Chapter II

REVIEW OF RELATED LITERATURE

A study of the literature is an essential step to get a full picture of what has been done and said with regard to the problem under study. Such a review brings about a deep insight and clear perspective of the overall field. Collection of related literature provides the basic understanding of the problem and its depth. It is an answer to the question “why is the hypothesis required for the present problem”. It is a key to the linking of the investigator, only when the large extensive study is made on the related problem. The knowledge of the old problems solved, the method of finding out the solution, the kind of statistics applied, etc., can be very easily achieved with confidence. Hence some of the earlier studies related to the present study are presented in this chapter.

Throughout the past two decades, a large number of researchers in various fields (e.g., personnel psychology, English, nursing, math, physical education, science, information technology) from around the world have become increasingly interested in the effectiveness of technology on students outcomes (Brown, 2001; Chen, 2005; Chang, 2002; Jantz, Anderson, & Gould, 2002; Matheson, 1990; McKethan, Everhart, & Stubblefield, 2000; Yildirim, Ozden, & Aksu, 2001). As a
result, many meta-analyses studies have been conducted to review and synthesize the outcomes of these studies.

The literature related to any problem helps the scholar to discover what is already known, this would enable the investigation to have a deep insight. Clear perspective and a better undertaking of the chosen problem and the various factors connected with the study.

The reviews are discussed under the following topics to have a better perspective about CAI in the literature:

- Technology and Teacher Education.
- CAI in Student’s Subject matter Achievement.
- Studies on Computer Assisted Instruction.
- Studies on Multimedia and Physical Education.
- CAI in sports Coaching and Teaching.
- Research in Physical education Courses and Different Subject Matter Courses.
- Multimedia

**Technology and Teacher Education:**

As teaching is a complex activity, it needs systematization for an effective delivery of information. Otherwise, the learning may not be effective. To ensure better information delivery, teachers have to understand the dynamics of the teaching learning process. As yesterday’s
knowledge becomes obsolete today, teachers have to cope with new changes and ideas in the field of education. New technologies new methods and practices help the teacher design the instruction in an effective way. In recent times, technology has totally, revolutionized the educational system and as a result, new ideas, methods and practices emerged to make the instruction effective and meaningful. Particularly multimedia courseware has totally revolutionized education, paving the way for new approaches and techniques in the teaching/learning process.

Information technology can support teacher preparation programs in several ways, such as in the method courses, foundation courses, different subject matters in the teacher education curriculum, and the student teaching experience. White (1991, 1994a, 1994b) was used simulations and databases in a social studies method course. In these courses students were required to create lesson plans and apply them using technology in their microteaching. In addition, they established professional development school (PDS) sites, and in-service teachers provided hands-on technology activities to use in method courses for pre-service teachers.

Pugh (1993) developed software called “electronic classroom” and “roundtable” to promote dialectic thinking; i.e. the ability to understand different views in a critical reading course. This software helped students
to understand certain case studies via simulations.

Different subject matters in the teacher education curriculum have also taken advantage of using information technology in their curriculum. Videodisc technology was developed at the Ohio State University PETE Program to teach physical education majors how to analyze sport-specific skills (O’Sullivan, 1989; Stroot et al., 1991).

In addition, the TECH (Technology in Early Childhood Habitats) program at the University of Delaware organized computer courses for pre-service teachers to teach computer use for early childhood education in many ways (Caruso et al., 1994).

Although computers have been used in physical education classes in many ways, there is limited research evidence about the effectiveness of CAI in K-12 physical education classes. Research completed in K-12 physical education indicates that CAI has produced positive outcomes in female junior high schools students’ volleyball skills (Wilkinson, et al., 1999) and secondary students’ badminton knowledge (Skinsley & Brodie, 1990). However, there is only one research study about CAI in elementary physical education classes and this study found no significant effect of CAI on teaching tennis rules, scoring, and terminology to fifth grade students (Alvarez-Pons, 1992).
Alvarez-Pons 1992 explored the effectiveness of a CAI programme in teaching tennis rules, scoring and terminology to fifth grade students. CAI was compared to the traditional teaching approach and data were collected using a pre and post-test ANOVA design in a five-week tennis unit. Although both groups improved their scores in the post test, the results showed that there was no significant difference between the groups. Briefly, very limited researches have been completed in K-12 physical education classes and these studies have produced different results in terms of the effectiveness of CAI.

Schifferdecker KE, (2012) studied computer-assisted learning (CAL) in medical education has been shown to be effective in the achievement of learning outcomes, This study examines the key elements and processes that led to the widespread adoption of a CAL program in undergraduate medical education, the Computer-assisted Learning in Paediatrics Program (CLIPP). The use of a national curriculum development by CDs and the meeting of CDs desire to improve teaching and student learning. An additional facilitating factor was that little time and effort was needed to implement CLIPP within a clerkship. The quantitative findings were mostly corroborated by the qualitative findings.
Cook DA (2012) proposed that adaptation to learners' cognitive and learning styles (CLSs) could improve the efficiency of computer-assisted instruction (CAI). Of 65 analyses reported in 48 studies, only 9 analyses (14%) showed significant interactions between CLS and instructional approach. It seems that aptitude-treatment interactions with CLSs are at best infrequent and small in magnitude. Adaptation to learners' CLSs thus seems unlikely to enhance CAI. The author recommends that educators focus on employing strong instructional methods. Educators might also consider assessing and adapting to learners' prior knowledge or allowing learners to select among alternate instructional approaches.

