i) to find out the effectiveness of Computer Assisted Instruction in Statistics education and (ii) to study the level of interactivity of CAI programme. This study employed meta-analysis to integrate the findings from 25 Primary studies, which met a specific set of criteria. The primary studies were selected from journal articles, ERIC documents and dissertations.

The results of the meta-analysis indicated that different modes of CAI programme produced significantly different effects on students’ achievement in learning statistics. The teacher made CAI programmes were significantly more effective than the commercially developed CAI programme. The effectiveness of CAI programme in teaching statistics did not differ significantly according to the study characteristic of the publication year, the publication score, the educational level of participants, the level of interactivity of CAI programme, the instructional role of CAI programme and the sample size.

Incimorgil and Secilarda (2003) carried out a study on “The Factors that Affect Computer Assisted Education Implementations in the Chemistry Education and Comparison of Traditional and Computer Assisted Education Methods in Redox Subject”.

The objectives of the research were (i) to find out the factors that affect the implementation of Computer Assisted Education in Chemistry (ii) to compare the Traditional and Computer Assisted Education Methods in Redox subject and (iii) to find out the attitudes of the students towards computer. Experimental pre-test and post-test design was used. The students were divided into control and experiment group randomly. Mean, Standard Deviation, t-test were the statistical used in the study.

It was observed that the factors such as attitudes towards computer, geometrical imagination capability and learning styles did not affect the student success so much. After the computer assisted applications it was observed that the geometrical imagination capabilities of the control group
students were better. But in spite of these, it was observed that, in the experimental group, the increase in the success was more than that in the control group.

**Rivet (2001)** conducted a study on “Student’s Achievement in Middle School Mathematics: Computer Assisted Instruction versus Traditional Instruction”.

The major objectives of the study were (i) to find out the effect of CAI on the achievement of the students in Mathematics and (ii) to compare the CAI method with the traditional method of teaching. A quasi-experimental pre-test post-test design was used. Four 6th grade classrooms were identified and two classrooms within each of two middle schools were selected for the study. Two classrooms used Computer Assisted Instruction as the primary means of content delivery involving Mathematical concepts all pertaining to the content area of Fractions. Within the same content area, the other two classrooms’ primary mode of instruction remained the lecture and textbook.

The findings of the study showed that the overall mean scores were significantly greater in Computer Assisted classrooms than in the traditional classrooms. Further, in spite of the achievement difference between the schools, the Computer Assisted classrooms performed better than the traditional classrooms at each school.

### 2.3.3 STUDIES CONDUCTED IN INDIA ON CL

The following are the Indian review studies which seem to be relevant to the present research. The investigator could collect seven studies conducted from 2000-2013. They are arranged in reverse chronological order.

**Mehar and Sekhri (2012)** conducted a study on “The Effects of Co-operative Learning Strategy on Achievement in Mathematics in Relation to Self-esteem”.
The objective of the study was to find out the effect of co-operative learning strategy on achievement in Mathematics in relation to self-esteem. Experimental study was used. The study was conducted on a random sample of 100 students. Tools for the study were Self-esteem inventory by Cooper Smith and Achievement test in Mathematics prepared by the investigators. The statistical techniques used were Mean, Standard Deviation, t-test and ANOVA.

The findings of the study proved that the Co-operative learning strategy was found to be more effective than the conventional method of teaching. It was found that the gain scores of the students with high self-esteem were more compared to that of the students with low self-esteem.

Sivaram and Ramar (2012) studied the “Effectiveness of Co-operative Learning Strategy on the Achievement of Various Categories of Students in English at the Higher Secondary Level”.

The objective of the study was to find out i) the effectiveness of co-operative learning strategy on the achievement of students in English. Experimental method of research was used for the study. For the purpose of investigation sixty students of XI Standard from S.S.H.N. Higher Secondary School, Muhavur were selected. Tool for the study was achievement test constructed by the investigator on the basis of items analysis. The content validity of the tool by expert opinion, item validity of the tool by expert opinion, item validity by item analysis and the reliability of the tool by split half method were established. The statistical techniques used were Mean, Standard Deviation, t-test and ANOVA.

The results of the study showed that the co-operative learning strategy was more effective than the traditional lecture method in teaching and learning English language. Since the use of the co-operative learning strategy enhanced the achievement of below average students, it would diminish wastage and stagnation in our schools.
Deeba and Sadananthan (2012) conducted a study on “Attitude of Secondary School Teachers towards Co-operative Learning”.

