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Introduction
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1. INTRODUCTION

Information and communication technologies are today playing a very important role in transforming the mode of imparting education. Due to the advent of computer technologies, information delivery has got new meaning. The teaching and learning process has been altered by the convergence of a variety of technological, instructional, and pedagogical developments in recent times (Bonk & King, 1998; Marina, 2001). Technology is challenging the boundaries of the educational structures that have traditionally facilitated learning. Recent advances in computer technology and the diffusion of personal computers, productivity software, multimedia, and network resources over the last decade heralded the development and implementation of new and innovative teaching strategies. Educators who advocate technology integration in the learning process believe it will improve learning and better prepare students to effectively participate in the 21st century workplace (Butzin, 2000; Hopson, Simms & Knezek, 2002; Reiser, 2001). Technology can play a vital role in helping students to meet higher standards and perform at increased levels by promoting alternative and innovative approaches to teaching and learning (George, 2000).

The computer has become one of the most central components of our modern culture. One of the most pervasive aspects of computing is multimedia. “Multimedia is the combination of a variety of communication channels into a co-ordinated communicative experience for which an integrated cross-channel language of interpretation does not exist” (Elsom-Cook 2001, p.7). Development, access and transfer of text, sound, and video data have given a unique face to classrooms, libraries, training and resource centers, in the form of interactive multimedia programs. The use of multimedia technologies in educational institutions is seen as necessary for keeping education relevant to the 21st century (Selwyn & Goddard 2003, p.169).

Multimedia technology has made rapid strides and today encompasses almost all areas of human activity. The capability of storing text, images, sound, and video on a single platform is forcing people to review their databases and augment them in future; a database will be incomplete without multiple media. Multimedia technology is being used as a brand new way of human communication. Multimedia has launched a publishing revolution.
Research works, reports, books, magazines, brochures, catalogues, directories, dictionaries and indeed all forms of printed communication are being packaged through digital interactive technology. As with all new technologies, multimedia users can be found at all levels. Multimedia is making possible applications that offer boundless opportunities in even “non-computer” areas such as music, storytelling, literature and theatre. The energy and excitement that multimedia has released in art and humanities faculties is leading to a birth of new synergies between the computer scientists and the domain experts.

The central theme is that the integration of multimedia technologies will lead to a transformation of pedagogy from traditional instructivist teacher-centered approaches to the more desirable constructivist learner approaches that are seen as embodying essential characteristics of more effective learning environments (Tearle, Dillon & Davis, 1999; Relan & Gillani, 1997; Willis & Dickinson, 1997; Lefoe, 1998; Richards & Nason, 1999). From the learner-centered perspective, the teacher’s role changes from the traditional (instructivist approach) role of instructor and supplier of knowledge to a role more closely aligned with support and facilitation of the active construction of knowledge by the learner (Tearle, Dillon & Davis 1999, p.5). The learner-centered approach implies empowerment of the individual learner and the ability to provide the learner with self-directed, more meaningful, authentic learning experiences that lead to lifelong learning. This implication is at the crux of constructivist based pedagogical arguments for the integration of multimedia technologies in educational contexts (Selwyn & Goddard, 2003; Gonzales, Hupert & Martin, 2002).

We must not forget that almost all teaching is multimedia (Schramm 1977, p.37). Today, the magnetism of multimedia is clearly oblivious via the use of streaming video, audio clips, and the internet. Research has shown that the use of multimedia can aid in the comprehension and retention of student learning (Cronin & Myers, 1997; Large, Beheshti, Breuleux & Renaud, 1996; Tennenbaum, 1998).

Properly designed, a technology-based learning environment provides students with more options than are typically available in traditional learning situations, in content, pace, preparation, review of prerequisites and for activities such as collaboration, consultation, and testing or evaluation. These are the objectives that have long been recognized as pedagogically essential (Zimmerman, 1972; Mezirow & Irish, 1974; Kemp, 1977; Dede, 1996; Roblyer, Edwards & Havriluk, 1997). Among the benefits of technology delivery are the potential for less required training time; greater mastery and better transfer of skills; more
consistency in delivery of content (a particularly important outcome of skill training); and greater student persistence, completion, satisfaction, collaboration, and self-direction (Grow, 1991; Moore, 1993). In the best examples, technologies increase learning, enhance learner satisfaction, stabilize costs, and raise the visibility and appeal of (and potential revenues from) existing programs (Oberlin, 1996).

No doubt, the prevalent usage of computer technology has enabled people to access much more information than ever before but at the same time proliferation of computers has created pressure on students to interact with them. Some respond with enthusiasm and a desire to become the master of the machines; others, however, approach the situation with fear and apprehension. The anxiousness about using computers troubles numerous people, it affects their effectiveness and productivity.

The availability or lack of a surrounding community of English speakers outside the classroom affects learning and teaching of English as a foreign language (EFL). When there are no English speakers easily available outside the classroom, it makes English as a foreign language learning and quality teaching more challenging (Parker, Heitzman, Fjerstad, Babbs & Cohen 1995, p.235). Because of this, the most successful English as a foreign language pedagogies attempt to replicate the target language’s environment, usually through technology-assisted teaching, bilingual curricula, and immersion programs (Lapkin, Swain & Shapson, 1990). Many researchers have studied the use of technology to improve English as a foreign language learning (Chung, 1991; Guthrie & Richardson, 1995; Liou, 1997; Scardamalia & Bereiter, 1991; Van Aacken, 1999).

In the view of Berns (1990), “English as a foreign language, school-level instruction does not emphasize the function of English as a tool for communication but instead focuses on knowledge of grammatical forms and structures that are often assessed in examination. As a consequence, students work hard to try to pass the examination in order to please the teachers and parents rather than develop an internal thirst for knowledge and experience. It is not surprising that students often lose interest in English learning as a result. Even after years of study, few foreign language learners are competent to communicate freely with native speakers. It is incumbent upon English as a foreign language teachers to provide students with authentic, functional, interactive, and constructive language learning environments to reduce students' anxiety, raise their motivation, and increase their confidence”.

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Second Language Acquisition (SLA) researchers and education experts have pointed out that individual differences such as learners' affective domain, learners' motivational orientations (Brown, 1994; Pintrich & De Groot, 1990), and instructional strategies (Brown, 1993; Keller & Suzuki 1988, p.401) perform significant roles in language teaching and learning. Recently, communicative language teaching (CLT) researchers have suggested that communicative approaches are needed in language teaching and learning (Angelis & Henderson, 1989; Berns, 1990; Savignon, 1997; Underwood, 1984). Brown (1993) suggested the utilization of technology such as films, videos, and computers from the various pedagogical techniques that can help accomplish the ultimate goal of communicative language teaching. Computer-based interactive multimedia (CBIM) is an instructional approach that integrates computer-assisted instruction and interactive multimedia which can help students to develop the various competencies mobilized in communication (Chanier, 1996).

1.1 COMPUTER BASED MULTIMEDIA INSTRUCTIONAL STRATEGY

Multimedia is a term frequently heard and discussed among educational technologists today. Unless clearly defined, the term can alternately mean “a judicious mix of various mass media such as print, audio and video” or it may mean the development of computer-based hardware and software packages produced on a mass scale and yet allow individualized use and learning. In essence, multimedia merges multiple levels of learning into an educational tool that allows for diversity in curricula presentation. Multimedia can be defined as the technology engaging a variety of media, including texts, audio, video, graphics and animation, either separately or in combination using computers to communicate ideas or to disseminate information.

Multimedia is the integration of more than one medium into some form of communication or experience delivered via a computer. Most often, multimedia refers to the integration of media such as text, sound, graphics, animation, video, imaging, and spatial modeling into a computer system (Von Wodtke, 1993). Multimedia can be described as the combination of various digital media types such as text, images, sound and video into an integrated multisensory interactive application or presentation to convey a message or information to an audience (Velleman & Moore, 1996). Multimedia is the exciting combination of computer hardware and software that allows you to integrate video, animation, audio, graphics, and text resources to develop effective presentations on an
affordable desktop computer (Fenrich, 1997). Multimedia is characterized by the presence of text, pictures, sound, animation and video; some or all of which are organized into some coherent program (Phillips, 1997).

Multimedia in a computer environment implies a combination of various media, text, video, images, and audio, or a combination of any two of these, and may be linear or non-linear (Sutton, 1999). Multimedia can be defined as an integration of multiple media elements (audio, video, graphics, text, animation, etc.) into one synergetic and symbiotic whole that results in more benefits for the end user than any one of the media elements can provide individually (Reddi 2003, p.3).

Multimedia comprises of a computer program that includes text along with at least one of the following: audio or sophisticated sound, music, video, photographs, 3-D graphics, animation, or high-resolution graphics (Maddux, Johnson & Willis, 2001). The key difference between multimedia and so-called traditional presentation “not mediated” through computers is that of the concurrent modalities of presentation that appears to be seamless and “arresting” with multimedia. This may be compared to a narrator on the television screen and the paraphernalia like the chalk board and other audio visuals in a traditional situation.

Hofstetter (1995), “Multimedia instruction is the use of computer to present and combine text, graphics, audio and video, with links and tools that let the user navigate, interact, create and communicate”. This definition contains four components essential to multimedia instruction such as: (i) There must be a computer to coordinate what is seen and heard and to interact with, (ii) There must be links that connect the information, (iii) There must be navigational tools, (iv) There must be ways to gather, process and communicate information and ideas.

Multimedia refers to a combination of communicative elements- text, sound, graphics (photos and diagrams) and motion visuals (animation and video) used in classroom or other presentations. The key words are communication and interaction. Multimedia has often been used in the classroom presentation setting with good result. Usage of still graphics combined with audio in slide show and filmstrip projections were pioneered in fifties and sixties. Sixteen millimeter film brought with it the ability to add motion to the presentation. In 1970's and 80's the popularity and affordability of video cassette recorder allowed greater ease of these powerful communication media. The question is what is different in 2001, and how can the instructional process be streamlined or improved?
Today we still use still graphics, audio, motion visuals and animation. Now, however, these media elements are under the control of the personal computer. Modern technology offers us several powerful advantages we have not before, including: the ability to easily create own media, the ability to use a single machine to present ideas, very rapid access over the media elements, a higher degree of control over the presentation of information; the ability to reuse the media, the ability to easily redesign instruction, the ability to easily update instruction and instructional media, the ability to use personal computers to greatly extend owes instructional capabilities.

Multimedia presents subjects and materials to students in an easier to remember and more interesting way than books or a single medium can. Multimedia is able to address different learning strategies-allowing students to learn at their own pace. Research has proven that students learn better and are able to retain more when audio visual aids are added to a classroom lecture. The combination of technology and instruction has occasionally been a rocky one, but has resulted in a raised quality of education for the learner.

Multimedia enhanced instruction has many advantages and capabilities in the classroom and outside the classroom. The use of multimedia outside class room involves enhancing student learning, review of classroom material, non linear presentation of material, drill and practice, testing and revaluation, stimulation discovery and exploring learning with computer based manipulative, getting information to the students.

According to Mayer (1999), one of the most important promises of multimedia is that learners appreciate multimedia explanations better than just a word alone. Learners can comprehend pictures and sound more easily than words. If words alone are presented to the learners, they try to form their own mental images and this may cause them to miss the actual points of learning. The promise of multimedia is simple; learners enjoy learning by using computer-assisted multimedia instructions. Multimedia instruction assists students to learn more deeply and above all to enjoy this learning environment. Students learn because the instruction is presented to them in a meaningful way using sounds, pictures and animations. Undoubtedly, these little animations and pictures foster deep learning. So the objective of multimedia message is clear; it encourages learners to learn with meaning. This happens when the users use the presented materials differently and in new ways i.e. discovery learning. Moreover, meaningful learning happens when students’ understanding is promoted using cognitive methods followed by a mixture of words and pictures (Mayer 2003, p.806).
1.1.1 ELEMENTS OF MULTIMEDIA

The different elements of media are as follows:

(i) **Text**: Inclusion of textual information in multimedia is the basic step towards development of multimedia software. It can be developed using any text editor. Text can be of any type—a word, a single line or a paragraph.

(ii) **Graphics**: Graphics is another interesting element in multimedia. The subject matter can be explained better with pictorial or graphical representation, rather than as a large chunk of text.