Al Jewair TS., Azarpazhooh A., Suri S., Shah PS., (2009) compared the efficacy of computer-assisted learning (CAL) with traditional methods of learning in orthodontic education. The main outcome measure of CAL efficacy was knowledge gain. The time efficiency of the method was assessed based on the time spent learning the material, while its qualitative effect was tested by the attitudes of participants. A statistically significantly higher knowledge gain favoring CAL was identified in studies that used pre- and post-intervention tests (weighted mean difference [WMD] 9.78 percent, 95 percent confidence intervals [CI] 2.89 percent, 16.67 percent; test of heterogeneity p=0.25).
For studies that used only post-intervention tests, significantly greater efficacy was noted, but the effect size was smaller (WMD 3.79 percent, 95 percent CI 0.31 percent, 7.28 percent; test of heterogeneity p=0.003). Overall, student attitudes were positive towards CAL.

**Gong Yingying, Gong Ning., (2011)** attempted to apply multimedia animation technology in P.E teaching practice analyzed the results from different angles and put forward relevant proposals. After experiments, it is indicated that there are significant differences between the experimental group and control group in aspects of mean achievement, quality and rhythm of actions and students' learning motivation, the experimental group has done better than the control group.

**Lei Xu., Zhiguang Liu., (2009)** studied multimedia is the core and main technical measure of the application of modern information technology into education. As a new modern teaching method, multimedia technology has been widely applied to all fields of teaching. Applying multimedia technology to the basketball practice class of college will benefit the improvement of teaching method and system and students will become more active in the learning of basketball theory and skill. This will also give them sufficient knowledge to appreciate a basketball match and contribute to China's basketball industry. Basic on
the investigation and discussion on the effect of multimedia teaching, author of the paper thought the application of multimedia technology should be accelerated and popularized.

**CAI in Student’s Subject matter Achievement:**

**Gerardo (1986)** compared the effectiveness for learning of the technology-assisted and the traditional method. The students were shown to be more successful in the technology-assisted applications. (The effects of the CAI were assessed).

**Ybarrondo (1984)** attempted to find out whether computer-assisted teaching could increase the level of learning in high school biology classes. The treatment group received CAI in addition to the traditional method. The CAI applications were computer simulations. The post-test results of both groups were evaluated through a t-test but no significant difference could be observed. The students were more interested in the computer-assisted applications.

**Sharp (1996)** designed to see the effect of computer-assisted instruction as a supplementing strategy on the academic achievement of secondary school students in the subject of science. Analysis of data revealed that the students taught through computer-assisted instruction as supplementary strategy performed significantly better. The students with high achievement level showed better results than those with low
achievement level when taught through computer-assisted instruction. The computer-assisted instruction was found equally effective for both male and female students.

**K. A. Owusu (2010)** investigated the comparative efficiency of computer-assisted instruction (CAI) and conventional teaching method in biology on senior high school students. A science class was selected in each of two randomly selected schools. The pretest-posttest non equivalent quasi experimental design was used. The students in the experimental group learned science concepts (cell cycle) through the CAI, whereas the students in the control group were taught the same concepts by the conventional approach. The conventional approach consisted of lecture, discussions and question and answer teaching methods. The results indicated that students that were instructed by the conventional approach performed better on the posttest than those instructed by the CAI. However, the performance of low achievers within the experimental group improved after they were instructed by the CAI.

**Ada Anyamene (2012)** examined the significance of retention achievement scores of students taught using computer-assisted instruction and conventional method. Three research questions and three hypotheses were formulated, and tested 0.05 level of significance. The Algebra
Achievement Test (AAT) was made of 50 items of multiple-choice objective type, developed and validated for data collection. The Algebra achievement Test (AAT) was administered to students as pre-test and post-test. The results of students were analyzed using t-test statistic to test the hypotheses. The result indicated that students taught using (CAI) package performed significantly better than their counterparts taught using the conventional method of instruction. Students taught using CAI performed better than the control group in retention test. Also there was no significant difference in the post-test performance scores of male and female students taught using CAI of package. Based on the findings it was recommended that Computer-Assistant Program should be encouraged for teaching and learning of mathematics.

Saucier, B. L., Stevens, K. R., & Williams, G. B. (2000) compared the effect of CAI and Written Nursing Process (NP) case study strategies on critical thinking skills in undergraduate family nursing clinical course students. The findings showed that CAI as an intervention produced equal outcomes to the traditional NP program in terms of critical thinking skills. However, CAI provided some advantages over the traditional method in time efficiency and student satisfaction. In brief, research on the effectiveness of CAI on students’ subject matters achievement has produced different and inconsistent results.
Christmann E., Badget J., & Lucking R. (2000) examined 18 studies for the effectiveness of CAI and found an overall mean effect size of 0.127. The results indicated that students who received TI supplemented with CAI performed slightly better than those who received only TI. Furthermore, this study found that CAI was most effective in aviation and English and least effective in mathematics and music. In a similar study, 42 studies that involved college students were examined for the effect of CAI on students achievement in science education when compared to TI.

Jeffries PR (2003) compared the effectiveness of an interactive, multimedia CD-ROM with traditional methods of teaching the skill of performing a 12-lead ECG. A randomized pre/posttest experimental design was used. There were no significant ($p < .05$) baseline differences in pretest scores between the two groups and no significant differences by group in cognitive gains, student satisfaction with their learning method, or perception of self-efficacy in performing the skill.

Tongkun Shi (2011) improved the teaching effects in clinical medicine courses, multimedia teaching and traditional teaching was combined in operation programme in nursing major. One hundred and two undergraduates majoring in nursing were distributed randomly into two groups, i.e., the case group and the control group. The case group
was administrated in traditional teaching method, while combined teaching method was applied to the case group. The results indicated that the combined teaching method being a useful and effective teaching method, was worthy of spreading.

Zhongbin Yin., Binli Wang., Li Wang., & Qiujun Ren. (2010) investigated the application of multimedia technology in teaching in football theory course can provide sound, image, icon and other information for students across time and space, which will enable them to receive good effect. Multimedia teaching helps students to take interest in learning, which can improve learning efficiency. Multimedia teaching helps to resolve the important and difficult teaching points, which is conducive to individualized, personalized instruction. This paper focuses on the study of design and application in football multimedia courseware. It also presents the student-centered design principles and analyses the structural design, teaching content as well as functional design of football multimedia courseware.