The objective of the study was to find out the attitude of Secondary School teachers towards co-operative learning. Survey method was adopted in this study. The sample used was stratified random sample of 180 secondary school teachers from 20 schools in Kanyakumari District, Tamil Nadu. The tools used for the study were i) Co-operative learning attitude scale and ii) personal information schedule. The statistical techniques used were Mean, Standard Deviation, t-test and ANOVA.

The findings of the study revealed that the male teachers showed more favourable attitude than female teachers towards co-operative learning. The analysis based on the locality of school revealed that urban teachers showed more favourable attitude than rural teachers. Likewise, considering the subject of teaching, arts teachers showed more favorable attitude than science teachers. This showed that the attitude was also influenced by the subject they were teaching. The analysis was based on the age, type of school and teaching experience. Teachers of the age group above 35 showed more favourable attitude than the other two categories. Also government school teachers showed more favourable attitude than aided and unaided school teachers.

Baskaran (2011) conducted a study on “Effectiveness of Co-operative Learning Approach in Enhancing the Academic Achievement of Learners in Learning Social Science at the Secondary Level”.

The prime objectives of the study were (i) to find out the impact of co-operative learning approach on the achievement of students and (ii) to compare the co-operative learning approach with the conventional method of teaching. For the study, non-randomized control group pre-test post-test design was adopted. The sample consisted of 20 learners studying in the school. The tool used was the criterion test developed by the investigator. The number of questions
included in the test was 50. Statistical techniques like Mean, S.D and t-test were computed to analyse the data collected.

The findings of the study showed that i) the better performance of the experimental group was found out in the post-test-I when compared to its pre-test performance. ii) This revealed the effectiveness of co-operative learning approach. The academic performance of the experimental group was better in the post-test-I when compared to its post-test-II. iii) The experimental group differed in its pre-test and post-test-II performance. The post-test group performance was better than its pre-test performance. iv) The study revealed the effectiveness of co-operative learning approach in enhancing the academic achievement of the learners.

Malarvizhi and Thangasamy (2010) studied “The Effects of Active Learning Techniques of Teaching Science in Schools”.

The objective of the study was to find out the effects of active learning techniques of teaching science in schools. The experimental design chosen for the study was pre-test, post-test equivalent- groups design. The sample used for the study was 60 students studying STD IX in Ramsun’s Matriculation school, Natham in Dindigul District of Tamil Nadu during the academic year 2009-2010. The method of selecting the sample for the study was non-probability sampling technique. Tool for the study was “Science concepts awareness test” (SCAT) constructed by the investigator. Statistical techniques like Mean, S.D and t-test were used to analyse the data collected.

The findings of the study revealed that the CL method was very effective for teaching of science in the school and the science teachers in high schools should plan for small group discussion and allow the students to share among themselves while teaching science concepts. ii) It was also indicated that the science teachers must give up too much text-book based expository and explanatory teaching, if they really wanted their students to understand science concepts effectively.
**Arasu and Kalaiyarasan (2006)** conducted a study on “The Effect of Co-operative Learning Approach in Teaching Chemistry at Plus One Level”.

The objective of the study was i) to find out the effect of co-operative learning approach in teaching Chemistry at +1 level. Experimental method of research was used for this study. The sample of the study was 84 students. Tool for the study was an achievement test for conducting pre-test and post-test. It was constructed and validated by the investigator. The internal consistency method yielded reliability co-efficient of 0.872 for the achievement test. Statistical techniques like Mean, S.D and t-test were used to analyse the data collected.

The findings of the study showed that i) the post-test mean score of the experimental group was higher than the post-test mean score of the control group. ii) There was significant difference between the control group and experimental group in their post-test performance. iii) The findings showed the superiority of the co-operative learning approach over traditional method of instruction.

**Prakash and Patnaik (2005)** carried out a study on “The Effect of Co-operative Learning on Achievement Motivation and Achievement in Biology”.

The objective of the study was i) to find out the effect of co-operative learning on achievement motivation and achievement in Biology. Experimental method of research was used for this study. The sample of 200 students from three schools of Tumkur town of Karnataka was selected for the study. Tools for the study were i) Achievement Values and Anxiety Inventory (AVAI) by Prayag Mehta and ii) Achievement Test in Biology developed by one of the investigators were used in the study. The statistical techniques used were Mean, Standard Deviation, t-test and ANOVA.