(iii) **Animation**: Moving images have an overpowering effect on the human peripheral vision. Animations show continuity in transitions, indicate dimensionality in transitions, illustrate change over time, multiplexes the display, enrich graphical representation, visualize three-dimensional structures and attracts attention.

(iv) **Video**: The video clips may contain some dialogues or sound effects and moving pictures. These video clips can be combined with the audio, text and graphics for multimedia presentation.

(v) **Audio**: There are several types of sound, which can be used in multimedia. They are human voices, instrumental notes, natural sound and many more. There are many ways in which these sounds can be incorporated into the computer, for example: using microphone, human voice can be directly recorded in a computer, pre-recorded cassettes can be used to record the sound into computer and instrumental sound can also be played directly from a musical instrument for recording into the computer.

1.1.2 THEORETICAL FOUNDATIONS OF MULTIMEDIA LEARNING

Surveying the history of educational technology, it seems that different media are incidental to the learning process. The implementation of any new technology into education has typically begun with incredible rhetoric and expectations. Technology developers have focused on the ground-breaking abilities of the new technology to promote interest in its application to the educational domain. Thomas Edison’s appraisal of the motion picture is an oft-cited example of the excitement that accompanies innovation. Promoting his invention, he proclaims “that the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks,” (Edison 1922 as cited in Cuban 1986, p.9). Researchers adopted the perspective that educational efficiency could be measured and optimized, and began to investigate the intrinsic advantages of one medium over another (Russell 1985, p.47). The medium itself seemed the obvious variable.
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for investigation, rather than the experience of the learner. McLuhan’s (1964) refrain ‘the medium is the message,’ focused attention on new and exciting inventions, fuelling the technology-centered approach. Early studies compared the performance of students who watched an instructional film to those who received only traditional lecture instruction, in experiments similar to Lewis’s (1995) study. The results showed increased motivation among students who watched films and either superior or equivalent academic performance compared to a control group (Cuban, 1986).

Some areas of cognitive science have significant implications for multimedia learning. The study of memory bears directly on theories of learning and it has a long and important history in psychological research. Significant developments in the 1960’s introduced the ideas of short-term and long-term memory (Baddeley, 1997). Working memory is limited in its ability to process information, handling around seven chunks of information, actively working with two to four at a time.

Cognitive load theory (Sweller, 1988; Chandler & Sweller, 1991; Sweller, Van Merrienboer & Paas, 1998) builds on these findings and is formulated in a way to guide decisions about the design of multimedia instruction. Most frequently, the guidance is to reduce the information presented wherever possible. This may take the form of cutting out extra words, pictures, or sounds; moving text closer to the picture to which it applies; presenting verbal information as narration rather than on-screen text; or eliminating redundant sources of information. New objectives of theorists are to accurately measure cognitive load, to focus on motivational factors influencing learning, and to manage intrinsic cognitive load in complex subject areas (Van Merrienboer & Sweller 2005). Paivio’s (1986, 1991) dual coding theory is pertinent to multimedia learning because it suggests that the human mind has two separate processing channels, one for verbal information and the other for non-verbal information.

Mayer (2001) gave the cognitive theory of multimedia learning (CTML) which combines cognitive load and dual coding theories with a view of learners as active participants in the learning process. Like cognitive load theory, the cognitive theory of multimedia learning assumes that processing in each channel is restricted by inherent biological constraints. The cognitive theory of multimedia learning, like dual coding theory, asserts the formation of relational links between verbal and non-verbal systems are essential for deep understanding. Mayer (2005), cognitive theory of multimedia learning (CTML) is built on the philosophy that "the design of e-learning courses should be based on a cognitive theory of how people learn and on scientifically valid research studies. In other words, e-
learning courses should be constructed in the light of how the mind learns and experimental evidence concerning e-learning features that promote best learning”. Cognitive theory of multimedia learning is supported by Mayer’s extensive research involving testing learning theory while focusing on authentic learning situations. Mayer calls this approach “basic research on applied problems.” Mayer’s cognitive theory of multimedia learning contends that words and pictures presented to the learner via a multimedia presentation are processed along two separate, non-conflicting channels and has been presented in fig. 1.

![Cognitive Theory of Multimedia Learning](image)

**Fig. 1: Cognitive theory of multimedia learning**

Mayer (2005) further elaborated, “Words and images enter the sensory memory through the ears and eyes. They are actively selected by the learner from the sensory memory and enter the working memory where they are organized into a verbal model and a pictorial model. Each channel can process only a few “chunks” of information at a given time in working memory. The two models are then integrated with prior knowledge retrieved from long-term memory. This integration occurs within the working memory following each segmented portion of instruction offered to the learner in the multimedia presentation”.

The cognitive theory of multimedia learning acknowledges that humans are actively engaged in cognitive processing in order to make sense of the stimuli presented. The concept of active processing is reflected in the cognitive theory of multimedia learning by the inclusion of selecting, organizing and integrating information. In his book, Multimedia Learning, Mayer (2005) states, “Perhaps the most crucial step in multimedia learning involves making connections between word-based and image-based representations.”

**1.1.3 MULTIMEDIA IN LANGUAGE ACQUISITION**

Language is the key, which opens all doors of human process. In every walk of life, man feels an utmost need of language. No one can do without an adequate mastery over the language-oral as well as written. Language plays a vital role in studying any subject whether
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it is academic, technical, professional or vocational. The entire progress of a nation depends very much upon the general achievement in language, as it provides for an adequate and effective instrument of communication.

Mayer and Moreno (2002) stated that providing words with narration and animation helped learners’ performance more than words alone; reducing the number of unneeded words and sounds helped learners’ performance; providing words with narration helped learners’ performance more than on-screen text; providing words as narration and animation helped learners’ performance more than narration, animation, and on-screen text.

Underwood (1990) explained the effectiveness of multimedia in language acquisition and claimed that since multimedia users are able to process combined media (text, sound, and visual) simultaneously, proponents of instructional multimedia have argued that the increase of sensorial input available via technology coupled with the potential for active engagement in, and interaction with this input predicts that content (in this case the target language) will be more readily integrated into learner’s developmental system and, in turn, recalled more thoroughly. Moreover, Mayer (1997) indicated that the presence of both pictorial and verbal cues can facilitate learning and also claimed that if information is cognitively processed through visual or verbal channels, a dual processing strategy assumes individuals’ developmental pictorial representations of graphic input and mental verbal representations of linguistic input.

Recently, a number of researchers have discussed the benefits of presenting information using multimedia components such as visual text, spoken text, graphics, and videos on language learning (Al-Seghayer, 2001; Chun & Plass, 1997; Duquette & Painchaud, 1996; Ehsani & Knodt, 1998). In their studies, information presented in text, spoken words, graphics, and video formats can be integrated to create an authentic, attractive, and multi-sensory language context for English as foreign language learners (Sun & Dong, 2004). English as foreign language learners performed better on both production and recognition vocabulary tests when they were allowed to use a combination of visual text and graphics (Kost, Foss & Lenzini, 1999). In fact, effective use of multimedia package by the language teacher can lead to:

(i) Presenting the stimulus
(ii) Directing and controlling student’s attention
(iii) Creating readiness in the learner for participating in the learning experience
(iv) Producing new learning stimuli
(v) Activating student’s response
(vi) Providing clarity and accuracy of the information processed
(vii) Transfer and assessing attainments
(viii) Providing feedback
(ix) Enhancing the attitude of students towards what they are learning
(x) Enrich the equality of learning
(xi) Focusing the abstraction of events that normally go unobserved

1.2 ACHIEVEMENT

Achievement is a psychological need, a learned motive to compete and strive for success. This need can only be satisfied when the scholastic goals set by an individual are within his reach. Need fulfillment is thus successful accomplishment or competition of the task which signifies the achievement on the part of the individual and leads to self-satisfaction and helps in gathering esteem and respect. Thus achievement means the proficiency of performance in a given skill or body of knowledge. In academic context, achievement concerns the development of knowledge, understanding and acquisition of skills. Therefore, achievement may be defined as a measure of cognitive learning outcomes of Bloom’s taxonomy at knowledge, understanding and higher order levels in a specific subjects or a group of subjects.

According to Crow and Crow (1969), “Academic achievement is the extent to which learner is profiting from instructions in a given area of learning and academic achievement of pupil is the knowledge attained and skill developed by him in the subject in which he is imparted training in school and subsequent success in life”.

According to Steinberg (1993), “Achievement encompasses student ability and performance, it is multidimensional, it is intricately related to human growth and cognitive, emotional, social and physical development; it reflects the whole child; it is not related to a single instance, but occurs across time and levels, through a student’s life in school and into post secondary years and working life”.

According to Encyclopedia of Education (1997), “Achievement means successful accomplishment or performance in a particular subject area or courses, usually by reason of
skills, hard work and interest, typically summarized in various types of grades, marks, and scores”.

According to Oxford Advanced Learner’s Dictionary of Current English (2000), “Achievement is a thing that somebody has done successfully, especially using his/her own effort and skill”.

According to Megargee (2000), “Achievement tests how well students have mastered the subject matter in a course of instruction”.

According to Ollendick and Schroeder (2003), “Academic achievement is the knowledge and skills that an individual learns through direct instruction. Achievement tests measures what a person has learned, whereas aptitude tests (including tests of intelligence) assess a person’s potential for learning.

1.3 RETENTION

Learning implies a relatively permanent change in behavior as a result of practice. It involves acquisition, retention and use. Knowledge retention is a significant goal of education (St. Clair, 2004). The very existence of school rests on the assumption that people learn something of what is taught and later remember some part of it (Semb & Ellis 1994, p. 25).

According to Encyclopedia Britannica (2010), “Retention is learning is to acquisition as memory is to retention. Psychomotor retention scores indicate the percentage or degree of originally learned skill that is remembered or recalled as a function of elapsed time.”

Retention of knowledge means recalling or remembering pieces of knowledge, processes or skills that were learned earlier in time (Semb & Ellis, 1994). However retention can occur only if something has been acquired initially and transfer of acquired outcomes to a new situation can occur only if the outcomes have been retained. Two factors are cited more frequently as affecting memory of new material: (a) whether the new information is consistent with or can be related to prior knowledge, and (b) how the new information is processed (Narli, 2011).

Retention is one of the four memory process, the others being memorizing, recall and recognition. Retention differs in individuals and may be sufficient for recognition but not for recall. It has also been defined as the amount correctly remembered. The ability to recall material previously learned.
1.3.1 FACTORS INFLUENCING RETENTION

(i) Repetition or Practice - Learning a task involves repeating acts related to that particular task. Many tasks that one can learn perfectly only by repeating them. For example, if one wants to learn typing or riding bicycle, one has to repeat the various acts involved in these skills continuously until one learns these skills perfectly. It has been shown that the greater the number of times we repeat or practice, the better is our retention.

(ii) Meaningful Learning - Learning often involves repeating a particular response or a given task. This type of learning, through repetition is demonstrated when a child repeats mechanically – the type of learning is rote learning. Rote learning makes little or no sense to the learner because the repetition is done without understanding. The things learnt through rote learning cannot be retained for a long period. Hence a better way of learning is to learn by paying attention to the meaning and significance of the matter that has to be learned.

(iii) Whole verses Part Learning - Whole learning is usually more efficient than learning bit by bit or in parts and then trying to put them together. However, the question of learning either by whole or part method depends upon the type of material, length of material and the way it is organized.

(iv) Massed and Spaced Practice - The method of learning in which the matter is learnt in one continuous sitting with no periods of rest between the practices is called the massed method of practice or learning. In contrast to this is the method called the distributed method of practice or the spaced method of learning where the matter is learnt with intervals in between the sittings. In other words, practice in this method of learning is spaced or distributed over a period of time with intervals or rest periods during the learning session.

(v) Motivation - When the learning is accompanied by a motive or purpose, the matter is retained for a longer period. The repetition or practice accompanied by the intent to learn is more effective than mechanical repetitions as one becomes more receptive when matter will be useful to him later.

(vi) Feedback - While performing a task or learning a particular material the checks at periodic intervals helps to see the results. This knowledge of results or feedback provides encouragement, correction and some sort of reinforcement. This may subsequently lead to effective learning and therefore, to effective retention.
1.4 COMPUTER ANXIETY

There are many definitions and interpretations of anxiety; however, they all refer to a complex combination of negative emotional responses that include worry, fear, apprehension and agitation. These responses are generally learned from direct experiences when a person comes in contact with a threatening object or situation.