Studies on Computer Assisted Instruction

Howerton, W. Bruce., Enrique, Platin RT., Ludlow, John B., & Tyndall, Donald A. (2004) compared computer assisted instruction (CAI) - multimedia instruction focused on intra-oral radiography with lecture format using recent hardware and software advances. Seventy-five
first-year dental students of University of North Carolina (UNC) were pre and post-tested to determine student performance and instructional preference. Analysis of covariance and the sign test were used to determine significance ($p<.05$). There was no significant difference between pre and post-test outcomes, indicating that similar learning took place using the interactive CD and/or lecture format. However, students preferred CAI to lecture format.

**Basudeb Roy Chaudhury (2014)** compared academic performance of students in class- X (ten) in one of the Bengali Medium School of rural area of Burdwan District, West Bengal, India between traditional instruction, and Computer Assisted Instruction (CAI) with simultaneous discussion. The design used in this study was pre-test and post-test to control group and experiment group. Fifty students of class-x were selected and two groups were formed. Students of each group were selected randomly. Statistical data analysis was used in data analysis. Significant difference was found in the post test scores of students receiving traditional method, and CAI with simultaneous discussion. It revealed that CAI with simultaneous discussion is more effective than traditional method.

**Bernard-Opitz (2001)** studied the influence of CAI on social problem solving skills in children with Autism versus their non-disabled
peers. Eight preschool children with Autism and eight preschool children without disability participated. Authors used repeated measures of ANOVA and the dependent variable was the number of novel ideas produced as a social problem solving skill. Results showed that compared to children without disabilities, children with Autism had a significantly lower number of novel ideas and normal children produced more novel ideas.

Wilkinson, C., Hillier, R., Padfield, G., & Harrison, J. (1999) examined the effects of a volleyball CD on cognitive and psychomotor skills of 69 junior high school girls. Students were randomly selected to be in the experimental and teacher instruction groups. Repeated measures of ANOVA were used to determine the effects of the CD on the students’ learning. Students completed pre and post skill tests and written cognitive tests. In addition, game play was videotaped during a tournament and successful and unsuccessful trials were recorded. Results showed that although students in both groups improved their forearm pass, set, and underhand serve, the CAI group obtained significantly higher scores in the forearm pass and had more successful passes/serve, sets/serve and contacts/serve during game play. Moreover, both groups improved significantly in their knowledge test, but there was no significant difference between the groups.
Skinsley and Brodie (1992) studied the effectiveness of CAI on the cognitive knowledge of 12 years old male students’ badminton knowledge. A total of 42 students were divided into two groups as CAI and teacher instruction according to their knowledge and badminton ability. Both groups were taught the same badminton unit. Using a pre and post test design with ANOVA, results showed that both groups improved their test scores considerably but there was no significant difference between the two groups. However, the CAI group retained information better with a mean score of 6.8% higher on the post-test than teacher instruction group.

Susan M. Bennett (2012) described the effects of computer-assisted instruction (CAI) on rural high school students taking algebra courses. Michigan has a high population of students in rural communities and strategies need to be implemented to increase the probability of success for these students to learn algebra content. From the studies indicated computer-assisted instruction may be beneficial for rural algebra students and may provide an equitable education compared to students in other settings.

Hall T.E., Hughes C.A., & Filbert M. (2000) interventions to improve students’ reading skills with Learning Disabilities (LD) is computer assisted instruction (CAI). To evaluate the extent to which this
promise has been realized, this literature review was conducted. The studies were evaluated by type of computer instruction (drill and practice, strategy, and simulation) and type of reading intervention (prereading, word recognition, vocabulary/language, and comprehension/higher order thinking skills). Studies demonstrating significant differences favoring a CAI reading intervention, employed effective teaching practices.

Mohammad Reza Iravani, & Hadi Delfechresh. (2011) analyzed the effect of CAI on Science Achievement of Higher Primary Students. The result revealed that CAI software package has effect on academic achievement in science subject of students in experimental group and scores of students in experimental group were higher than the students who were teaching by traditional method in control group and also the results revealed that there is no significant difference between boys and girls in academic achievement scores in science of experimental group after implement the CAI software package teaching method and both of two groups have been got higher scores in science subject.

Justice Kofi Armah (2013) aimed at determining the effect of CAI on the academic achievement of junior high school students in Pre-technical Skills. The study employed the quasi-experiment, pretest-posttest non equivalent groups design in two junior high schools
purposively selected for the experiment. In all, eighty junior high school second year students participated in the study. Using the results of a pre-test, the schools were put into treatment and control groups. The study revealed that there is no significant difference between the general performance of the experimental group and that of the control group. However, it was concluded that CAI has influence on the learning of specific aspects of basic design.

**Erickson ML (2004)** compared the computer-assisted instruction (CAI) use in physical therapist (PT), physical therapist assistant (PTA) education programs and examining faculty attitudes toward CAI. Positive aspects reported included improved knowledge of technology and independence with information gathering. Negative aspects reported included cost and time. Respondents were unsure whether different students benefit more from CAI (high or low aptitude, learning style). Results indicated that contextual differences between PT and PTA probably account for differences in types and uses of CAI for PT and PTA programs. Instructor feedback is important when using CAI to teach psychomotor skills.

**Howerton WB Jr (2004)** compared the interactive computer-assisted instruction (CAI) vs. lecture format in dental education. A pre- and post-test was used to determine student performance and instructional
preference. Analysis of covariance and the sign test were used to determine significance ($p<.05$). There was no significant difference between pre- and post-test outcomes, indicating that similar learning took place using the interactive CD and/or lecture format. However, students preferred CAI to lecture format.