The findings of the study were i) there was positive effect of co-operative learning on achievement motivation. ii) Co-operative learning had a positive effect on achievement in Biology in terms of knowledge, understanding and application objectives as well as total achievement.
3.4 STUDIES CONDUCTED ABROAD ON CL

As far as the abroad studies on Co-operative Learning concerned, the investigator could collect 27 studies conducted for more than a decade (2001-2014). They are arranged in reverse chronological order.


Objectives of the study were (i) to find out the effect of co-operative E-learning on teaching of Biology and (ii) To determine whether there was a gender difference in achievement of Biology when students were taught using co-operative e-learning strategy. The study was quasi-experimental and the Solomon’s Four Non-Equivalent Control Group Design was used. Four secondary schools in Nakuru County in Kenya were used as the sample. Convenience sampling was used to select the four schools that participated in the study. The study involved county schools to ensure that the students participating were of comparable academic abilities. Two hundred (200) students participated in the study. The tool used in the study was Biology Achievement Test (BAT). Data were analysed using Analysis of Variance (ANOVA) and t-test.

The findings revealed that Co-operative e-learning enhanced achievement when compared with conventional methods. The findings further indicated that CEL overcame the gender disparity in achievement. It also showed that CEL was an effective strategy that should be incorporated in the teaching of Biology.

James and Olumorin (2013) studied the “Effectiveness of Video-Based Co-operative Learning Strategy on High, Medium and Low Academic Achievers”.
The objective of the study was to study the effect of co-operative, competitive and individualistic instructional strategies on the performance of high, medium and low academic achievers using video instructional package. A pre-test, post-test, experimental control groups design was employed for this study. A total of 120 senior secondary school Mathematics students were randomly assigned into co-operative, competitive, individualized, and conventional teaching methods. Students from each group were stratified into high, medium and low achievers. Analysis of Variance and Scheffe test were used for data analysis.

The findings of the study indicated that there was significant difference in the performance of the groups in favour of co-operative learning strategy. Students’ achievement levels had significant influence on their performance in competitive and individualized instructional settings.

**Simsek and Yilar** (2013) carried out a study on “The Effects of Co-operative Learning Methods on Students’ Academic Achievements in Social Psychology Lessons”.

The objectives of the study were (i) to investigate the effects of co-operative learning on students’ academic achievements in social psychology lessons and (ii) to compare the achievement of the students in co-operative learning and traditional method. A quasi-experimental design in which participants were not randomly assigned to the groups; instead, there were naturally occurring groups or groups to which participants were assigned for reasons other than randomizing the sample was used in the study. The sample of the study consisted of a total of 107 (57 male and 50 female; 20 and 25 ages) second grade social studies prospective teachers from different groups enrolled in a social psychology course for the 2012–2013 academic year. In the study, the Academic Achievement Test (AAT) was used as the tool.
The results obtained from the data showed that the Reading-Writing Presenting method had more positive effect on students’ academic knowledge and achievements in social psychology lessons than the Group Investigation method.

**Wichadee** (2013) conducted a study on “The Effects of Co-operative Learning on English Reading Skills and Attitudes of the first-year students at Bangkok University”.

The major objectives of the research were (i) to study the effects of co-operative learning on English reading skills (ii) to study the students’ attitudes towards co-operative learning method used in English classroom and (iii) to develop skills in reading. A Student Teams-Achievement Divisions (STAD) program was used with the subject group. A group of 40 first–year students at Bangkok University were taken as the sample. The tools used were the reading comprehension test, the questionnaire of attitudes towards co-operative learning, the co-operative learning behavioural assessment form, and the interview. The researcher administered the English reading comprehension test before and after teaching. The pre-test and post-test scores of the group were compared using a t-test dependent measure.

The findings of the study showed that the students obtained higher reading comprehension and the attitudes towards co-operative learning were positive. Hence majority of the students wanted to learn co-operatively.

**Akhtar and Kiran** (2012) conducted a study on “A Study of Student’s Attitudes towards Co-operative Learning”.

The objectives of the study were i) to understand the concepts of co-operative learning in global context and ii) to find out the attitude of students towards co-operative learning. Experimental method was used to the study. The total sample size was 120. The tool for the study was a questionnaire designed to investigate the attitude of students towards co-operative learning.
The findings of the research showed that the co-operative learning was an effective teaching approach. It was found that the students interestingly completed their tasks and they felt satisfaction in co-operative learning. Majority of students wanted to do group tasks and wanted to learn co-operatively.