Anxiety is the distress or uneasiness of mind caused by apprehension of danger or misfortune. In more general terms, Spielberger (1966) regarded anxiety as a principle causation agent for such diverse behavior consequences as insomnia, immoral and sinful acts, instinct and psychometric symptoms and idiosyncratic mannerisms of endless variety.

May (1977) defined anxiety as “an apprehension cued off by a threat to some value that the individual holds essential to his existence as a personality”.

The most common types of anxiety are generalized anxiety disorder, panic disorder, social anxiety disorder, phobias, obsessive-compulsive disorder, and post-traumatic stress disorder. However, when it comes to technology, Oetting (1983) identified three types of anxieties such as (i) trait, (ii) state, and (iii) concept-specific. He described trait anxiety as the general pervasive anxiety experienced by a person over the entire range of life experiences. Trait anxiety is frequently used as a construct for personality, learning theory, and psychopathology since people who exhibit trait anxiety are chronically anxious and constantly under tension regardless of their situation (Martin, 1998). Howard and Smith (1986) stated that a high trait anxious person will exhibit computer anxiety more than a low trait anxious person. Oetting (1983) explained that state anxiety was a feeling a person experienced at a specific time. When a person experiences anxiety, the feelings fluctuate over time and react to a responsive situation. It is related to a person’s learning background. The individual may have experienced some anxiety in a specific situation and that feeling is transferred to another similar situation. Concept-specific anxiety is a transitory-neurotic type of anxiety. This is the range between the trait and state anxieties that is associated with a specific situation. The concept-specific anxieties “fill the gigantic range between general trait anxiety and concept-specific anxiety.”
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anxiety and state anxiety” and are “an anxiety that people associate with specific situations” (Oetting 1983, p. 1).

Eysenck and Calvo (1992) categorized anxiety into two distinct areas (a) worry, and (b) cognitive arousal. The authors stated that when anxiety produces worry, it has a tendency to decrease an individual’s ability to concentrate on a task. The cognitive arousal effect, on the other hand, influences a person’s alertness and ability to do a task. The combination of the worry and arousal components yields processing efficiency, which are the mental performance and the state of mind of an individual. A physiological state that is portrayed by cognitive, somatic, emotional, and behavioral components and that creates feelings of nervousness, fear, worry, or apprehension (Seligman, Walker & Rosenhan, 2001).

Computer anxiety is a concept specific anxiety type; that regularly occurs in a specific type of situation (Harris & Grangennett, 1997). According to Rosen, Sears and Weil (1987) computer interaction will be or already is an integral part of most academic majors. In 1993, researchers Rosen and Weil reported that some type of technophobia now afflicts one third of college students (DeLoughry, 1993) and the numbers have never been higher. In the move towards computerizing education and the work place a substantial number of students and workers who have been left behind are today’s computer anxious.

Computer anxiety is a concept-specific anxiety because it is a feeling that is associated with a specific situation, in this case when a person interacts with computers. Computer anxiety is “the anxiety that people feel they will experience when they are interacting with computers-the anxiety associated with the concept of computers” (Oetting 1983, p.1). Herdman (1983) defined computer anxiety as emotional fear, apprehension, and phobia felt by individuals towards interactions with computers or when they think about using computers. Cambre and Cook (1985) stated that computer anxiety is a form of state anxiety, and it was brought on in part by the rapidly changing nature of new technology and the subsequent pressure for social change in modern time. Howard and Smith (1986) defined computer anxiety as “the tendency of a particular person to experience a level of uneasiness over his or her impending use of a computer” (p. 18). Heinssen, Glass and Knight (1987) stated that computer anxiety refers to negative emotions and cognitions evoked in actual or imaginary interactions with computer-based technology, and it affects the utilization of computer-based technology and performance on tasks that involve the use of computers. Rosen and Weil (1990, 1995) described computer anxiety as “technophobia” and used the
term “cyberphobia” to describe individuals who are frightened by the use of computers and technology. Computer anxiety has also been classified as a complex psychological construct that cannot be fully described from a single perspective (Chua, Chen & Wong 1999, p. 611). They simply generalized the definition of computer anxiety as “a kind of state anxiety, which can be changed and measured along multiple dimensions”.

Jay (1981) defined computer anxiety as- (a) resistance to talking or even thinking about computer technology; (b) fear or anxiety, which may even create physiological consequences; (c) hostile or aggressive thoughts and acts, indicative of some underlying frustrations. Computer anxiety, defined by Raub (1981) is the complex emotional reactions that are evoked in individuals who interpret computers as personally threatening. Mcdonald (1983) estimated that approximately 30 to 35% of all computer users experience some level of anxiety when they first encounter computer technology. Computer anxiety manifests itself in many forms and results in a number of common fears. Users are afraid that they will break the computer or destroy vital information. They feel awkward and fear looking stupid. Computers seem to have almost human characteristics and their speed can make people feel like the machine is smarter than they are. They feel over whelmed by the technology and their lack of understanding is expressed as “if I am so far behind already how will I ever catch up? (Raub, 1981).

Research has established firmly that stress and anxiety reduce performance effectiveness. Elder, Gardner and Ruth (1987), Howard and Smith (1986) and Igbaria and Chakrabarti (1990) suggested that computer anxiety and stress may cause some individuals to avoid using computer completely. The presence of computer phobic and anxious people in the work place can lead to other serious performance problems, including sabotage, decline in motivation, work quality and morale; and increase in mistakes, absenteeism, interpersonal conflicts and turnover (Morgan, 1990).

Literature on computer anxiety offers conflicting theories researchers (Loyd & Gressard, 1984; Howard & Smith, 1986; Glass & Knight, 1988; Necessary & Parish, 1996) support the theory that increasing computer experience will decrease computer anxiety. Necessary and Parish (1996) found that college students with little or no computer experience have more anxiety than those students who have computer experience. The result of their study revealed that increased levels of computer experience and balance of weekly computer usage were both related with reduced levels of computer related anxiety. Glass and Knight
(1988) determined that computer anxious students will become less anxious after an initial trauma period. It is reasonable to assume that by increasing computer usage thereby experience one would reduce anxiety yet for those who are computer anxious this may prove to be difficult because there are varying degrees of anxiety, those who are highly anxious may completely avoid computers.

1.5 SELF-CONCEPT

Self-concept means what an individual thinks about himself. It is his own conception of his intelligence, abilities, academic status, behavior, temperamental qualities, mental health, emotional tendencies and socio-economic status. Self-concept is taken to refer to the store of self attributes of a person. The “self” is one of the oldest phenomena. Baldwin (1889) claims that St. Augustine (354-430 A.D.) was among the first to investigate the self. The pioneers of theory of “self” are Cooley, 1902; Mead, 1934. Cooley (1902) defined self as that which is designated in common speech by pronouns of the first person singular, “I”, “me”, “mine” and “myself”.

A person’s self-concept is both a cause of his/her present behavior and effect of past experience. One’s feelings about oneself depend greatly on his past history of failures and successes on the quality of his interaction with others in the environment and on what he thinks other people thinks of him.

According to Allport (1961) self is something which we are immediately aware of. We think of it as a warm central private region of our life. As such, it plays a crucial part in our consciousness. Thus, it is some kind of the case of our being. Self-concept is the totality of attitudes, judgments and values of an individual relating to his behavior.

Cohen (1962) described the self, as the object a person regards himself to be and is thus, selectively weighed according to the individual’s abstraction of the common feature of his personal experience. Although the idea of self is open to change and alteration, it appears to be relatively resistant to such changes.

Hawk (1966) and Emmerich (1968) viewed that the center of gravity of personality pattern is the individual’s concept of himself as a person as related to the world in which he lives.

LaBenne and Greene (1969) defined self-concept as the person’s total appraisal of his appearance, background and origins, abilities and resources, attitudes and feelings which culminate as a directing force in behavior.
Gale (1969) stated that man creates his world from experiences around him. The development of self is a social product. According to him, self-awareness does not happen all at once, but it is dynamic and an on-going developmental process that begins during infancy and early childhood and continues until death.

According to Eysenck, Arnold and Meili (1972) self-, abilities and qualities. Self-concept embraces awareness of these variables and their evolution. It is his own conception of his intelligences, abilities, academic status etc. In general terms, self-concept is our perception of ourselves and in specific terms, it is our attitudes, feelings and knowledge about our acceptability (Jersild, 1965; West & Fish, 1973).

Epstein (1973) asserted that self is central to understand individual behavior. Self-concept is not hereditary, rather it develops in a person as a result of life-long processes and develops continuously in a social setting. Sherif (1968) pointed out that the earliest manifestation of self-hood starts with the bodily states like hunger or sleep, acceptance and punishment by persons etc. which are responsible for formulation of self-system. Building of self-concept is a slow process, which grows out of the reactions of parents. The concept of self is not restricted to attitudes and adjustment but is equally important in the area of academic learning. There are positive inter-relationships among the measures of intelligence, achievement and self-concept (Lewis & Adank, 1975). Self-concept is the mental and conceptual understanding and persistent regard that human beings hold for own existence. A person’s self-concept may be viewed as a store of self-perceptions. It consists of answers to such questions as Who am I? What are my strengths and weaknesses? Self-concept refers to the experience of one’s being. It is an organized cognitive structure comprised of a set of attitudes, beliefs and values that cuts across all the facets of experience and action, organizing and tying together the variety of specific habits, abilities, outlooks, ideas and feelings that a person displays.

Pandit (1975) defined self-concept as the nucleus around which the entire personality structure revolves in its homeostic process of maintaining the consistency and stabilities within the individual’s personality.

Encyclopedia of Psychology (1983) defined ‘self-concept’ as the totality of attitudes, judgments and values of an individual relating to his behavior, abilities and quantities. Self-concept embraces awareness of these variables and their and their evaluation. Self-concept means what an individual thinks about himself.
Gill (1986) considered ‘self-concept’ as the pivot around which the person’s whole being revolves. Gupta (1989) opines ‘self-concept’ as self-estimation by the individual.

Markus and Wurf (1987) summarized self-concept as a multifaceted phenomenon, as a set or collection of images, schemes, conceptions, prototypes, theories, goals or tasks.

Purkey (1998) opined that self-concept is the totality of a complex, organized and dynamic system of learnt beliefs, attitudes and opinions that each person holds to be true about his or her personal existence.

1.5.1 THEORETICAL MODELS OF SELF-CONCEPT

Various attempts have been made to understand and explain the nature of self-concept. Notable psychologists and self theorists have developed different theoretical models. Byrne (1984) reviewed four theoretical models:

(i) According to Soares and Soares (1983), the first and oldest perspective model may be referred to as the nomothetic positions. In this model, self-concept is perceived as a unidimensional construct. Accordingly, characteristic description of self-concept is used to explain one’s behavior in various settings.

(ii) Hierarchical Model holds that self-concept has multiple dimensions and that the multiple facts of self-concept may be ranked in a hierarchical formation. This model was originally proposed by Shavelson and Stuart in 1981. The hierarchical model parallels in many ways Vernon’s (1950) model of intelligence.

(iii) The third theoretical view of self-concept supports the notion that self-concept is structured like a series of several specific factors. This perspective has been termed as the taxonomic model (Soares and Soares, 1983).

(iv) Winne and Marx (1981) proposed the compensatory model. This perspective, in agreement with the hierarchical and taxonomic model, supports the notion of general facets of self-concept. However the specific facets are inversely related, rather than proportionality or independently as proposed by the hierarchical and taxonomic models respectively. Hence, lower status on one specific facet of self-concept might be compensated by higher status of another facet of self-concept.

In general, self-concept is our perception of our selves. It is our attitude, feelings, knowledge about our abilities, skills, appearance and social acceptability. The individual’s awareness and identification with other organisms’ cognitive powers and modes of conduct and performance are accomplished by specific attitudes towards others.
Self-concept is a value that an individual places on his or her own characteristics, qualities, abilities and actions (Woolfolk, 2001). The term self-concept refers to the ordered set of attitudes and perceptions that an individual holds about him or herself (Wolffe, 2000; Woolfolk, 2001; Tuttel & Tuttel, 2004).