**Qayumi AK, et al., (2004)** aimed to compare the effects of computer-assisted, text-based and computer-and-text learning conditions on the performances of 3 groups of medical students. Compared to the control group, all 3 study groups exhibited significant gains in performance on knowledge and performance measures. For the knowledge measure, the gains of the computer-assisted and computer-assisted plus text-based learning groups were significantly greater than the gains of the text-based learning group. Lower achieving students performed better after using computer-based learning methods.

**Studies on Multimedia and Physical Education**

Nowadays computers can be used by physical education teachers in three ways; utilities, assessment, and Computer-Assisted Instruction (CAI) (**Silverman, 1997**). The use of computers as utilities is the most common application in physical education classes. At present, many physical education teachers use computers for managerial purposes such as data management, record keeping, attendance, planning, and
communication with parents (Lambdin, 1997; Mohnsen, 1997; Mitchell & Hunt, 1997).

Assessment is the second important purpose for the use of computers in physical education activities. Physical education teachers use computers for skill and fitness assessment in a wide variety of ways. Bonnie’s Fitware (Mohnsen, 1995) and Motion Software (1994) are good examples of this. Bonnie’s Fitware helps students and teachers record fitness data, and provides information about their yearlong progress. By using Motion Software students analyze their strokes using biomechanical principles.

Although computers have been used in physical education classes in many ways, there is limited research evidence about the effectiveness of CAI in K-12 physical education classes. Up to date, there have been only three research studies completed about the effects of CAI on K-12 physical education classes. Research completed in K-12 physical education indicates that CAI has produced positive outcomes in female junior high schools students’ volleyball skills (Wilkinson, C., Hillier, R., Padfield, G., & Harrison, J., 1999) and secondary students’ badminton knowledge (Skinsley & Brodie, 1990). However, there is only one research study about CAI in elementary physical education classes and this study found no significant effect of CAI on teaching tennis rules,
scoring, and terminology to fifth grade students (Alvarez-Ponns, 1992).

Kao. C., Wu.Y., and Tsai, C. (2011) developed an evaluation system for the executive judgment of volleyball referees. They presented computer assisted techniques to digitalize volleyball games, make judgments, and generate evaluation results. Through the interface of the computer assisted evaluation system, times and correctness of judgments are recorded, and corresponding scores are prompted immediately after a test is over. The feasibility of this system was validated, as ten qualified volleyball referees of level A, B, and C were chosen for test participators. According to the Pearson's coefficient analysis, the results from three correlated test sets showed that the computer assisted evaluation system for volleyball referee’s executive judgment was highly reliable in both test-retest form and alternate form. In addition to serve for the volleyball referees evaluation, the system can also be used as a training purpose to improve the performance of judgment technique.

Vernadakis, N., Panagiotis, Antoniou., and Heracles, Kellis. (2003) determined the effect of computer assisted instruction on learning the skill of setting in volleyball. The subjects of TI group experienced the skill of setting through a series of progressive skills accompanied with drill and repetition of practice presented by an instructor. The CAI group experienced these skills of setting through a series of progressive skills
accompanied with drill and repetition of practice presented by a multimedia programme. In the beginning and the end of this study, the groups received a 10-item multiple choice knowledge and a skill test. The result indicated that there were no significant differences between the TI and CAI groups concerning the knowledge and skill test. The results suggested that the multimedia technology as a teaching aid is as effective and profitable as the traditional teaching method on learning skills.

**Baca, A., Eder, C., and Strubreither, O. (2005)** developed anifold animations and video sequences to assist instructors and students to comprehend sports motions and technical/tactical actions as applied in game sports. One specific emphasis lies in the methodical organization of the learning process of sports techniques.

**Roland Leser, Arnold Baca., and Johannes Uhlig. (2011)** examined multimedia technology impacts learning in the field of sport motor skill acquisition. This question was investigated during a practical sports education course involving 35 students who participated in a university soccer class. The whole course was split into two groups: Group A was taught traditionally with no assistance of multimedia and Group B was prepared with multimedia-assisted instructional units. A comparison of the gathered data between the two groups resulted in no significant differences, neither concerning the results of the technique test
nor concerning the tactic test. However, the results of the questionnaire showed a positive agreement among the participants in the usability and assistance of multimedia for the sports practical course.

Wiksten, L.D., Spanjer, J., and LaMaster, K. (2002) analysed the effectiveness of using a CD-ROM on Sports Injuries 3-D, by Cramer Products (Gardner, KS) in an introductory athletic training laboratory class of Undergraduate Kinesiology major as a supplement to traditional lecture instruction. Student attitudes toward the CD-ROM programme were favorable, and the qualitative data suggested that students would use this type of educational resource provided it was targeted toward the specific course and offered a time-efficient method for access.

Toth-Cohen (1995) examined the learning outcomes of a computer assisted instruction (CAI) tutorial in applied anatomy and kinesiology and to determine its applicability for use in two university settings. The learning outcomes of an experimental group of occupational therapy students using a CAI programme and a control group using books to study the same material were compared. Establishment of clear learning objectives, use of a theoretical base to design instruction, and development and testing in different educational settings can help improve the quality of CAI programmes and ensure their relevance to other curricula.
Apostolos Siskos, Panagiotis Antoniou, Athanasios Papaioannou, Konstantinos Laparidis, (2005) investigated Computer Assisted Instruction (CAI) in Physical Education is functional in the school environment. The experiment lasted 12 class hours, two classes per week over six weeks. The results of an analysis of covariance indicated that there was a significant increase in achievement post-test for the (MCAI) group when compared to either the (TA) or control groups, the results indicate that this new educational tool is an effective way to introduce health-related physical education programs for young students in typical classroom settings.