**Mundy and Maxwell (2012)** made a study on “Faculty Perceptions of Co-operative Learning and Traditional Discussion Strategies in Online Courses”.

The prime objective of the study was to find out the perceptions of the faculty towards co-operative learning and traditional discussion strategies in Online Courses. This qualitative case study examined how instructors of online courses perceived the effectiveness of proven traditional teaching methods as well as co-operative learning strategies in the virtual classroom. The five selected faculty members, all of whom held terminal degrees, were selected through purposeful, convenient sampling as well as snowball sampling or chain sampling.

The findings of the study revealed that i) all the five informants had been working in online learning contexts with their students for two years and more but two of the informants still had not adapted themselves to maximize the online learning context and were unable to apply their understanding of traditional instruction to the context of online learning. ii) The two informants who were younger and less experienced than others had adapted well in implementing co-operative learning to maximize online learning. iii) Finally, one informant was able to take her instruction to a more complex level and became the facilitator of learning through employing extensive use of student facilitators.

**Goswami and Meling (2012)** conducted a study on “Co-operative Learning in Distance Learning: a Mixed Methods Study”.

The main objective of the study was to analyse the effect of co-operative learning in distance learning. The study, conducted at a Hispanic-Serving Institution, compared the effectiveness of
online CL strategies in discussion forums with traditional online forums. Quantitative and qualitative data were collected from 56 graduate student participants. The statistical techniques used were t-test and ANCOVA.

The study revealed that the students in the co-operative learning groups found more learning benefits than the traditional group. So the study would benefit instructors and students in distance learning to improve teaching and learning practices in a virtual classroom.

**Ford (2012)** conducted a study on “The Effects of Co-operative Learning on the Classroom Participation of Students Placed at Risk for Societal Failure”.

The objectives of the study were (i) to investigate the impact of co-operative learning on the students’ achievement of low income families and (ii) to analyse the participation of students in the co-operative learning programme. The study was conducted with the first year students in the upward bound pre-college of the University of Maryland. The pre-college program at upward bound was designed to assist students from the first generation and low-income families in making a successful transition from high school to college. Two professional counsellors from the upward bound programme completed classroom observations and documentation. Each of the individuals’ recording data had been with the upward bound program more than two years. A multiple baseline across subjects was used to measure the effectiveness of treatment. A baseline was taken until stability was established for each participant. Intervention was then introduced to Participant 1, while a baseline continued to be collected for Participant 2. Once Participant 1 reached criterion, Participant 2 was introduced to the intervention.

It was revealed from the study that the structured small group activities were effective at increasing students’ participation.

**Jebson (2012)** studied the “Impact of Co-operative Learning Approach on Senior Secondary School Students’ Performance in Mathematics”.


The objectives of the study were (i) to determine the impact of co-operative learning approach on students’ performance in Mathematics and (ii) to determine whether there was any gender difference when the co-operative learning approach was used. Quasi-experimental research design was used in the study. A sample of twenty students (20) was randomly selected from each school for both the experimental and the control groups. The instrument used in the study was the Mathematics Test of Assimilation (MTAS).

The findings of the study revealed that the co-operative learning approach had significant effect on students’ performance in secondary school Mathematics.

**Chianson and Kurumeh** (2011) conducted a study on “Effect of Co-operative Learning Strategy on Students’ Retention in Circle Geometry in Secondary Schools in Benue State, Nigeria”.

The objectives of the study were (i) to find out the effect of co-operative learning method compared with the conventional learning method and (ii) to find out the retention level of students in circle geometry. The design adopted for the study was the quasi experimental design. The sample for the study was made up of 358 SSII students randomly selected from three local government areas from the three education zones in Benue State Nigeria. The tools used were i) Pre–GAT (Geometry Achievement Test), ii) Post – GAT and RET- GAT (Retention Geometry Achievement Test). The RET-GAT was to test the students’ retention level after the topic had been taught to them. The GAT consisted of 20 items with 4-option multi choice test. A pilot study was carried out on a school other than the school selected to participate in the study. This was to test the reliability coefficient of the instrument being used.