1.5.2 DIMENSIONS OF THE SELF-CONCEPT

The dimensions of self-concept are as follows:

(i) The Basic Self-Concept – This is the individual’s perception of his abilities and status. It is the individual’s concept of the kind of person he thinks he is. It is influenced by his physical self, personal appearance, dress, grooming, values, beliefs and aspirations.

(ii) The Transitory Perception of Self – The individual’s self-image may at one time be compulsive, compensatory and unrealistic and at other times insightful and practical. Many individuals do not recognize their transitory nature. They are optimistic or pessimistic, elated or depressed, satisfied or dissatisfied. They are sometimes able to switch from one extreme to the other. Since there is some tendency of the individual to reflect more on his problems than accomplishments, the transitory perception of self is largely in good light.

(iii) The Social Self – “To see yourself as others see you” may or may not be valid. When in an optimistic mood, the adolescent perceives that others see him in good light. When depressed, he perceives that others do not like him. More positive views on the part of others may enhance his perception of his social self.

(iv) The Ideal Self – The concept of the ideal self, the kind of person he hopes to be, involves relating levels of aspiration to the levels of ability. It also involves opportunities for self-realization.

According to Hershey and Lugo (1970) by the time of adolescence, the person’s self-concept is almost fully developed. Frequently the ideas that one has about himself are based on what others think he is or should be. From these experiences with others, the person develops what is frequently referred to as an ideal self. It is this ideal self which is challenged during adolescence as the individual tends to become more independent and autonomous at this stage.

Guindon (2001) explained that there are two kinds of self-concept; global self-concept which is defined as an overall estimate of general self-worth i.e. level of self-acceptance or respect of oneself. Selective self-concept is an evaluation of specific trait or quality that is weighed and combined into an overall evaluation of oneself.
1.6 REVIEW OF RELATED LITERATURE

The review of related literature is a very essential and significant aspect of any pinpointed and scientifically sound research project. The importance of this aspect may be realized from the fact that the relevant literature, if properly reviewed, help the researcher not only in broadening his outlook by providing him up-to-date knowledge of result established, the method adopted and the relevance of the use of particular types of tools used by earlier researches but it also helps him to decide and choose his own directions. Hence keeping in view the importance of related literature it has been tried to trace and obtain the relevant material through direct and indirect sources of information and an effort has been made to present studies that appear to have a direct or indirect bearing on the present study. Some of the researches related to the variables in the present study have been presented under the following sub headings:

1.6.1 Studies related to Computer Based Multimedia Instructional Strategy and Achievement
1.6.2 Studies related to Computer Based Multimedia Instructional Strategy and Retention
1.6.3 Studies related to Computer Anxiety
1.6.4 Studies related to Self-Concept

1.6.1 STUDIES RELATED TO COMPUTER BASED MULTIMEDIA INSTRUCTIONAL STRATEGY AND ACHIEVEMENT

Vardhini (1983) developed a multimedia instructional strategy for teaching science (physics and chemistry) at secondary level for students of class VIII and studied the relationship between achievement and intelligence. The major findings of study were that almost all the students showed an average high level of performance in the test after being taught through multimedia instructional strategy. There was also significant relationship between intelligence and achievement.

Adams (1989) studied the development of a computer based interactive multimedia program for teaching interpretive aspects of wind instrument notation and concluded that the computer based interactive multimedia approach was viable for instruction in interpretive aspects of wind instrument notation.

Wagh (1991) developed a multimedia instructional system (MIS) for remedial measures in fractional numbers, according to the MIS for developing computational skills and compared the results of this approach to those of traditional approach of remedial teaching to find the difficulty level of skills experienced by the students in fractional
numbers. The study was conducted on a sample of 120 students of grade VIII. Both traditional instructional system (TIS) and MIS remedial approaches helped students in improving their performance on all the six computational skills in fractional numbers.

Nishino (1993) conducted an exploratory investigation to determine the effects of a multimedia computer based science learning environment and gender differences on achievement, attitudes and interests of students in an eight-grade science classroom and found that the students in the experimental science classroom had significantly higher post-test mean score in self-concept than the students in the traditional science classroom. Female students in the experimental classroom had a significantly higher post-test mean score on "self perception as a student" than both the males and females of the traditional science classroom and the males of the experimental classroom had a significantly higher post-test mean score on the Hueneme Computerized Interactive Test on science than the students in the traditional science classroom.

Williamson and Abraham (1995) studied the effects of computer animation on the particulate mental models of college chemistry students and revealed that using animations in a chemistry course, where students had difficulty with mental models about the particulate nature of matter, students obtained significantly higher test scores when the animation was viewed as part of a lecture or as a supplement to individual study compared with a control group of students who did not have access to the animation.

Moore and Miller (1996) explored how the use of multimedia affects students retention and learning and found that the use of multimedia increased class attendance and enhanced retention. In addition, there was a significant improvement in students' grades. Along with student learning, professors' methods of instruction improved, seemed to be more effective and they were able to cover more material. However, the study also pointed out a couple of disadvantages of multimedia-based instruction i.e., the cost of equipment and time required to plan lessons to include the multimedia technology.

Mackenzie and Jansen (1998) studied the impact of multimedia computer based instruction on students comprehension of drafting principles and concluded that multimedia computer based instruction (MCBI) held promise for improving teaching of technical graphics. The significantly higher scores of the treatment group, coupled with the positive findings on the attitudinal questionnaire supported the use of MCBI over the traditional techniques presently used.
Frear and Hirschbuhl (1999) examined the impact on students’ grades and higher 
level thinking skills when computers were added to the classroom. Interactive multimedia 
simulations of real world situations (actual field trips of a geology professor with 22 years’ 
experience) were incorporated into one section of an environmental geology course. The 
sample consisted of 152 students and the research design was quasi-experimental. The group 
assessment of logical thinking (GALT) scores were found to be significantly higher for the 
post-test over the pre-test for those students using the treatment (Interactive Multimedia). 
When the difference in the treatment group GALT score was compared to the difference in 
the control group score no significant difference was found, \( F = 2.58, p = 19 \).

Thillaka and Pramilla (2000) conducted a study to find out the influence of computer 
based multimedia programme on achievement in mathematics among high school students 
and to find difference in achievement in math between high achievers and low achievers. A 
sample of 62 students of class IX was selected. Finding revealed that there was no influence 
of computer based multimedia on the achievement in mathematics among high school 
students. There was no significant difference is achievement of mathematics between high 
achievers and low achievers for both experimental and control group.

Guttormsen and Krueger (2001) conducted empirical research on effects of dynamic 
media for information presentation. Two experiments were performed to see the effect of 
dynamic media in relation to learning content. The basic hypothesis suggested a positive 
effect of combining dynamic media with dynamic information content. Five different 
processes were implemented (heart ECG, solar eclipse, off side rules soccer, protein 
synthesis, and malaria cycles). Experiment one showed that subjects preferred dynamic 
presentation. The expected positive effect of combing dynamic media with dynamic 
information was not clearly supported. In experiment two, the effect of media selection on 
different ways to knowing was tested. Only one process was implemented. Both experiments 
showed that media may influence the resulting knowledge. This became even clearer with 
differentiated measures of knowledge (process knowledge, structure knowledge, active 
knowledge, visual knowledge, verbal knowledge).

Teong (2002) studied the effect of metacognitive training on the mathematical word 
problem solving of low achiever demonstrated how explicit metacognitive training influences 
the mathematical word problem solving of forty 11-12 years old low achievers in cognitive 
apprenticeship-computer based environment. Results from experimental and case study
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designs revealed that experimental students outperformed control students on ability to solve word problems on their individual written measures. Experimental students developed the ability to ascertain when to make metacognitive decisions and elicit better regulated metacognitive decisions than control students, knowing when and how to use metacognitive strategies is an important determinant to successful world problem-solving and cognitive apprenticeship. Computer based environment appeared to amplify low achievers' metacognitive and cognitive behaviours during word problem solving.

Malliga (2003) studied the relative effectiveness among different strategies of computer mediated multimedia presentation in teaching and learning of chemistry at higher secondary stage and concluded that Interactive individualized learning supported by multimedia presentation (IILMMP) was found to be the most effective strategy among all the three instructional strategies viz, PBL(Peer-based learning), ILMPP, IILMMP in terms of cognitive skills such as knowledge, understanding and in realizing the instructional objectives. It was influenced that irrespective of difficulty level of content, IILMMP was found to be the most effective one, while ILMMP was least effective.

Mayer (2003) conducted a study on the promise of multimedia learning by using the same instructional design methods across different media, and explored a program of research aimed at determining, research-based principles for the design of multimedia explanations which can be called methods and to find extent to which methods are effective across different learning environments. Conclusions drawn were: (a) a multimedia effect in which students learns more deeply from words and pictures than from words alone-in both book based and computer based environments,(b) A coherence effect - in which students learn more deeply when extraneous material is excluded rather than included in both book-based and computer based environments, (c) A personalization effect - in which students learn more deeply when words are presented in conversational rather than formal style both in computer based environment containing spoken word and those using printed words.

Qiu (2003) conducted a study integrating computer-based multimedia instructional design into teaching phonetic symbols. The study stated some theories and a tutorial computer program to support integrating computer based multimedia into teaching international English phonetic symbols (IEPS). The evaluation studies showed that participants do have positive attitudes towards this program and computer animation in it.
Rossler (2003) studied the effects of hypertext in a multimedia environment on the achievements in Islamic studies of elementary and junior high school students. The study was implemented with pre-adolescents and adolescents. Findings revealed that the achievements brought through PC-aided learning were higher in all parameters, and found that in grade eight, the boys did better than girls, while in grade four the girls did better.

Chittipun (2004) conducted a study on multimedia software programs for on-line instruction and remediation in relation to cognitive style of high school students. The objective of study was to study effectiveness of multimedia software programmes for online instruction and remediation learning as cognitive style with achievement through multimedia software programmes for on-line instruction. Conclusions of the study were: a) the two instructional treatment strategies (MMO and CGL) were not found equal in respect of the gain means yielded by them, b) multimedia on-line instruction resulted into higher gain means as compared to conventional group learning.

Zittle and Zittle (2004) explored the effects of web based multimedia lessons on Native American learning and revealed that web based multimedia mathematics, science and reading lessons for 3rd, 4th, 5th and 8th grade students appear to enhance learning in low English proficient and low income native American learners. The majority of the students performed well below the national average in academic achievement.

Yaibua (2005) studied the effect of multimedia CAI through co-operative and individualistic learning conditions of vocational students of Thailand in relation to persistence and concluded that the group of students learning through multimedia CAI in co-operative learning achieved higher than their counterparts in multimedia CAI in individualistic learning. The achievement gain means of students with high, average and low computer background were not significantly different.

Sunder (2006) compared the effect of computer based multimedia instructional strategy and traditional methods on use of grammar in English language. Findings of the study were that a) significant differences were found in achievement of students in English language between the groups with regard to methods of teaching. The mean scores of group-I (taught from computer based multimedia instructional strategy) showed that group I scored higher than group II. b) Computer based multimedia instructional strategy using CD-ROM was found slightly better than traditional methods of verbalism and print media.
Kumar (2007) compared effectiveness of audio-video instructional system (AIS), multimedia instructional system (MIS) and conventional instructional system (CIS) in terms of achievement and studied relative retention in learning through audio-video instructional system, multimedia instructional system and conventional instructional system. Total 120 students were selected randomly. There was a significant difference between the mean achievements of students receiving instructions through different instructional system. Multimedia instructional system was found to be the best instructional system than two instructional systems i.e. Audio-Video instructional system and conventional instructional system. AIS were better than CIS. The relative comparison of three instructional systems on retention was made by using the assumption that a method lower on mean score i.e. mean score of MIS was termed as more effective as compared to method having higher mean scores i.e. AIS & CIS on retention.

Sunha and Mido (2007) studied the differential effects of computer use on academic performance of students from immigrant and gender groups and found a significant effect of computer use in diverse contexts and its differential effects for immigrant and gender groups. Computer use for schoolwork had significantly positive effect on achievement for overall students although the same effect was not significant for immigrant students. The effect of computer use for their own learning was significantly lower for female students than male. The study results had implications for the theory and practice of multimedia use.