Panagiotis Antoniou (2003) developed and compared the computer-assisted instruction appears to be a highly promising mode for teaching cognitive concepts of physical education and sports. The purpose of this study was to examine the effect of multimedia computer-assisted (MCAI), traditional (TI), and combined (traditional and multimedia computer-assisted) (CI) instruction on learning rule violations in basketball. Results indicated that students in all groups improved their knowledge of rule violations but only those in the TI and CI groups retained this knowledge since their scores in the retention test were greater than those in the pre-test. Also, the TI group showed significantly greater retention than the MCAI group both in the written
test and in total performance. On the contrary, the type of instruction did not affect performance in the video test and students’ improvement was temporary. It appears that physical education students can learn basketball rules through TI and CI.

**CAI in Sports Coaching and Teaching**

*Williams E (1997)* analyzed movement skills is fundamental to effective teaching in Physical Education (*Barrett, 1979; Kelly, Walkley, & Tarrant, 1988; O’Sullivan, Stroot, Tannehill, & Chou, 1989*). Unlike coaches who specialize in sport specific movement forms, physical educators are typically confronted with a large variety of movement forms to analyze and diagnose. Although sport-specific training programs have been successful in developing analytic abilities of preservice physical education teachers (*Kniffen, 1985; Halverson, 1987; Rush, 1990; Wilkinson, 1986*), the variety of movement forms encountered by physical education teachers, as well as the time available to teach qualitative assessment, precludes a sport-specific approach. Recent skill analysis dissertations completed at The Ohio State University (*Johnson, 1990; Matanin, 1993*) suggest the potential for a mechanical approach to the analysis of skill (*Kreighbaum & Barthels, 1990*), otherwise referred to as a performance principle approach.
Mary-Margaret Kerns (2008) assessed the effectiveness of computer-assisted instruction in teaching tennis rules and strategies. The control group (n=%) received instruction by traditional means. The experimental group (n = 19) received no instruction on tennis rules and strategies during regular class periods but did interact with computer-assisted tutorials during two scheduled classes. The between-groups analysis and the interaction analysis were not significant, but the within-group analysis revealed an ‘F’ ratio of 99.72 (p<.001). It was concluded that both groups learned tennis rules and strategies significantly from the pretest to the posttest, their learning performance on the retest differed significantly from pretest administration but not from posttest to the retest, and there was no significant difference between the performance of either group on all three testing occasions.

Chu and Chen (2000) developed a multimedia prototype on serve of badminton and conducted an experimental research in elementary school classes (sixth grade) to explore whether the multimedia material is a helpful tool to motor skills learning. The multimedia computer-assisted instruction group had better results on the cognitive test but not on the motor skill test than the traditional instruction group. Similar findings emerged in the Ross (1994) study involving primary school children aged 9 to 11.
Ibrahim Abdel Razeq Selim (2010) examined the effect of using multimedia in teaching kindergarten children the skills of running, jumping forward, throwing and balancing. The study sample consisted of 50 children who were divided into two equal groups. The researchers used the experimental method with the pre-post two groups design to examine the hypotheses and research question. Research results showed that using multimedia was more effective than the traditional methods in learning and performing the basic motor skills.

Denise Lebsack Wiksten, Patricia Patterson, Kimberly Antonio, Daniel De La Cruz, Barton P Buxton (1998) evaluated the effectiveness of an interactive athletic training educational curriculum (IATEC) computer program as compared with traditional lecture instruction. The IATEC group ($n = 20$; 2 subjects were dropped from this group due to scheduling conflicts) worked independently for 50 to 65 minutes using the Q-angle module of the IATEC program. The control group ($n = 22$) received no instruction. Results suggest that use of the IATEC computer module is an effective means of instruction; however, use of the IATEC program alone may not be sufficient for educating students in cognitive knowledge. Further research is needed to determine the effectiveness of the IATEC computer program as a supplement to traditional lecture instruction in athletic training education.
Bago, G., Hedbávný, P., (2011) create a modern multimedia course for sports gymnastics and verify its efficiency in the training of physical education students. The results were gained to enable the acceptance of the hypothesis (H1) concerning the experiment with men and the hypothesis (H2) concerning the experiment with women that the multimedia materials into the system of habitual education of sports gymnastics will increase the efficiency of this process. It means that experimental groups will be able to perform various gymnastic skills at better quality than control groups after the same period of time.

Robert Dewell (2004) examined the use of multimedia education in coaching beginner and intermediate cricketers. An interactive coaching simulation and coaching video were manufactured, tested against batting participants and rated by a cricket coach. The results show the different participants’ improvement scores after multimedia training and the collection of quantitative data regarding their performance. A further investigation showed a vast array of multimedia learning packages currently available which are discussed in detail. A worldwide evaluation by way of a five-point Likert scale was carried out on the interactive coaching produced by the researcher. This returned intriguing responses from ex international cricketers, coaches and multimedia designers, forming qualitative and quantitative data. Problematic areas of the
interactive coaching are highlighted by the participant evaluation questionnaires and suggestions are made on further research.

Antoniou, P., Derri, V., Kioumourtzoglou, E. & Mouroutsos, S. (2003) examined the effect of multimedia computer assisted instruction (MCAI), traditional instruction (TI), and combined instruction (CI) on learning rule violations in basketball by university physical education students. Written test results indicated that students in all groups improved their knowledge of rule violations but only those in the TI and CI groups retained this knowledge. Also, the researchers found that TI group showed significantly greater retention than the MCAI group both in the written test and in total performance.

Si-min Li., & Jin hai Sun. (2008) studied the experimental research on multimedia teaching for sports aerobics found that: (1) the multimedia teaching for sports aerobics, which takes the students' study as the center, pays great attention to the learning environment design is helpful in making the student to establish the correct technical movement concept, and then raise the utilization rate of effective time in class, and increase the teaching information capacity the grades, (2) the sports aerobics received in the experiment group are better than those of the students in the opposite one, and (3) the multimedia teaching has its unique superiority in theoretical knowledge and the technical skill
instruction aspects of sports aerobics compared to conventional teaching methods.