The findings of the study were i) Co-operative learning approach could capture students’ attention in class activity and gave them the zeal to work tirelessly in a Mathematics class.
ii) Co-operative learning could enhance a better retention and recalling of circle Geometry concept being taught to the students.

**Kan (2011)** conducted a study on “Co-operative Learning Environment with the Web 2.0 tool e-portfolios”.

The purpose of the study was to develop a co-operative learning environment to promote an active learning in Malaysia. Web 2.0 tool namely e-portfolios was used as the tool among the smart secondary schools students in Malaysia. Multimedia technology and Web 2.0 tools were integrated to provide the students to learn on their own as well as to document their progress and experience within the co-operative learning environment.

The result of the study was that the students managed to cope with each other to reach their common goal. The usage of blogs acted as an important tool to enhance team co-operation and to foster a learning community within the class.

**Keskin and Polat (2011)** had done a study on “The Effectiveness of Co-operative Learning on the Reading Comprehension Skills in Turkish as a Foreign Language”.

The main objective of the study was to identify the efficiency and the effects of co-operative learning techniques on the reading skills of the students. Experimental method was used in this research. The sample of the study was 40 students. Tool used for the study was Reading Comprehension Skills Achievement Test developed by the researchers.

The finding of the study showed that the students were able to develop reading comprehension skills effectively through co-operative learning. The students expressed that they had fun during experimental studies; they did not get bored since they were active during almost the whole lesson.
Lavasani and Khandan (2011) studied “Mathematic Anxiety, Help Seeking Behaviour and Co-operative Learning”.

The objective of the study was to find out the effectiveness of co-operative learning over the Mathematic anxiety and review the behavior of help seeking in first grade high school girl students. The experimental method was used in the research. The sample consisting of 40 girl students from two schools were selected randomly. The tools for the study were i) to measure the variables; the questionnaire of Mathematic anxiety and the questionnaire of help-seeking technique were used. The statistical techniques used were Mean, Standard Deviation, t-test and ANOVA.

The accomplished results indicated that the co-operative learning method, in comparison with the traditional technique, significantly decreased the Mathematic anxiety in students and increased the help seeking behaviour and reduced the avoidance factors.

Ajaja (2010) conducted a study on “Effects of Co-operative Learning Strategy on Junior Secondary School Student’s Achievement in Integrated Science”.

The purpose of this study was to determine the adoption of co-operative learning as an instructional strategy for teaching Integrated Science. Experimental method was used in the research. The population of study was made up of 205 JS III students. A sample of 120 students was randomly selected. The instruments used for the collection of data included i) a Scholastic Ability Test in Integrated Science (SATIS) ii) Students’ Attitude Scale (SAS) and iii) Integrated Science Achievement Test (ISAT). All the data collected were analysed with analysis of co-variance.

The major findings of the study showed that the achievement test scores of students in co-operative learning group were high compared to the traditional classroom teaching. There was no gender difference in achievement test scores between male and female students in the co-operative learning group.
Oludipe and Awokoy (2010) carried out a study on “Effect of Co-operative Learning Teaching Strategy on the Reduction of Students’ Anxiety for Learning Chemistry”.

The main purpose of the study was to investigate the influence of co-operative learning methods on anxiety for learning Chemistry. This study employed a quasi-experimental design. One Twenty students (52 females and 68 males) were randomly selected from the senior secondary schools in South-West Nigeria for the study. Two lesson notes, one for co-operative learning method (Jigsaw) and the other for conventional chalk-and-talk method, and Chemistry Anxiety Scale (CAS) were the instruments used to collect the relevant data. The data collected were analysed using one-way analysis of variance (ANOVA).

The findings of the study revealed that students in both the co-operative learning group and conventional-lecture group exhibited high level of Chemistry anxiety at the pre-test level. However, after the treatment (post-test level), the Chemistry anxiety level of the students in co-operative learning group was reduced drastically while the Chemistry anxiety level of the students in conventional-lecture group increased.

Ahmad and Mahmood (2010) conducted a study on “Effects of Co-operative Learning versus Traditional Instruction on Prospective Teachers’ Learning Experience and Achievement”.