Vellaisamy (2007) investigated the effectiveness of multimedia approach in teaching science at upper primary level and revealed that the group taught through multimedia approach achieved more than the pupils of the control group in science at upper primary level. The pupils of the experimental group had improved than the pupils of the control group in their scientific attitude. This was due to the favorable impact of the multimedia approach in the learning of the VII standard pupils.

Babu and Vimla (2008) studied the impact of multimedia method in accountancy learning at higher secondary level and concluded that there is significant difference between the pre-test and post-test errors of experimental group of aided school students with respect to the remediation in multimedia method in error of principle, omission, recording, casting and other type of error. But there is no significant difference between the pre-test and post-test errors of experimental group of aided school students with respect to the remediation in multimedia method in error of posting. There is significant difference between the pre-test
and post-test errors of experimental group of corporation school with respect to the remediation in multimedia method in error of principle, omission, recording, casting, posting and other type of error. The effect of remediation through multimedia method played a positive role in minimizing the errors in accountancy learning at higher secondary level.

Chuang (2008) studied the effects of learning style, gender, and math achievement in multimedia computer environment and concluded that subjects performed significantly better on the post test in the animation + text + voice version, which was also the favorite interface design chosen by most of the subjects. It was also found that the animation + text + voice interface effect was only strong for FI subjects, males, or students with low math achievement.

Khirwadkar (2008) conducted a study on integrating multimedia package at pre-service level. The objectives of the study were to develop a multimedia package for laboratory method in teaching of chemistry at pre-service level, to implement multimedia package in actual classroom situation at pre-service level and to study effectiveness of developed package. The sample included 18 B.Ed. students. The multimedia package consisted of video-clippings, text, pictures, animation compiled in Microsoft font page. Multimedia package was found to be effective in learning the concept of management of chemistry laboratory after analysis of pre-test and post-test scores.

Kim and Gilman (2008) studied the effects of text, audio, and graphic aids in multimedia instruction for vocabulary learning and revealed that participants learnt better when they received “visual text and added graphics” or “visual text, added spoken text, and added graphics” instruction. Although the added multimedia components required learners to spend more time on the instruction, the extra time was not significant. The results lead to conclude that an effective way to improve learning of English vocabulary is to offer graphics that illustrate what the vocabulary means.

Chuang and Chen (2009) investigated whether computer-based video games facilitate children’s cognitive learning in comparison to traditional computer-assisted instruction (CAI). One major research null hypothesis was tested: there are no statistically significant differences in students’ achievement when they receive two different instructional treatments: (1) traditional CAI; and (2) a computer-based video game. One hundred and eight third-graders from a middle/high socio-economic standard school district in Taiwan participated in the study. Results indicated that computer-based video game playing not only improves
participants’ fact/recall processes ($F = 5.288, p < .05$), but also promotes problem-solving skills by recognizing multiple solutions for problems ($F = 5.656, p < .05$).

Guan (2009) investigated the effects of multimedia presentations on the efficiency of learning scientific information (i.e. information on basic anatomy of human brains and their functions, the definition of cognitive psychology, and the structure of human memory). Experiment 1 investigated whether the modality effect could be observed when the learning material contained auditory information and visuals altered in complexity, and whether the redundancy effect is caused by redundant information or by interference in information processing. In Experiment 2, verbal-only information was used to examine whether subjects could perform better with auditory rather than with on-screen textual information, and whether the length of the verbal information would exert an effect on learning. The results of Experiment 1 contradicted the prediction of the modality effect in that subjects learned no better or even worse with the audio-visual format of learning material than did subjects with the visual-only one. Besides, redundant information per se did not impair learning, which suggested that the redundancy effect could be rather caused by the interference in information processing. The results of Experiment 2 indicated a negative effect of auditory information on learning regardless of the length of the verbal information. No evidence supported the superiority of auditory instructional mode over the visual one.

Aldalalah and Fong (2010) investigated the effects of computer–based instructional designs, namely modality and redundancy principles on the attitude and learning of music theory among primary pupils of different music intelligence levels. The lesson of music theory was developed in three different modes, audio and image (AI), text with image (TI) and audio with image and text (AIT). The independent variables were the three modes of courseware. The moderator variable was music intelligence. The dependent variables were the post test score. ANOVA was used to determine the significant differences of the pretest scores among the three groups. Analyses of covariance (ANCOVA) and Post hoc were carried out to examine the main effects as well as the interaction effects of the independent variables on the dependent variables. High music intelligence pupils performed significantly better than low music intelligence pupils in all the three treatment modes. The AI mode was found to help pupils with low music intelligence significantly more than the TI and AIT modes.
Srinivasalu and Vijayalakshmi (2010) studied the effectiveness of computer multimedia package (SLM) on achievement in social sciences and revealed that a strategy implemented with self learning material of multimedia techniques brings about improvement in social sciences on the achievement of students of experimental group. There was a superior performance of experimental group over the traditional group which suggests that multimedia package was found effective. A focused treatment with self learning material of multimedia techniques enhanced the achievement of students of experimental group in social sciences. The gender of the students had no influence on the achievement in social sciences of students of experimental group.

Adegoke (2011) examined the effect of multimedia instruction on senior secondary school students’ cognitive achievement in physics. The sample comprised of 198 (106 boys and 92 girls) students who came from four senior secondary schools in Isokan and Ayedeade local Government Areas, Osun State, Nigeria. There were three experimental groups and a control group. Three courseware versions namely, animation + on-screen text, animation + narration, animation + on-screen text + narration were developed to examine the interface effects. A conventional lecture method group served as control. The dependent variables were cognitive achievement in recall and transfer items in physics test. The quality of notes taken by the students during lessons was also assessed. Results showed that, on the average, students in the animation + on-screen text + narration group took best quality notes and this seemed to have influenced their superior cognitive achievement in physics. Generally, students under multimedia instruction performed better than their colleagues in the lecture group. These findings suggest that learning outcomes of students in physics can be enhanced with multimedia instruction.

Serin (2011) revealed that the findings obtained from the results of the pre and post tests administered at the end of the computer-based science and technology instruction program revealed that there was a significant difference between the achievements and problem solving post test scores corrected according to the pre test scores of the experimental and control groups. It was found out the use of the computer and the teaching package with the materials such as videos, slides, CD’s, sounds and animations in the science and technology course makes it possible to have an interactive lesson. Moreover, the presentations of topics by means of rich visual materials increase the achievements of the students. It can also be stated that the use of CBI has positive effects on the learners’ problem
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solving skills. The high eta-square values obtained from the study indicate that the group and pre test variables can provide an explanation for the variances in the scores of the post test. The results of the research indicate that the use of the interactive learning package assists the learners in increasing their achievements and developing their problem solving ability.

Aggarwal (2012) evaluated the usage of a computer based concept mapping in acquisition of concepts of chemistry. Students either utilized the concept maps to prepare the learning project or used other traditional means to prepare their report. Students learning outcomes were evaluated for effectiveness in relation to attitude towards science. Sample consisted of 240 students of IX class studying in PSEB affiliated schools located in Amritsar. The result revealed that the students taught by computer based concept mapping were found to have advanced significantly high in acquisition of concepts of Chemistry than those who were taught through lecture method.

1.6.2 STUDIES RELATED TO COMPUTER BASED MULTIMEDIA INSTRUCTIONAL STRATEGY AND RETENTION

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

Ojha (1996) studied development of instructional material for teaching Economics to class 9th through concept attainment model (CAM) in relation to achievement and retention and reported that: (i) The instructional material developed through CAM was found to be effective in terms of student achievement and their reactions towards model (employing the material developed on the lines of CAM), (ii) the mean scores of achievement of students taught through CAM (employing the material prepared on the lines of this model) were found to be significantly higher than those of their counterparts taught through the traditional method at immediate and retention level.

Abu (1997) investigated the effects of cooperative learning methods on achievement, retention and attitudes of home economics students in North Carolina and found no significant difference among the dependent variables (achievement and retention) between
the teaching methods used. There was also no significance difference in students’ attitude towards the teaching methods.

Abu and Flowers (1997) determined the effects of the cooperative learning approach of Student Teams-Achievement Divisions (STAD) on the achievement of content knowledge, retention, and attitudes toward the teaching method. Cooperative learning was compared to non cooperative (competitive) learning classroom structure using a quasi-experimental design. An achievement test, consisting of items from the state competency test-item bank for the course, and an attitude questionnaire were administered immediately following instruction on the unit of special nutritional needs. A retention test was administered three weeks following the achievement test. California Achievement Test scores and first semester grades in home economics classes were used as covariates to adjust for possible preexisting differences between the groups. Multivariate analysis of covariance showed no significant difference among the dependent variables (achievement and retention) between the teaching methods used. There was also no significant difference in student attitudes toward the teaching methods.

Mehar (1997) studied effect of advance organizer model and conventional method of teaching on learning and retention and concluded that: (i) No significant difference exists between both groups at immediate and retention level in respect to methods of teaching. (ii) No significant difference was found in the achievement between the field-dependent and field-independent groups at immediate and retention level. (iii) Significant interaction between methods of teaching and cognitive styles was found at immediate level but no significant interaction between methods of teaching and cognitive styles was found at retention level.

Brenluin (1999) conducted a study to examine the effects of computer-aided instruction on the understanding and retention of polygonal areas concepts in high-school geometry. The results of the study indicated that the rate of retention decay was significantly slower for the experimental group on all ability levels (remedial, average, and accelerated). Further statistical analysis revealed that the experimental group posted higher overall retention scores.

Crowe and Barbara (2001) studied relationship between group leader emotional intelligence and student's retention and suggested that emotional intelligence scores are not significantly related to student's retention.
Sharma (2002) studied the effectiveness of vocabulary teaching strategies on retention and use in relation to certain variables and concluded that the performance of the experimental group was found better on all the tests. The new strategies of teaching of vocabulary had affected boys and girls similarly in case of retention; whereas, boys performed better in using vocabulary. The experimental group showed better retention as compared to the controlled one, but the subjects in the experimental group were found to have a significant loss of the known words and easy words. The strategy of communicative task proved to be the most effective for retention of vocabulary. IQ level interacts with retention and use of vocabulary. But the loss of vocabulary in higher IQ group was found more than that of the lower IQ group. Students’ achievement in the previous examination did not affect their retention or use of vocabulary. In the absence of treatment the high achievers in the controlled group lost significantly more words than their counterparts in the experimental group. The interest and motivation level of the students in the experimental group were observed to be high by the investigator and other teacher observers.

Sasidharan (2003) investigated the influence of instructional learning strategies and classroom environment on achievement and retention in Malayalam language of standard VII pupils and revealed classroom interaction was higher in the cooperative classroom than in the conventional classroom. The cooperative learning group obtained higher mean scores in achievement, gain and retention than the conventional group before controlling the covariates. Achievement and retention in Malayalam language of standard VII pupils depended upon the changes in the instructional learning strategies. Achievement and retention in Malayalam language have not been affected by the combined effect of instructional learning strategies and classroom environment. There existed statistically significant difference between the cooperative group and conventional group with regard to achievement when the effects of the covariates were controlled. In case of retention also, the two groups possess statistically significant difference after control.

Saini (2004) studied the efficacy of modular instructional strategy of teaching English in relation to achievement motivation and cognitive style of secondary school students and concluded that students having different levels of achievement motivation produce differences in the achievement and retention of grammatical concept in English irrespective of the facts that they are exposed to any strategies of instruction (self-learning module, learning module with teacher intervention and conventional method of classroom teaching).
Cognitive style of students does account for difference in the achievement and retention of the learners of three groups in English grammar.

Nicola and Brahm (2007) found that the three groups of pupils with different learning styles showed different gains to teaching that matched these styles. Retention of word spelling was higher one week after the teaching when the teaching matched the learning style.

Mehra and Thakur (2008) revealed that students when exposed to cooperative learning yielded better mean gain on achievement scores and retention scores as compared to those taught through conventional group learning. Field-independent and field-dependent students yielded comparable mean gain on achievement scores but field independent students exhibited better retention than field-dependent group of students. Through cooperative learning, students yielded better mean gains on achievement scores and retention scores on items related to knowledge than those related to comprehension level but yielded comparable mean gains on items related to comprehension levels and application levels and at knowledge and application levels; field-independent and field-dependent students yielded better mean gains on achievement and retention scores through cooperative learning than conventional group learning.