Cui Dong-Dong, Qu Yang, Lin Qiu-Ping. (2012) studied CAI (Computer Assisted Instruction) is core content of education projects assisted by computer and the main technical form of modern information technology applied in education. As a new kind of modern teaching methods, CAI has been widely used in various fields of education and teaching. However, there are few updated CAI application theory research in physical education, nor the studies of CAI practical application, and software development and application, which does not meet the need of modern teaching and training. Along with the development of martial arts sport and the unceasing consummation of martial arts competitions, the traditional empirical training mode cannot meet the needs of the development of modern technology level, thus modern education technology have great impact upon traditional teaching mode, so there are changes in teaching methods. Scientific training means and methods will further improve training effectiveness, the tendency of modern martial arts training.

Antoniou Panagiotis, Moulelis Elias, Siskos Apostolos, and Tsamourtzis Euagelos. (2006) examined the effects of the use of an Interactive Instructional Multimedia Software in the teaching process of
alpine skiing. (Multimedia Group n=16 (MG) and Control Group n=16 (CG). Statistical analysis two-way ANOVA revealed main effects of the independent variable “group” \[F(1, 28) = 35.393 \ p = 0.001\] at the technique level, main effects of the independent variable “group” \[F(1.28) = 76.507 \ p<0.001\] at the performance and also main effects of the independent variable “gender” \[F(1.28) = 5.066 \ p<0.05\] at the performance. Finally results revealed that Multimedia assisted instruction method of teaching alpine skiing in beginners is more effective than the traditional method.

Nicholas Vernadakis, Panagiotis Antoniou, Eleni Zetou, Maria Giannousi, Eftimis Kioumourtzoglou. (2010) examined the effect of multimedia computer – assisted instruction (MCAI), traditional instruction (TI), and combined instruction (CI) methods on learning the skill of setting in Volleyball. Additionally, a comparison of the students’ attitudes towards the MCAI and TI methods was made. Post-test results indicated no significant differences between the groups concerning the written test. Nevertheless, the attitude test scores of the CI group were more favourable to MCAI method than the TI method. Retention test results showed that groups retained the knowledge acquisition. However, the combine method of instruction tended to be the most effective on cognitive learning.
**Wiksten DL (1998)** evaluated the effectiveness of an interactive athletic training educational curriculum (IATEC) computer program as compared with traditional lecture instruction. Results of a 1-way ANOVA on cognitive knowledge of the Q-angle revealed that the traditional lecture and IATEC groups performed significantly better than the control group, and the traditional lecture group performed significantly better than the IATEC group. Results of a 1-way ANOVA on practical skill performance revealed that the traditional lecture and IATEC groups performed significantly better than the control group, but there were no significant differences between the traditional lecture and IATEC groups on practical skill performance. Results of a t test indicated significantly more favorable attitudes (P < .05) for the traditional lecture group when compared with the IATEC group for comfort, creativity, and function.

**Fincher AL (1996)** evaluated the percentage of undergraduate and graduate NATA-approved athletic training education programs are using some form of computer-based instruction (i.e., computer-assisted instruction or interactive video). Respondents also identified the educational software they use and their method for implementing this software. Software was used most often to supplement traditional instructional methods. A lack of funds was reported to be the primary impeding factor for those programs not using computer-based instruction.
Respondents reported an overall positive attitude toward computer-based instruction use in athletic training education and indicated the need for increased development of athletic training/sports medicine software.

**Ferman Konukman (2005)** studied the effects of multimedia Computer-Assisted Instruction (CAI) on tennis skill and task analysis in a Physical Education Teacher Education (PETE) program. The results of this study revealed that no significant differences were found among the groups in tennis serve skill analysis test (p>0.05). Therefore, post hoc analysis did not use. In addition, none of the groups improved within the group from pre to post-test (p>0.05). Finally, significant differences were found among the groups in tennis serve task analysis (p<0.05). Results indicated that the TI group performed significantly better than the CAI and CG groups (p<0.05). In addition, the TI and CG groups improved significantly within the group (p<0.05). The CAI group did not improve (p>0.05).

**Chia-Hsin Wu., Hsiu-Chu Lin., Kuo-Hsin Wang., Ya-Po Lin., & Chung-Lin Chen. (2010)** examined the multimedia computer assisted instruction, which contain a high degree of visual and verbal cues, compared to multimedia instruction on elementary 5th grade students learning motivation, classroom climate, and motor skill achievement in physical education. Results from one-way ANOVA show that students in
experimental group A had significantly higher scores than the experimental group B and control group regarding learning motivation, classroom climate, and motor skill achievement (p<0.05), but results show no significant differences between experimental group B and control group (p>0.05). Findings revealed an improvement in motor skill achievement and in the development of a positive learning motivation regarding the use technology to support instruction on the experimental group A and B (p<0.05). This study suggests that visual and verbal cues in multimedia may be important for student learning achievement in elementary physical education.

**Research in Physical education Courses and Different Subject Matter Courses**

**Apostolos Siskos (2005)** investigated the Computer Assisted Instruction (CAI) in Physical Education is functional in the school environment. Computer Assisted Instruction, Traditional Approach to teaching (TA) and Control. The results of an analysis of covariance indicated that there was a significant increase in achievement post-test for the (MCAI) group when compared to either the (TA) or control groups, F(1, 238) = 13.486, p < .0167; F(1, 238) = 53.872, p < .0167. These results indicate that this new educational tool is an effective way to
introduce health-related physical education programs for young students in typical classroom settings.

Computer Assisted Instruction (CAI) is one of the good examples of technology’s implications in physical education programs. The use of CD-ROMs can contribute a self-paced and interactive environment for teaching and learning in certain subject matters. However, there is no practical and empirical research evidence of using CD-ROMs in PETE programs until now.