The prime objectives of the study were (i) to investigate the effects of co-operative learning on prospective teachers’ learning experience and (ii) to study the effect of co-operative learning on students’ achievement. Repeated measure design was used for the study. Thirty-two student teachers enrolled in master degree programme were the subjects of the study. The conditions comprised (a) Traditional Instruction (TI) (b) Co-operative Learning Loosely Structured (CLLS) and (c) Co-operative Learning Students Team Achievement Division (CLSTAD) model. The statistical techniques used were Mean, Standard Deviation, t-test and ANOVA.
The results of the study showed that co-operative learning enhanced perspective teachers’ academic achievement as compared to traditional instruction and promoted enriched, enjoyable and interactive learning experience.


The objectives of this study were (i) to investigate the effects of co-operative learning on the Mathematics ability of the students and (ii) to evaluate the effect of co-operative learning on Kindergarten Children’s Mathematics Ability. The design adopted for the study was quasi experimental design. The sample for the study was made up of 34 students who were randomly selected. The tool used for the study was the Test of Early Mathematics Ability Third Edition (TEMA-3) developed by Ginsburg and Baroody (2003) to evaluate children’s Mathematics abilities. Validity and reliability studies of the TEMA-3 for six-year-old Turkish children were performed by Erdogan and Baran (2006).

The finding of the study was that there were significant improvements in Mathematics abilities for children in the experimental group that utilized co-operative learning.


The prime objective of the study was to find out the impact of co-operative learning approach on the achievement of students. A Meta analysis was done. The studies yielded 194 independent effect sizes representing academic achievement. Co-operative learning methods had a significant positive impact on students’ achievement. When the impact of co-operative 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 Co-operative Integrated Reading and Composition (CIRC).

When the impact of co-operative lessons was compared with individualistic learning, LT promoted the greatest effect, followed by AC, GI, TGT, TAI, STAD, Jigsaw, and CIRC. The consistency of the results and the diversity of the co-operative learning methods provided strong validation for its effectiveness.

Duxbury and Tsai (2010) carried out a study on “The Effects of Co-operative Learning on Foreign Language Anxiety: a Comparative Study of Taiwanese and American Universities”.

The purpose of this study was to find out the effect of Co-operative Learning on Foreign Language Anxiety. The method adopted for the study was quasi experimental design. The sample for the research consisted of 385 students in one American university and in three Taiwanese universities. The instrument used in this study was a composite portion of two well established surveys, plus 10 more questions created for the study pertaining to co-operative learning and two demographic questions. There were 50 items on this instrument. Two instruments i) The Foreign Language Classroom Anxiety scale by Horwitz et al., (1986) and ii) the Style Analysis Survey by Oxford et al., (1999) were employed, along with ten questions designed by the author.

The findings of the study were (i) no significant correlation was found between foreign language anxiety and co-operative learning at the United States University; (ii) of the three Southern Taiwan colleges, results showed that only one showed a significant correlation. This was the only school that had a Taiwanese teacher.

Mehmettasdemir and Adamtasdemir (2009) conducted a study on “The Influence of Portfolio Evaluation in Co-operative Learning on Student Success”.
The objective of the study was to find out the influence of portfolio evaluation in co-operative learning on student success. Experimental method of research was used for this study. The sample of the study was 88 second year students of classroom teaching in the Faculty of Education. A 75-item multiple choice test was developed for the purpose of data collection. The academic achievement test which was used to obtain research data was grouped in three dimensions namely programme and planning teaching strategies, methods and techniques and measurement and evaluation and the answers given to those were analyzed separately. The statistical techniques used were Mean, Standard Deviation, t-test and ANOVA.

The results showed that i) the group in which portfolio evaluation along with co-operative learning applied was more successful than the other groups and ii) the relationship between gender and achievement scores was examined for the experimental and the control groups and no significant statistical differences were found.

Karacop and Ada (2009) conducted a study on “Effect of Co-operative Learning Strategies on Teaching and Learning Topics of Thermo Chemistry”.

The main objective of the study was to determine the effect of co-operative learning on student’s achievement in thermo Chemistry. Experimental method was used in the study. The study included a total of 80 students studying Chemistry in two different classes during the academic year 2008-2009. One of these classes served as the Group Investigation group using Jigsaw technique. The tools used for obtaining data were the i) thermo Chemistry achievement test (TAT) and ii) the Particulate Nature of Matter Evaluation Test (PNMET), which were applied to treatment groups.

The results indicated that the instruction based on group investigation techniques caused a significantly better achievement in terms of the TAT.