Anhor, Imoko and Uloko (2009) determined the effectiveness of ethno mathematics teaching approach (ETA) on students’ achievement and retention in Locus. The study was carried out in education zone B of Benue State of Nigeria using a sample size of 253 Senior Secondary 2 (SS 2) students. It was a non equivalent quasi experimental study which was guided by two research questions and two hypotheses. Locus Achievement Test (LAT) instrument with a reliability coefficient of 0.78 was used as pre, post and delayed tests though reshuffled each time. Answers to the research questions were given using mean and standard deviation while the hypotheses were tested at 0.05 significant level using a 2-way analysis of covariance (ANCOVA). Results from the analysis revealed that students exposed to ETA were superior in achievement and retention than those taught with conventional approach. Thus there were significant differences between the mean score of the students taught Locus with ETA and those taught with the conventional approach in both achievement (F1, 248 = 241.317, p = 0.000) and retention (F1, 248 = 270.421, p = 0.000). The study therefore recommended training of mathematics teachers on the use of ethno mathematics in their daily lessons especially in Locus with a view to making learning meaningful, relevant and interesting.
Kalani (2009) studied effectiveness of concept attainment model and conventional method of teaching on achievement at high school and retention of high school level and found: (i) The achievement of students who were taught by concept attainment model was found to be better than conventional method, (ii) Concept attainment model was more effective than conventional method with respect to the scores on attainment on the concept in Science, (iii) Concept attainment model was more effective than conventional method in the retention of concept.

Savoya, Proctorb and Salvendya (2009) studied the effect of power point presentations on student performance. Analyses considered retention of lecture information presented to students without the presence of power point (i.e., traditional lecture), auditory information in the presence of power point and visual (i.e., graphic and alphanumeric) information displayed on power point slides. Students retained 15% less information delivered verbally than the power point presentations. Students preferred power point presentations over traditional presentations.

Alloway, Banner and Smith (2010) investigated the relationship among working memory, cognitive styles and attainment in adolescents using both national curriculum tests and teacher-based assessments. Working memory was found to be the predictor of learning outcomes in English, Mathematics and Science, as well as all teacher assessments. There was also a significant interplay among working memory, cognitive styles and attainment. For students with high working memory, their cognitive styles preference does not impact attainment.

Sukkrong and Teo (2010) examined the English vocabulary learning achievement and retention of the students treated with and without games and their attitude towards games teaching method. The samples were 60 freshmen of Nakhon Si Thammarat Rajabhat University in the first semester of 2009. They were divided into an experimental group of 30 students treated with games, and the other 30 students in a controlled group were treated with conventional teaching method. After the seven-week teaching by the researcher, the samples of both groups were immediately assigned to do the achievement test, which was done again two weeks later in order to compare the learning retention of both groups. Before the learning retention test, the students from the experimental group completed the attitude questionnaire and were interviewed about vocabulary learning through games. Statistics and t-test were used to analyze the achievement and retention data, while statistics and data grouping were
chosen for the analysis of the students’ attitude. The study discovered that the achievement and retention of the experimental group students were higher than those of the controlled group students at significant levels of .01 and .05 respectively. The games-treated students also had positive attitude toward this kind of learning.

Dulger (2011) examined the effects of meta-cognitive strategies on writing. The findings that the results suggest is that meta-cognitive strategies are found effective on total writing achievement in general, and on content, organization, vocabulary, and mechanics of writing in particular. However, meta-cognitive strategies are not found to create a meaningful difference in the language use dimension. Correspondingly, metacognitive strategies are found to be effective on retention in dimensions of content, organization, vocabulary, which in turn constitute a positive effect in total retention. However, meta-cognitive strategies are not found to have a significant influence on language use, and mechanics in writing.

Kumar (2011) studied the effect of concept attainment model on learning and retention in Punjabi in relation to cognitive styles and intelligence and revealed that the retention of the group taught through concept attainment model was significantly higher than that of the group taught by conventional model of teaching. Further, the results also revealed that the interaction effect among instructional strategies, cognitive styles and intelligence did not yield significant difference in retention scores.

Narli (2011) investigated the long-term effects of instructing cantor set theory using constructivist learning approach on student knowledge retention. The participants included 60 first-year secondary mathematics pre-service teachers. Students were divided into two classes one of which was taught via traditional lecture (n = 30) and the other was taught using active learning approach (n = 30). A pre-test named “Minimum Requirements Identification Test” developed by the researcher was used in the determination of the groups. This test involved the concepts such as “set, relation, and function” which were required to be able to learn cantor set theory. Student retention of cantor set theory was measured by using a questionnaire which consists of open-ended questions about the topic. The test was administered to all of the students approximately 14 months after the first instruction. In addition, five students from each group were interviewed. Analyses of the data revealed that the students in the constructivist learning environment showed better retention of almost all of the concepts related to cantor set theory than the students in the traditional class.
Abdu-Raheem (2012) investigated the effects of problem-solving method of teaching on secondary school students’ achievement and retention in Social Studies. The study adopted the quasi-experimental, pre-test, post-test, control group design. The sample for the study consisted of 240 junior secondary school class II students randomly selected from six secondary schools in Ekiti State, Nigeria. The instrument used for the study is the Social Studies achievement test (SSAT) designed and validated by the researcher. Section A of the instrument consisted of the bio-data of the respondents while section B was made up of 40 multiple-choice items designed to measure the students’ achievement and retention in Social Studies. The data were analyzed using t-test and ANCOVA statistical tools. The results showed that there is a significant difference between the achievement mean scores of students in the experimental and control groups. There is a significant difference between the pre-test mean scores and achievement mean scores of students in the experimental and control groups. There is a significant difference between the retention mean scores of students in the experimental and control groups. There is a significant difference between the achievement mean scores and the retention mean scores of students in the experimental and control groups. It was discovered in the study that problem-solving method is more effective than conventional lecture method in improving students’ achievement in social studies.

### 1.6.3 STUDIES RELATED TO COMPUTER ANXIETY

Brown and Coney (1994) performed a study to identify factors influencing computer anxiety and attitudes related to clinical information system use. The results showed that the best predictor of anxiety about computer use included self-rated skills, typing ability and minimal frequency of prior computer use and computer ownership. Factors that were not predictive of computer anxiety or attitudes toward computer included age, gender, and physician input of data.

Broome and Havelka (2001) conducted an empirical study to identify significant determents of computer anxiety among business students. The results indicated that those students in fields heavily relied upon technology would have a higher degree of confidence and lower anxiety when dealing with computing technology. This study also found no significant difference in computer anxiety between male and female students.

Panagiotakopoulos and Koustourakis (2001) conducted a study within a sample of first year students at the department of primary education to establish the existence of any such anxiety or phobia in education. The test was carried out both before and after a six
month course on computer so as to enable any directions in anxiety to be traced. The results showed that the sample initially exhibited symptoms of computer anxiety which was however, drastically reduced at the end of the course. There was no connection between the degree of “computer anxiety and seen or the age of the subjects.

Rockwell and Singleton (2002) investigated the effects of computer anxiety and communication apprehension on the adoption and utilization of the internet. This study suggested that psychological barriers such as computer anxiety and communication apprehension might offer some insight into the reasons for this rejection. Internet usage patterns of 249 survey respondents were monitored for a one-year period. Results suggest that those with high levels of computer anxiety are less likely to use the Internet at all while those with high levels of communication apprehension reported that they were less likely to use internet services that involve interpersonal communication. Further, the results suggest that experience with the internet appears to increase the amount of time spent on-line.

Barbeite and Weiss (2004) concluded that computer anxiety had poorer effect on computer and internet use than computer self-efficacy. But it had significant correlation with computer self-efficacy. But a regression analysis demonstrated that both computer anxiety scales predicted each computer self-efficacy measures. For computer self-efficacy for general/beginner activities, anxiety of computer use (B= - 0.46, P< 0.001) and anxiety of computer related activities (B= -0.014, P= 0.018) both accounted for significant portion of variance (R square = 0.26, P< 0.001). For computer self efficacy for advanced activities anxiety of computer use (B = - 0.031, P< 0.001) but not anxiety of computer related activities (B= -0.034, P = 0.60), accounted for a significant portion of variance (R Square = 0.10, P < 0.001)

Aziz (2004) carried out a study to investigate the relationship between I.C.S. Student’s knowledge, anxiety and attitude towards computer. Sample of the study consisted of all the students of computer science studying at intermediate level in Punjab. The subject of computer studies was being taught as an optional subject at intermediate level in Pakistan labeled as inter in computer as inter in computer science abbreviated as I.C.S. Attitude and anxiety were measured through C.A.S. The key conclusions based on descriptive and inferential statistical analysis indicated that majority of the students had no previous knowledge of computers and no home computer while majority of colleges had computer graduate teachers and insufficient physical facilities. It was revealed that there was a positive
correlation between knowledge and attitude and negative correlation between anxiety and attitude.

Johnson (2005) validated a model of four factors that contributed to application specific computer self-efficacy (AS-CSE) formation (Previous experience, Personality, Learning goal orientation and computer anxiety) and three factors that mediate the relationship between AS-CSE and performance [Goal level, Goal Commitment and Performance Goal orientation (PGO)] using data from 313 individuals in an introductory computer skills course, the model was validated for database software. Result indicate that previous database software experience trainee personality and learning goal orientation were positively related to AS – CSE, whereas computer anxiety were relatively related to AS-CSE.

Noiwan, Piyawat and Norcio (2005) found that students with less computer anxiety tend to have more computer confidence and computer liking. Students who are more confident in using computers tend to like working with computers Students who think that computer are moderately useful tend to have less anxiety, more confidence and more computer liking Moreover, novice users have lower levels of computer attitude and computer self efficacy than do moderate skill users.

Sam, Othman and Nordin (2005) in their study on computer self-efficacy, computer anxiety and attitudes towards the internet, found a significant relationship between computer anxiety and attitudes towards internet. Under graduates who were highly computer anxious generally have more negative attitudes toward the use of internet.

Fuller, Vician and Brown (2006) investigated the role of anxiety associated with computers, communication and using computers to communicate within the content of the communication component of an e – learning environment. The results suggested that anxiety was a significant influential factor in an individual’s e-learning experience Computer anxiety, oral communication apprehension and e-mail familiarity explained 68% of the variance in e-mail anxiety. E-mail anxiety accounted for 22% of the variance in e-mail use.

Embi (2007) found that a majority of the faculty had low levels of computer anxiety and high levels of computer self-efficacy. Statistical analysis showed no significant mean difference between gender and age categories nor was there an interaction between the two said variables related to computer anxiety.

Papastergiou (2008) concluded that students had moderate familiarity with computer and internet use, and that they felt self-efficacious towards computers and the internet,
although their computer and particularly their internet self-efficacy were not high. Students’ computer attitudes were moderately positive and their computer anxiety relatively low. Although no significant gender differences were found, significant differences were noted as to students, prior route of studies. Students who were more experienced in computer and internet use had greater computer and internet self-efficacy, more positive computer attitudes and less computer anxiety.

Olatoye (2009) investigated the influence of computer anxiety and knowledge on computer utilization among senior secondary students and revealed computer anxiety and knowledge when taken together significantly predicted computer utilization. There was significant relationship between computer knowledge and computer utilization. There was no significant difference between male and female students’ computer anxiety.

Saade and Kira (2009) revealed that computer self-efficacy played a significant role in mediating the impact of anxiety on perceived ease of use. This role was observed by computer self-efficacy by reducing the strength and significant of the impact of anxiety on perceived ease of use and having a strong and significant relationship with computer anxiety. The existence of a strong and significant relationship between anxiety and computer self-efficacy showed that as student anxiety increases, the perception of ease of use of the learning management system decreases or vice versa.

Omidian (2010) revealed that Indian students exhibited more computer anxiety as compared to Iranian students. There was significant positive relationship between attitudes towards e-learning and computer self-efficacy. Significant negative correlation was found between attitude towards e-learning and computer anxiety.