Aspasia (2011) analyzed the use of technology in sports. The aim of this study was to present the researches focusing on the application of technology on movement education with emphasis on physical and dance education. The predominant research finding is that although contemporary technological media were substantially advanced and innovative, they had not been incorporated in the classroom everyday learning practice yet. A prerequisite for the achievement of this goal was the researchers’ interest to be focused: a) on the cognitive aspects of a technologically supported instruction and b) on the design of multimedia products according to the principles of the modern theories of multimedia learning.

instruction (i.e., *WordMaker*) on students having different levels of reading ability. Of particular interest were the effects of *WordMaker* on the spelling performance of first graders in a co-taught classroom. In a short 10-week period, the *WordMaker* software program had a positive impact on children’s decoding and spelling skills. Eighty-three percent of the students experienced gains between the pre- and posttest scores. Findings suggest that Word Maker is an effective complement to other activities associated with the first grade curriculum (e.g., spelling and decoding) and has the potential to enhance students’ reading and writing skills.

*Mudasiru Olalere Yusuf, Adedeji Olufemi Afolabi* (2010) investigated the effects of computer assisted instruction (CAI) on secondary school students performance in biology. 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 cooperatively were better than their counterparts exposed to the conventional classroom instruction. However, no significant difference existed in the performance of male and female students exposed to CAI in either individual or cooperative settings. Based on the research findings recommendations were made on the need to develop relevant CAI packages for teaching biology.
Semra Bayturan and Cenk Keşan (2012) investigated the impact of computer-assisted instruction method on students achievement and attitudes towards mathematics in secondary mathematics education. The research was designed based on an experimental pre-test post-test model. Computer-assisted instruction and traditional instruction methods were used in the experiment group and the control group respectively. The data were collected by using the Mathematics Test, Mathematics Attitudes Scale. Our results demonstrated that teaching mathematics with a computer assisted instruction method increased student success significantly in mathematics lesson. However, the experimental and control groups did not differ between students’ attitudes towards mathematics.

Basturk R (2005) demonstrated and discussed the educational advantages of Computer Assisted Instruction (CAI). Findings suggest participants’ learning capacity of the introductory statistics could be improved successfully when CAI used as a supplement to regular lecture in teaching introductory statistics course.

Ahmet Hakan Hançer and Ahmet Turker Tuzemen (2008) examined the effectiveness of computer assisted teaching method over the teacher-centered method (explaining, question-answer, demonstration) together with the academic achievement of science
teaching students in the fields of science and technology. After t-test analysis, data showed that computer assisted teaching was more effective than teacher-centered methods to increase academic achievement and to acquire permanent teaching.

Goran, M & Reynolds, K (2005) examined the efficacy of a computer-based interactive multimedia curriculum for promoting physical activity in fourth grade children. The researchers concluded that the interactive multimedia curriculum favored an improvement in obesity indices in girls and was associated with subtle changes in physical activity in girls and general improvement in psychosocial outcomes related to physical activity.

Mohammed Ali Ahmed Akour (2000) investigated the effects of traditional instruction (TI) plus Computer-Assisted Instruction (CAI) versus TI alone on college students' achievements in an introductory computer science course. This study was conducted at a small government university in Jordan using a Quasi-experimental, nonequivalent control group design. A courseware was developed to investigate the difference between two groups who were given a pretest and a posttest to measure achievement of the course objectives. An analysis of covariance on the posttest scores with pretest scores as the covariate showed that the TI plus Computer Assisted Instruction group
performed significantly better than the TI alone group with a small effect size. It was concluded that TI plus CAI format should be considered as a substitute to the TI alone format.

Ramazan Basturk (2005) compared the learning outcomes of participants in an introductory statistics course that integrated CAI to participants in a Lecture-only introductory statistics course. Reviews of participants’ identical midterm and final exams scores demonstrated that participants in Lecture-plus-CAI section obtained higher averages on midterm and final exams than participants in the Lecture-only sections and these higher averages likely were because of their better performance on concepts and practices that were taught in both regular lecture and CAI course. Findings suggest participants’ learning capacity of the introductory statistics could be improved successfully when CAI used as a supplement to regular lecture in teaching introductory statistics course.

Yasuo Sengoku (2003) identified the effect of a CAI web site for swimming to elementary school children’s learning motives and learning strategy. The superiority oriented motive and aim learning strategy decreased significantly \((p<0.05)\) after the swimming class in the control group. Using the CAI web site, it was indicated that the motivation to achieve higher swimming performance was kept high through the swimming class and that students were able to achieve a clear objective
Nikolaos Vernadakis (2012) investigated the impact of traditional and blended instruction, in students’ performance in a Physical Education in Early Childhood course. The course was designed and developed to meet the learning needs of students and the course’s objectives. The t test analysis on independent samples, revealed statistically significant differences in students’ performance. Based on the findings, blended instruction appears as an alternative teaching practice that should be embraced by teachers, in order to assist students to improve their performance.

Oguz serin (2011) investigated the effects of the computer-based instruction on the achievements and problem solving skills of the science and technology students. In the analyses of data, the independent groups 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 follow a normal distribution and finally, the covariance analysis (ANCOVA) to evaluate the efficacy of the experimental process. The result of the study reveals that there is 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.

Angie Tatiana Galvis., Jimmy H., Ishee., and Saly Schultz. (2011) compared the effectiveness of computer-assisted instruction (CAI) and traditional classroom lecture (TCL). Two methods were compared for teaching the basic concepts of the Occupational Adaptation theory: lecture method in which the teacher follows a Power Point presentation, and a multimedia CD-ROM method, with the same Power Point presentation as lecture. There was no significant difference ($p<.05$) in baseline knowledge about the theory between the two groups. Results showed significant differences between the two group cognitive gains ($p < 05$.), with the CAI group demonstrating more cognitive gain than the TCL group. Additionally, the CAI group spent 46% less time than the TCL group to cover the material. The results of this study suggested that occupational therapy learners could independently learn theory using computer.