Adewumi (2008) conducted a study on “Effect of Co-operative Learning and Problem-solving Strategies on Junior Secondary School Students’ Achievement in Social Science”.
The main objectives of the study were (i) to find out the effect of co-operative learning on junior secondary school students’ achievement in social science and (ii) to study the effect of problem-solving strategies on teaching social science. The design used for the study was pre-test, post-test control group non-randomized quasi-experimental design. The study made use of 150 students who were selected using stratified cluster sampling from three public secondary schools in central local government area of Osun state, Nigeria. The statistical techniques used were t-test and ANOVA.

The results of the study indicated that the effect of teaching strategies was gender sensitive. The findings also revealed that the co-operative learning method was more effective than the traditional method of teaching.

Hanze and Berger (2007) had a study on “Co-operative Learning, Motivational Effects, and Student Characteristics: an Experimental Study Comparing Co-operative Learning and Direct Instruction in 12th grade Physics classes”.

The main objectives of the study were (i) to find out the motivational effects on the students’ performance and (ii) to compare co-operative learning and direct instruction in 12th grade Physics classes. Quasi-experimental study was used in this research. 137 students in 12th grade Physics classes participated in a quasi-experimental study comparing the Jigsaw Technique of co-operative instruction with traditional direct instruction. The tools used were autonomy, competence, and social relatedness as posited by self-determination theory of learning.

The analysis showed that the basic needs partially mediated the effects of the method of instruction on cognitive activation and intrinsic motivation. Increase in feelings of competence with co-operative learning was associated with better performance in Physics. When controlling for competence, direct instruction had a facilitating effect on Physics performance. Method of
instruction was found to interact with self-concept: students with low academic self-concept profited more from co-operative instruction than from direct instruction because they experienced a feeling of greater competence.

*Alifathi-Ashtiani and Ayubi (2007)* conducted a study on “A Comparison of the Co-operative Learning Model and Traditional Model on Academic Achievement”.

The purpose of the study was (i) to compare the effect of co-operative learning model and the traditional learning model on academic achievement and (ii) to find out the effective teaching method for enhancing teaching learning process. Experimental study was used in this research. The sample selected comprised 23 students in each group. In Phase 1, an educational subject was taught to both the groups for 4 weeks. In phase 2, the experimental and control groups were instructed using co-operative learning model and traditional learning model respectively for six weeks. In the final phase, both groups were instructed using traditional learning model, for 4 weeks.

The results revealed that there was significant differences between pre-test and post-test for the experimental group but not for the control group. In addition, significant differences were found between the two groups in phases 2 and 3.

*Fink and Thomas (2007)* had a study on “Student Assessment: A Comparison of Solitary, Co-operative, and Competitive testing”.

The main objective of the study was (i) to compare Solitary, Co-operative, and Competitive testing. Solitary testing approach was used in this method. In most comparisons examining the undergraduate respondents’ (N=77) performance, the two group-testing methods were equivalent. Both group methods were superior to the solitary testing format in determining students’ knowledge of the course material and confidence in their answers.

The findings of the study showed that the co-operative learning group surpassed the solitary testing group in terms of preference for their format of assessment. Placing students in
teams to assess their knowledge of a subject matter appeared to be a viable strategy according to the results and may provide instructors with an attractive option to solitary testing. Students performed well in group situations, perceived it as an accurate measure of their knowledge, liked the experience, and appeared to work together to arrive at answers to questions.

**Urboniene and Barzdziukiene (2006)** carried out a study on “Developing Critical Thinking through Co-operative Learning”.

The prime objective of the study was to develop critical thinking through co-operative learning. The research methodology was based on humanistic philosophy and cognitive theory related to a constructivism principle which recognizes teaching as an active process. The study presents both theoretical and practical considerations of the development of critical thinking.

It was found from the study that the Co-operative Learning (CL) activities appeared to be an effective technique for developing critical thinking. This fact encouraged the authors of the study to analyze the development of critical thinking in university environment while teaching Business English (BE).

**Wachanga and Mwangi (2004)** conducted a study on “Effects of the Co-operative Class Experiment Teaching Method on Secondary School Students’ Chemistry Achievement in Kenya’s Nakuri District”.

The study sought to examine how the Co-operative Class Experiment (CCE) teaching methods affected students’ achievement using a non-equivalent control group design with 521 randomly selected students.