Shah, Hassan and Embi (2011) revealed that 42.6% (136) of the respondents had low computer anxiety. Using Independent Samples t-Test showed there was no difference with the scores of computer anxiety on gender. However, there were differences in computer anxiety scores between non-executives and executives. The scores for computer anxiety among younger adults were different from middle-aged adults in this study. When One –Way Anova was conducted, the results revealed there were significant differences in experiencing computer anxiety among the Malays and Chinese. The results also showed there was a significant difference between SPM/MCE holders in experiencing computer anxiety as compared to those who held Bachelor’s degrees. In terms of tenure of the respondents, there was a significant difference for those who had worked for 1-10 years who had higher mean
scores for computer anxiety than those who had worked from 11-19 years. The Pearson’s product-moment correlation coefficient was used to determine the direction and strength of the relationship between variables. It was revealed that the levels of all variables have a small to large negative correlation with computer anxiety. Stepwise multiple regression analysis was carried out to predict and evaluate the relative contributions of technology acceptance, computer skills, computer knowledge and computer applications. The test revealed that computer skills was the most significant predictor, explaining 35.2% of the variance in computer anxiety.

Rahimi and Yadollahi (2011) investigated the relationship between success in English as a foreign language and the degree of use and computer ownership among Iranian high school student. The results revealed that computer anxiety and achievement in English were inversely related. High achievement students in English used computers (both online and offline) more than low achievement students. Computer ownership was also significantly related to students’ success in English. It was also found that except gender, achievement is English, PC time and computer ownership were predictors of computer anxiety.

Deryakulu and Caliskan (2012) investigated computer anxiety within a sample of Turkish twins aged 10–18. A total of 185 twin-pairs participated in the study. Of the twins, 64 pairs (34.6 percent) were monozygotic (MZ) and 121 pairs (65.4 percent) were dizygotic (DZ). Of the 121 DZ twins, 54 pairs (44.63 percent) were same-sex twins and 67 pairs (55.37 percent) were opposite-sex twins. Computer anxiety was assessed using Computer Anxiety Rating Scale-Turkish Version (CARS-TV), one of the three main scales of “Measuring Technophobia Instruments” developed by Rosen and Weil. The results of paired t-test comparisons showed no significant differences in MZ and same-sex DZ twin-pairs’ levels of computer anxiety. On the other hand, a significant difference was found in opposite-sex DZ twin-pairs’ level of computer anxiety. Interesting enough, males appeared to be more computer anxious than their female co-twins. In the present study, using Falconer’s formula, heritability estimate for computer anxiety was derived from correlations based on MZ and DZ twins’ mean scores on CARS-TV. The results showed that 57 percent of the variance in computer anxiety was from genetics and 41.5 percent was from nonshared environmental factors. Shared environmental influence, on the other hand, was very small and negligible. Interpretations of results and potential directions for future research are presented.
1.6.4 STUDIES RELATED TO SELF-CONCEPT

Maqsud and Rouhani (1991) explored the relationships between socioeconomic status, locus of control, self-concept, and academic achievement in secondary school pupils in the Mmabatho area of Bophuthalswana (Southern Africa). The analyses of data revealed the following: (a) both male and female Batswana adolescents were found significantly more externally oriented when compared against the normative data provided (Nowicki-Strickland 1973); (b) socioeconomic status was significantly positively associated with internality, self-concept, and academic achievement in English; (c) externality was significantly negatively related to self-concept and achievement in English; (d) self-concept was significantly positively correlated to measures of achievement in English and mathematics; and (e) mathematics achievement of male students was significantly higher than female ones.

Sangwan (1992) revealed that group of students taught by mastery learning strategy achieved significantly higher mean score on the test of self-concept than the group of students taught through conventional method.

Chand and Nautiyal (1994) concluded that there was no significant difference in the self-concept of students living in destitute homes and parents home. However, the students living in destitute homes had low self-concept as compared to parent home students. Therefore, type of home play significant role in deciding the self-concept of the children.

Haque and Sarwat (1998) conducted a study using academic self-concept scale to investigate the age, gender and achievement effects on academic self-concept of high school children. The results showed that there was a strong positive relationship between achievement and academic self-concept.

Sabir (1999) conducted a study on academic self-concept and achievement among university students as related to their psychological adjustment. A Psychological Adjustment Scale (PAS) has been developed for Pakistani population and an Academic Self-concept Scale (ASCS) originally developed by Ahmad (1986) was modified to explore the relationship among three variables, namely psychological adjustment, academic self-concept, and achievement. Sample consisted of 75 M.Sc. (4th semester) students (including 36 boys and 39 girls) from Quaid-e-Azam University, Islamabad. PAS consisted of 27 items in all. It was found that academic self-concept and achievement (p<0.05) were significantly and positively correlated.
Gulati (2001) found insignificant difference in the gain mean self-concept scores of two groups of students taught by mastery learning model and conventional method of teaching after the experimental treatment.

Kaur (2001) found the values of self-concept and independent variables such as intelligence, creativity and achievement of rural and urban schools. The findings of the study revealed that the variable of intelligence and creativity to be positively significantly with self-concept in urban as well as in rural. No correlation was found between the variable of achievement and self-concept. It was revealed that the variable of achievement contributed 13.6% variance in predicting the self-concept of urban girls. The conjoint effect of variable of intelligence and creativity on achievement is higher in both the samples as compared to predicting the self-concept.

Gakhar and Agarwal (2002) revealed that mastery learning was found to be helpful in improving the achievement level of students. Learning with mastery learning approach changed the aptitude and interest of students. Unlike conventional method, students get feedback and remedial teaching which automatically improves their achievement and promotes their self-concept. This helped students become confident to solve problems. Mastery learning students represent adequate degree of trust and show better classroom trust behavior.

Munjal (2003) revealed that there is significant relationship between emotional intelligence and self-concept as well as emotional intelligence and achievement motivation.

Dambudzo (2005) conducted a study about the relationship between learner self-concept and achievement in secondary schools in Zimbabwe. The sample consisted of 1281 adolescent learners in urban and rural government and nongovernmental secondary schools. Data were collected by means of questionnaires and interviews. A positive and reciprocal relationship between learner self-concept and academic achievement was found. It was also revealed that sports have an influence on the academic achievement of male students in government schools. Students believed that sports improve their confidence, discipline, time management skills and social relationships.

Sanchez and Roda (2007) conducted research on relationship between self-concept and academic achievement in primary students. The sample consisted of 245 primary school students currently studying in public or subsidized schools in Almeria Province (Spain). Self-
Description Questionnaire was administered to obtain data regarding the subjects’ self-concept, and their scholarship performance through marks assigned by their teachers. A close relationship was found between academic self-concept and measures of academic performance. Results indicate that non-academic self-concept negatively predicts school achievement (and that of language, arts and of mathematics), while academic self-concept powerfully and positively predicts both general achievement as well as that in language arts and in mathematics.

Patel (2007) studied the self-concept of principals working at degree colleges in relation to particular variables. The findings of the study revealed that there is no effect in the self-concept of principals in rural and urban areas and no effect in the self-concept of principals of arts and commerce stream.

Asgari and Marashian (2008) investigated the relationships between personal characteristics, self-concept, computer anxiety and the Internet addiction among the students of Ahvaz Islamic Azad University and revealed that there were significant relationships between personal characteristics and computer addiction as well as between computer anxiety and Internet addiction. However, there was not a significant relationship between self-concept and Internet addiction.

Kaur, Rana and Kaur (2009) explored academic achievement and home environment as correlates of self-concept in a sample of 300 adolescents. The results of the study revealed self-concept to be positively correlated with academic achievement, though not significantly so. A significantly positive relationship of home environment components of protectiveness, conformity, reward, and nurturance with self-concept is revealed, thereby meaning that use of rewards and nurturance from parents should be done for positive self-concept development among adolescents. However, the correlation of social isolation, deprivation of privileges and rejection components of home environment is significantly negative with self-concept among adolescents indicating that for positive self-concept development among adolescents, there should be less or no use of social isolation, deprivation of privileges and rejection.

Nagavali (2009) examined self-concept and literacy of female adults and found female adults educated up to middle school level do not differ in their ability from illiterate female adults.

Khushwaha (2009) studied gender differences in the self-concept of students and concluded that boys and girls do differ in their self-concept. Boys have higher self-concept...
than the girls. In the self-concept of intellectual status, physical appearance and anxiety, boys have higher self-concept score and in self-concept of happiness and satisfaction, girls have higher self-concept score.

Kohli (2009) concluded that there is a significant positive relationship between emotional intelligence and self-concept of adolescents. The findings also revealed that there is significant negative correlation between emotional intelligence and anxiety and there is no significant difference in the emotional intelligence of male and female adolescents.

Sharma (2010) revealed that male adults of different literacy levels differ in their self-concept. Female adults of different literacy levels differ in their self-concept. Female adults of different literacy levels differ in their self-concept. There is no significant difference between the self-concept of male and female adults.

Agbatogun (2010) examined relative and combined contributions of computer anxiety, self-concept and gender to teachers’ attitude toward the use of Interactive Computer Technologies. The findings revealed that the combination of the three independent variables significantly predicted the independent variables. Meanwhile, only computer anxiety and self-concept contributed to the prediction of the dependent variable with gender making no significant contribution.

Yara (2010) studied the relationship between students’ self-concept and how it affects their academic achievement in Mathematics in some selected senior secondary schools in Southwestern Nigeria. One thousand seven hundred and twenty two (1722) senior secondary school II students were randomly selected from two senatorial districts of Southwestern Nigeria. One validated research instrument (STSCP) was used in collecting data. The data were analysed using simple descriptive statistics of frequencies and percentages. The result of the findings showed that students have good self-concept of themselves in performing well in mathematics and that they needed to do well in mathematics in order to please themselves and their parents and to get admission into higher institution of their choice. The result also revealed that students’ believed in themselves that natural ability, good luck and lots of hard work studying at home will make them do well in mathematics. It is therefore suggested classroom teachers should teach students' good student habits and self-management skills together with appropriate self attribution strategies.

Awan, Ghazala and Anjum (2011) examined the achievement and its relationship with achievement motivation and academic self concept. The subjects consisted of 336 students
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(146 males and 172 females) from four public and four private schools of the Sargodha district at secondary level. Intact groups of all eight schools enrolled in 9th grade were involved in the study. An Urdu translated version of ‘Academic Self-Description Questionnaire II’ (Marsh, 1990) and ‘General Achievement Goal Orientation Scale’ (McInerney, 1997) was used for data collection. The results revealed that achievement motivation and self concept were significantly related to academic achievement. Significant gender differences were discovered which were in favor of girls. It was suggested that teachers must use motivational strategies to involve students in academic activities for improving their self concept and grades.

Othman and Leng (2011) examined the relationship between self-concept, intrinsic motivation and self-determination with academic achievement among the respondents. The sample of the study was 200 students in standard 5 and standard 6 from a Chinese primary school in Johor, Malaysia. Data was collected using a self-developed set of questionnaire. The reliability of the instrument was tested using Cronbach’s Alpha and the result was 0.941. The data was analyzed using Statistical Package for Social Science (SPSS) version 17.0. Pearson correlation at the significant level of 0.05 was used in order to determine the relationships among the measured variables. Research finding shows that correlations between independent variables (self-concept, intrinsic motivation and self-determination of the respondents) and dependent variable (academic achievement) were all significantly low.

Marsh and Martin (2011) concluded that prior academic self-concept had direct and indirect effects on subsequent achievement, whilst the effects of self-esteem and other non-academic components of self-concept were negligible.

Kaur (2012) revealed that the overall self-concept was positively and significantly related to academic achievement. Further, the results revealed that among all the components viz; physical, social, temperamental, educational, moral and intellectual self-concept, educational self-concept was the major component which positively and significantly influenced student’s academic achievement.

Parmar (2012) revealed that the self-concept of urban group of adolescents was found significantly higher and more positive than rural group of adolescents. A 2x2x2 factorial design was subjected to adequate of statistical analysis viz. technique of Analysis of variance (ANOVA) in order to examine the role of main variables and to study their main as well as interaction effects subsequently on students’ self-concept, adjustment and academic
achievement. All following Interaction effect among independent variables on students’ self-concept were found significant.

Singh (2012) conducted a study on the academic achievement of 9th class students of District Solan of H.P. in relation to their area of residence and self-concept. The sample consisted of 300 students from rural and urban areas of Solan District of H.P. The data were analyzed by using analysis of variance. The finding of the study revealed that urban and rural students do not differ their academic achievement and different levels of self-concept significantly. Further, the study also revealed that the academic achievement of students at different levels of their self-concept does not differ significantly and area of residence and self-concept do not interact significantly with regard to the academic achievement of students.