Yoshida N (2012) developed computer-assisted learning (CAL) materials and reports of a survey of junior college dental hygiene students who have used them. The overall results of the evaluation were positive. The students were given five sets of simulation learning materials (SLMs). All of the students found the virtual practice beneficial for their learning.
Stegeman CA, et al., (2010) compared the effectiveness of MMI (multimedia instruction) in health care education compared to traditional pedagogies. Two specific domains emerged from the literature: types of learning with MMI and the instructional design of multimedia learning environments. Regardless of the outcomes of the study, each researcher favorably described the value of MMI in health care education, citing a need for further research before universal implementation of this technology is placed in the curriculum.

Foreman KB (2005) teach human gross anatomy course content available through computer-assisted instruction (CAI). To assess the design and utility of our CAI tool, a questionnaire addressed navigation, clarity of the images, benefit of the CAI tool, and rating of the CAI tool compared to traditional learning tools. Results showed that 88% of the respondents strongly agreed that the CAI tool was easy to navigate and overall beneficial. Eighty-four percent strongly agreed that the CAI tool was educational in structure identification and had clear images. Furthermore, 95% of the respondents thought that the CAI tool was much to somewhat better than traditional learning tools. We conclude that the design of a CAI tool, with minimal limitations, provides a useful ancillary tool for human neuroanatomy instruction.
Multimedia

Glittenberg C., & Binder, S. (2006) created 3D animations and interactive computer programmes demonstrating the neuro-ophthalmological nature of the oculomotor system, including the anatomy, physiology and pathophysiology of the extra-ocular eye muscles and the oculomotor cranial nerves, as well as papillary symptoms of neurological diseases. The comparative study showed that the experimental group students achieved significantly better test results than the control group. Three dimensional computer animation technologies can significantly increase the quality and efficiency of the education and demonstration of complex topics in ophthalmology.

Maag (2004) described the effectiveness of an online interactive multimedia learning tool versus text only, text and images, and multimedia learning explanations on Math achievement, Math self-efficacy, and student satisfaction. Compared to students in the control group, students in the interactive multimedia group demonstrated equal post test and retest knowledge of Math; their Math self-efficacy scores were also the same. Interactive multimedia group students were more satisfied with the method of learning, reported the technique to be enjoyable and more interesting, and provided sufficient feedback. An online interactive multimedia learning tool is a realistic and creative
Wender and Muehlboeck (2003) investigated whether computer animated graphics are more effective than static graphics in teaching statistics. Four statistical concepts were presented and explained to students in class. The presentations included graphics either in static or in animated form. The concepts explained were the multiplication of two matrices, the covariance of two random variables, the method of least squares in linear regression, alpha error, beta error and strength of effect. A comprehension test was immediately administered following the presentation. Test results showed a significant advantage for the animated graphics on retention and understanding of the concepts presented.

Carmichael and Pawlina (2000) developed animated presentations for all lectures in Gross and Developmental Anatomy. As a starting point, they scanned pen-and-ink drawings to create a digital image. The output is directed to a video projector and the PowerPoint presentation is projected in the "Slide Show" mode. They used a wireless mouse that allowed them to control the presentation from anywhere in the room. Before the lecture, students were provided with the same unlabeled drawings as handouts, and during the lecture the students were actively engaged in labeling the drawings and making related notes. After the lecture, the file was saved in HTML format and posted on the authors’
course web site where students can access the slides. Evaluation by the students at the end of the course demonstrated that this style of presentation was very favorably received.

**Summary of the Literature**

The reviews were presented in eight sections such as Technology and Teacher Education, Student’s Subject Matter Achievement, Computer Assisted Instruction, Physical Education, Athletic Training Courses, PETE Courses and Different Subject Matter Courses, Students’ Attitudes and Perception towards CAI, and Multimedia. This section gives an insight into the number and range of how computer assisted instruction has been used as teaching methods in different disciplines.

In summary, studies on Computer Assisted Instruction revealed much on learning styles of the learners, and redefined the role of a teacher from the level of disseminator of knowledge into a constructive guide facilitating optimum learning. The studies reviewed in this section mostly in the disciplines of Physical Education, Medical Science, Dental, Physics, Library, Mathematics, Plant Physiology, Medical Anatomy and Physiology, Radiology, and so forth. The evaluation of these CAI materials revealed the fact that the computer assisted instruction was more interesting, useful and enjoyable. However, some studies revealed that there were no significant differences existed between Computer
assisted instruction and Traditional instruction in terms of skill, knowledge test and so forth.

The research studies reviewed were from journals available in the websites such as www.pubmed.gov, www.aace.org, www.icass.org, www.ijcss.org, ERIC websites and so forth. All such websites employ Computer Assisted Instruction, Development of Courseware/CD ROM and Multimedia Courseware in the disciplines of Medical, Dental, Physics, Mathematics, Education, Language, Economics, Statistics, Plant Physiology and so forth, that too at school and college level. Studies on Physical Education revealed much on technology role in teaching, coaching and learning. It is observed from the review of literature that there are some reviews related to Computer assisted instruction in Long Jump performance, Tennis, Volleyball and so forth. Moreover, teaching the skills of tennis is highly technical and athletes may not be able to keep the pictures of teaching progression effectively in their mind. As the researcher felt that teaching traditionally alone cannot help the students to achieve their performance, he thought to combine traditional instruction method with computer assisted instruction method.

On the basis of the reviews of related research studies and from the above discussion, bringing in newer teaching methods such as combination of computer assisted instruction with traditional instruction
in tennis skills for physical education students become a significant need. Besides, the researcher himself is a tennis coach and has been teaching and coaching different skills of tennis. The significant need felt through the review of related literature, qualification, in-depth knowledge in relevant subject areas and functional knowledge in computer promoted the researcher to turn his attention towards computer assisted instruction. It is hoped that the present study may serve as a base for future research in tennis through computer assisted instruction.