The finding of the study was that the gender did not affect achievement of the students. The co-operative class experiment teaching method was found to be effective in the teaching learning process.
2.4 SYNTHESIS OF REVIEWED STUDIES

The investigator has reviewed 83 studies on the whole on Computer Assisted Instruction and Co-operative Learning from 2000 to 2014. Out of which 21 studies on CAI and seven studies on CL were Indian studies. 28 studies on CAI and 27 studies on CL were conducted abroad.


Of the 28 studies conducted abroad on effect of CAI, three studies by Sowunmi and Aladejana, (2013); Yung-Chen, (2003) and Rivet, (2001) were done at the primary level; nine studies by Hussain et al. (2014), Achor and Ukwuru (2014), Sharma and Jain (2013), Tayeer and Alsharaideh, (2011); Akengin, (2010); Spradlin and Ackerman, (2010); Caskey (2008), Stultz and Sherry (2008) and Barnett (2006) were done at the secondary level; eight studies by Akram and Ali (2011), Serin (2011), Yusuf (2010), David and Myra (2008), Tayyabakausar and Gujjar (2008), Cepni and Kose (2006), Rosales (2005) and Incimorgil and Secilarda (2003) were done at the tertiary level; five studies by Ragasa (2008), Akcay and Durmaz (2006), Tosun (2006), Hodge (2002) and Cannon (2005) were done at the college level. In all the studies, the
instructional strategies such as computer assisted instruction, computerised programmes, computer-based self-instructional programmes; multimedia, web-based instruction etc. was used. In these studies the methods used were survey, experimental and quasi experimental designs through qualitative and quantitative analysis. Questionnaire, interview and tests were used to collect the data. The statistical techniques employed were mean, Standard deviation, ANOVA and ANCOVA.

Among the seven Indian studies on CL four studies by Mehar and Sekhri (2012), Sivaram and Ramar (2012), Arasu and Kalaiyarasan (2006) and Prakash and Patnaik (2005) were done to test the effectiveness of CL at the higher secondary level; two studies by Baskaran (2011) and Malarvizhi and Thangasamy (2010) were done at secondary level; one study by Deepa and Sadananthan (2012) was done on attitude of teachers towards CL. In these studies the methods used were experimental and quasi experimental design. The data were collected through screening tests and achievement tests. ANCOVA was used for data analysis in most of the studies.

Among the 27 abroad studies on CL three studies by Ajaja (2010), Artut (2010) and Adeyemi (2008) were done at the primary level; six studies by Orova and Wachanga (2014), James and Olumorin (2013), Chianson and Kurumeh (2011), Keskin and Polat (2011), Lavasani and Khandan (2011) and Wachanga and Mwangi (2004) were done at the secondary level; three studies by Jebson (2012), Oludipe and Awokoy (2010) and Hanze and Berger (2007) were done at the tertiary level; Eleven studies by Uimsek and Yilar (2013), Wichadee (2013), Mundy and Maxwell (2012), Goswami and Meling (2012), Ford (2012), Ahmad and Mahmood (2010), Duxbury and Tsai (2010), Karacop and Ada (2009), Mehmettasdemir and Adamtasdemir (2009), Fink and Thomas (2007) and Urboniene and Barzdziukiene (2006) were conducted to find out the effectiveness of CL on various subjects at the college level. The methods used in these studies were experimental and quasi experimental design. ANOVA, correlation and multivariate approaches were used for analysing the data. The data were collected through achievement tests, interview and questionnaire.
Overall, the statistics employed were mean, Standard deviation, t-test, ANOVA and ANCOVA, correlation and multivariate approaches. In these studies the methods used were survey, experimental and quasi-experimental designs. Questionnaire, interview and tests were used to collect the data in most of the studies. Instructional strategies such as computer assisted instruction, computerised programmes, computer based self-instructional programmes, multimedia, web-based instruction, co-operative learning, active learning technique etc. were used. In the experimental studies, all except four, (Ramesh, 2010; Stultz, 2008; Micki, 2008 and Barnett, 2006) have showed positive results.

The investigator, after reviewing the studies carefully, perceived that the present study is entirely different from the studies already conducted. No researchers had done an experimental study on teaching Chemistry by CAI and CL strategies especially on the topic chemical bonding for higher secondary students. Hence, the investigator wanted to fill the gap in the research region and decided to conduct a study on, “The Effect of Select Teaching Strategies on Achievement of Higher Secondary Students in Chemistry”.

The following chapter explains in detail about the methodology employed in the study.