1.7 REVIEW OF RESEARCHES


A review of the research studies revealed that experimental group showed better retention as compared to the controlled one (Brenluin, 1999; Ojha, 1996; Sharma, 2002; Sasidharan, 2003; Saini, 2004; Nicola & Brahm, 2007; Mehra & Thakur, 2008; Anhor, Imoko & Uloko, 2009; Kalani, 2009; Savoya, Proctorb & Salvendya, 2009; Sukkrong & Teo, 2010; Dulger, 2011; Narli, 2011; Kumar, 2011; Abdu-Raheem, 2012). However, Abu, 1997; Abu & Flowers, 1997 showed no significant difference among the dependent variables (achievement and retention) between the teaching methods used.

A review of the research studies revealed that there was no significant correlation between student’s computer anxiety and gender (Brown & Coney, 1994; Brooms & Havelka, 2001; Erkan, 2009; Panagiotakopoulos & Koustantakis, 2001) or age (Brown & Coney, 1994; Panagiotakopoulos & Koustantakis, 2001). In addition, those students in fields heavily reliant upon technology would have a higher degree of confidence and lower anxiety when
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dealing with computing technology (Broome & Havelka, 2001; Papastergiou, 2008). It was also revealed that there was a negative correlation between student’s computer anxiety and computer attitude (Aziz, 2004; Noiwan, Piyawat & Norcio, 2005; Sam, Othman & Nordin, 2005) and computer self-efficacy (Barbeite & Weiss, 2004; Noiwan, Piyawat & Norcio, 2005; Saade & Kira, 2009; Omidian, 2010; Torkzaden, Changa & Denerhan, 2006; Wilfong 2006).

A review of the research studies revealed that students taught by multimedia instructional strategy achieved significantly higher mean score on the test of self-concept (Sangwan, 1992) while Gulati (2001) showed insignificant difference. Kaur (2001) showed the variable of intelligence and creativity to be positively significant with self-concept. Munjal (2003) and Kohli (2009) showed a significant relationship between emotional intelligence and self-concept. Asgari and Marashian (2008) showed there was not a significant relationship between self-concept and internet addiction. Agbatogun (2010) showed that computer anxiety and self-concept contributed to the prediction of teachers’ attitude towards the use of interactive computer technologies. Kaur (2012) revealed that the overall self-concept was positively and significantly related to academic achievement. However, Singh (2012) revealed that the academic achievement of students at different levels of their self-concept does not differ significantly.

1.8 NEED AND SIGNIFICANCE OF THE STUDY

The current age of 21st century, which is well known as Information Age has brought a paradigm shift in our school systems from traditional methods of teaching to modern method of teaching which encompasses the use of technology. The modern technology aids in improving the teaching learning techniques. Schmidt (1992) reported that the computerized instructions had positive effect on students’ motivation, attitude and instructional task and in improving students learning. Computers have become an essential classroom tool for the acquisition, analysis, presentation and communication of data in many ways which allow students to become more active participant in research and learning. It offers students a very important source for learning the concepts and processes through simulations, graphics, sound, data manipulation and model building. In the field, the portability of the laptop computer allows students to actively gather and analyze data and take it back to the classroom for in-depth study and the sharing of information. These capabilities can improve scientific learning and facilitate communication of ideas and concepts. Tutorials and
multimedia software engage students in meaningful interactive dialogue and creatively employ graphics, sound and simulations to promote acquisition of facts and skills promote concept learning and enhance understanding.

The need for computer education in schools cannot be over emphasized. This is because computers make things easy in our society. Computer information communication technology has become an integral part of our society (Chiemeke, 2004). Shinn (2001) asserted that for a school to remain competitive it also must adapt to changes and be innovative with its use of computer. Schools spend a great amount of money on computer-based education and training each year. The increase in computer usage is rapid and has also generated new challenges. Computer anxiety can be one of the major problems that affect the effectiveness of learning. Computer anxiety is a phenomenon which accompanies the growing use of computers in our society. Computer anxiety is caused by exposure to computer technology (North & Noyes, 2002). Students hesitate in using computers for fear of making mistakes. Feelings of anxiety towards computers and computer use, is common, affecting 30 to 40% of the population (Tseng, Tiplady, Maclead & Wright, 1997). Rosen, Sears and Weil (1987) agreed that one third of all college students experience some type of technophobia (Deloughry, 1993). Students with computer anxiety will avoid classes and this may have a deleterious effect on learning outcomes. The performance of computer anxious students might be poorer than those with little or no computer anxiety (Heinssen, Glass & Knight, 1987; Rosen & Weil, 1995).

In the 21st Century, English has become the common international language, the language most frequently used to communicate when two people are not native speakers of the same language. As a result, instruction of English as a Foreign Language (EFL) is a priority around the globe. But instructional methodologies have not always kept pace with these changing realities. In countries where there is not a surrounding population of active English speakers, the language is still often taught as a traditional classroom subject, similar to maths or geography. Technology, however, now offers opportunities for authentic interaction with people from other cultures that can be incorporated into the classroom (Chang & Lehman, 2002). Foreign language (FL) anxiety, “a situation specific and unique type of anxiety closely related to the acquisition of foreign language” (Horwitz, Horwitz & Cope, 1986), affects many university students who are studying a foreign language that they are not proficient in, and a number of research studies suggest that this plays a crucial and negative role in the academic achievement of such students (MacIntyre & Gardner, 1991;
Phillips, 1992). To reduce language anxiety, identifying these “at-risk” learners and providing them with opportunities to fully exploit the resources available to them is very important (Onwuegbuzie, 1999). On the other hand, multimedia has been widely and creatively utilized in the language learning context in various ways. The design features of multimedia computer-assisted language learning have been shown to offer ideal conditions for second language learning. With dimensions of multiple media, learner control and interactivity (Pusack & Otto, 1997), multimedia environments provide a more communicative, powerful, supportive, non-threatening and low-anxiety language learning experience because “the control and manipulation of meaningful information is passed into the hands of the learner” (Brett 1998, p. 50). Consequently, providing learners with particular learning environments that are learner-centered, supportive and motivating with clear task orientation has the potential to reduce foreign language anxiety, and in turn to increase the possibility of improving achievement. Multimedia environments are promising to serve as a remedy due to the consistency of features of multimedia environments and researchers’ suggestions. Joiner (1997) pinpointed the greatest advantage of such computer-assisted multimedia applications as “instantaneous random-access to any sentence or segment on the sound source and the ability to replay and relisten with ease to difficult passages”. More importantly, interactive multimedia programs can facilitate listeners by providing considerable and easily accessible online help to contribute to the comprehension process. Apparently, the features of multimedia environments allow language learners to explore, discover, ponder, search, question, answer and receive feedback (Brett, 1998). However, as many researchers claim that more media does not guarantee better learning and urge that more studies should be conducted to develop more understanding about what actually help students learning (Pusack & Otto 1997, p. 10).

Therefore, the aim of this study is to explore the process of how computer based multimedia instructional strategy affects learning English in relation to computer anxiety and self-concept, which may in turn provide implications for learners’ academic performance in the future.

1.9 STATEMENT OF THE PROBLEM

The title of present research problem is stated as follows:

**EFFECT OF COMPUTER BASED MULTIMEDIA INSTRUCTIONAL STRATEGY ON ACHIEVEMENT AND RETENTION IN ENGLISH IN RELATION TO COMPUTER ANXIETY AND SELF-CONCEPT**
1.10 OPERATIONAL DEFINITION OF THE VARIABLES

- **Computer Based Multimedia Instructional Strategy** - It is the presentation of information by making integrated use of multiple forms of media and technologies involving texts, images (including videos), graphics and sounds.

- **Conventional Teaching Strategy** - The conventional educational system focuses entirely on intellectual and ignores experiential learning, teaches students how to succeed in tests or examination and much more, has an authoritarian nature, and leads students to only extrinsically value education and not intrinsically value learning. The traditional educational system relies almost entirely on intellectual learning without including experiential learning.

- **Achievement** - Achievement means performance in a subject or in a test. The achievement test is an investigator made test. It involves the set of questions from different lessons chosen for study. This helps to measure high and low achievement of students under study.

- **Retention** - Retention is considered as persistence of after-effects experiencing which are implied in learning and memory. The organism continues to perform certain learned act after an interval in which the performance has not taken place. In the present study, retention scores will be obtained as marks on the achievement score administered again after three weeks of interval.

- **Computer Anxiety** - Emotional fear, apprehension and phobia felt by individuals towards interactions with computers or when they think about working with a computer.

- **Self-Concept** - Self-concept is something beneath one’s skin which affects his/her behavior as on organization of ideas about oneself, which is derived from one’s experiences with others. It is based on self theory. It is a theory that an individual has unwittingly constructed about himself as an experiencing, functioning individual and it is a part of a broader theory which he/she holds with respect to his entire range of significant experiences.

1.11 DELIMITATIONS

The study was delimited with respect to the following:

(i) The present study was confined to IX class English students of Central Board of Secondary Education affiliated of Amritsar district only.

(ii) 20 lessons based on computer based multimedia instructional strategy were developed in English grammar on topics such as verbs, adjectives, adverbs, tenses and active passive voice from the prescribed syllabus of IX class.
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(iii) The study was confined to classifying variables i.e. computer anxiety and self-concept.

(iv) The experimental treatment was confined to about 30 working days of academic session.

1.12 OBJECTIVES

The study was conducted to achieve the following objectives:

1. To develop computer based multimedia programs for selected topics of English grammar.
2. To develop lesson plans based on conventional teaching strategy for selected topics of English grammar.
3. To develop and standardize criterion referenced test for selected topics of English grammar.
4. To develop and standardize achievement test for selected topics of English grammar.
5. To compare the achievement of groups taught through computer based multimedia instructional strategy and conventional teaching strategy at immediate and retention level.
6. To compare the achievement of high and low computer anxiety groups of students at immediate and retention level.
7. To compare the achievement of groups having high, average and low self-concept of students at immediate and retention level.
8. To examine the interaction effect of instructional strategies and computer anxiety at immediate and retention level.
9. To examine the interaction effect of instructional strategies and self-concept at immediate and retention level.
10. To find out the interaction effect of computer anxiety and self-concept at immediate and retention level.
11. To examine the interaction effect among instructional strategies, computer anxiety and self-concept at immediate and retention level.

1.13 HYPOTHESES

The study was designed to test the following hypotheses in respect of immediate performance and retention:
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• IMMEDIATE PERFORMANCE

H_{1O}: The achievement of group taught through computer based multimedia instructional strategy will be significantly higher than that of group taught through conventional teaching strategy in English.

H_{2O}: The achievement of low computer anxiety group will be significantly higher than that of high anxiety group of students in English.

H_{3O}: The achievement of high self-concept group will be significantly higher than that of average and low self-concept groups of students in English.

H_{4O}: There exists no significant interaction effect of instructional strategies and computer anxiety on achievement in English.

H_{5O}: There exists no significant interaction effect of instructional strategies and self-concept on achievement in English.

H_{6O}: There exists no significant interaction effect of computer anxiety and self-concept on achievement in English.

H_{7O}: There exists no significant interaction effect among instructional strategies, computer anxiety and self-concept on achievement in English.

• RETENTION

H_{1O}: The retention of group taught through computer based multimedia instructional strategy will be significantly higher than that of group taught through conventional teaching strategy in English when measured after an interval of 30 days.

H_{2O}: The retention of low computer anxiety group will be significantly higher than that of high anxiety group of students in English when measured after an interval of 30 days.

H_{3O}: The retention of high self-concept group will be significantly higher than that of average and low self-concept groups of students in English when measured after an interval of 30 days.

H_{4O}: There exists no significant interaction effect of instructional strategies and computer anxiety on retention in English when measured after an interval of 30 days.

H_{5O}: There exists no significant interaction effect of instructional strategies and self-concept on retention in English when measured after an interval of 30 days.

H_{6O}: There exists no significant interaction effect of computer anxiety and self-concept on retention in English when measured after an interval of 30 days.

H_{7O}: There exists no significant interaction effect among instructional strategies, computer anxiety and self-concept on retention in English when measured after an interval of 30 days.