EFFECT OF COMPUTER BASED MULTIMEDIA INSTRUCTIONAL STRATEGY ON ACHIEVEMENT AND RETENTION IN ENGLISH IN RELATION TO COMPUTER ANXIETY AND SELF-CONCEPT

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SUMMARY

INTRODUCTION

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).

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).

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).

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).

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.

Achievement is a psychological need, a learned motive to compete and strive for success. 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”.

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.”
Computer anxiety is a concept specific anxiety type; that regularly occurs in a specific type of situation (Harris & Grangennet, 1997). 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”.

Research has established firmly that stress and anxiety reduce performance effectiveness. Elder, Gardner and Ruth (1987), Howard and Smith (1986), 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 workplace 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).

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.

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.

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.

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).

Franken (1994) stated that “there is a great deal of research which shows that the self-concept, is perhaps, the basis for all motivated behaviour. It is the self-concept that gives rise to possible selves, and it is possible selves that create the motivation for behaviour.” We develop and maintain our self-concept through the process of taking action and then reflecting on what others tell us about what we have done. We reflect on what we have done and can do in comparison to our expectations of others and to the characteristics and accomplishments of others (Brigham, 1986).

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.

**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 (Chiemek, 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 in 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.

**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*

**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.

**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 urban and rural schools 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.

(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.

**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.

HYPOTHESES

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

- **IMMEDIATE PERFORMANCE**

  \( H_1^O \): 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.

  \( H_2^O \): The achievement of low computer anxiety group will be significantly higher than that of high anxiety group of students in English.

  \( H_3^O \): The achievement of high self-concept group will be significantly higher than that of average and low self-concept groups of students in English.

  \( H_4^O \): There exists no significant interaction effect of instructional strategies and computer anxiety on achievement in English.

  \( H_5^O \): There exists no significant interaction effect of instructional strategies and self-concept on achievement in English.

  \( H_6^O \): There exists no significant interaction effect of computer anxiety and self-concept on achievement in English.
There exists no significant interaction effect among instructional strategies, computer anxiety and self-concept on achievement in English.

**RETENTION**

H1O: 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.

H2O: 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.

H3O: 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.

H4O: There exists no significant interaction effect of instructional strategies and computer anxiety on retention in English when measured after an interval of 30 days.

H5O: There exists no significant interaction effect of instructional strategies and self-concept on retention in English when measured after an interval of 30 days.

H6O: There exists no significant interaction effect of computer anxiety and self-concept on retention in English when measured after an interval of 30 days.

H7O: 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.

**SAMPLE**

Sampling is an important aspect of life in general and enquiry in particular. The adequacy of sample i.e. the lack of bias depends on our knowledge of the population as well as method used for drawing the sample. Population refers to all cases under investigation and a sample is an actual subset of observation drawn from population. The sample can thus be described by a distribution of proportions propelling the probability distribution of function. The sampling distribution can be thought of as the result of repeating a sampling operation many times with a fixed sample size, and calculating a statistic like from each sample. At the same time, the sampling distribution of statistics gives us a way of relating the sample estimate to the population parameter. It provides a way of determining the significance level
of a given result under the null hypothesis. The sample in the present study was drawn at the school and student level.

THE SCHOOL SAMPLE

The school sample was drawn from representative secondary schools of Amritsar district affiliated to Central Board of Secondary Education, New Delhi. A list of the schools under the administration of Amritsar district was procured from the District Education Officer. The schools were compared with regards to the criteria that schools had almost same class climate, physical facilities, teacher taught ratio, sex ratio etc. The names of schools were written down on slips of equal size. The names were folded into six symmetrically equal parts and put in an enclosed container. The lid was then covered and the box was shaken up many times for easy shuffling. Then the investigator drew out the first four cards one by one bearing the names of each school which represented the population under investigation is given below:

(i) Ajanta Public School, Basant Avenue, Amritsar.
(ii) Government Girls High School, Mall Road, Amritsar.
(iii) Capt. Amardeep Singh, Government High School, Majitha.
(iv) Baba Desa Singh Public School, Majitha.

THE STUDENT SAMPLE

The study was initiated on a random sample of 400 students of class IX of English medium rural and urban schools of Amritsar district. These were English medium schools affiliated to Central Board of Secondary Education, New Delhi. Most of these students belonged to middle class families. A list of schools was collected from the District Education Officer. Out of the total schools of Amritsar district, four schools were selected. After selecting the schools the student sample was drawn randomly. 200 students were divided each into experimental and control group for the conduct of the experiment. The test of computer anxiety was administered and high and low computer anxiety groups on the variable were formulated. According to Kelley (1939) criteria of taking up top 27% and bottom 27% students as constituting the experimental and control group respectively. Then the test of self-concept was given to classify the students into three groups i.e. high, average and low.
DESIGN

The present study was experimental in nature. A pre-test and post-test factorial design was employed. In order to analyze the data 2×2×3 Analysis of Variance was used. The study covered three independent variables i.e. instructional strategies, computer anxiety and self-concept. The variables of instructional strategies was studied at two levels i.e. computer based multimedia instructional strategy and conventional teaching strategy. The variable of computer anxiety was studied at two levels only such as high and low computer anxiety. The variable of self-concept was studied at three levels viz., high, average and low self-concept. The main dependent variable was achievement gain which was calculated as the difference in post-test and pre-test score for the subject. After 30 days same achievement test was administered as retention test and scores were obtained. Experimental and control group scores were compared according to their pre-test and retention test scores and difference was called retention scores.

TOOLS USED

The following tools were used for collecting data:-
(i) A Criterion Referenced Test in English Grammar.
(ii) Achievement Test in English Grammar was developed by the investigator herself.
(iii) Instructional Material on computer based multimedia instructional strategy in English Grammar was developed by the investigator herself.
(iv) Instructional Material on Conventional Teaching Strategy in English Grammar was developed by the investigator herself.
(v) Computer Anxiety Scale was developed by the investigator herself.
(vi) Self-Concept Questionnaire by Saraswat (1999) was used.

PROCEDURE

After the selection of the sample and allocation of students in two groups for instructional strategies, the experiment was conducted in five phases as following:-

Firstly, the investigator made necessary arrangements with the principals of schools selected for the experiment. An achievement test as a pre-test measure was administered on the total sample. The students were assigned to two groups such as experimental and control group on the basis of pre-test scores to make equivalent groups. Before implementing the computer based multimedia instructional strategy, the two groups i.e. experimental and control groups were randomly decided and matched on the basis of pre-test scores so that
equivalent groups could be formed. The answer-sheets were scored to obtain the information regarding the previous knowledge of the students.

Secondly, The computer anxiety scale and self-concept scale were administered in each school of the experiment and control groups. The answer-sheets were scored as per the scoring key to obtain knowledge about threshold values of learners on the variables.

Thirdly, treatment was given to the experimental group. The experimental group was taught through computer based multimedia instructional strategy and the control group was taught by conventional strategy. The same content was taught to both the groups for the same duration of time. The duration of instructional treatment was twenty sessions in each case with each session of 45 minutes. Regarding the experimental period, the investigator had already contacted the heads of the schools taken for study and informed them that grammar portion of IX class syllabus would be taken by her. The investigator personally requested the concerned subject teachers of the schools for leaving grammar portion of IX class syllabus from Central Board of Secondary Education, New Delhi and had taken the time for experimental phase as per their suitability without disturbing their schedules.

Fourthly, after the completion of the instructional program, the same achievement test in English grammar was administered as post-test to the students of both the groups. The students were given 45 minutes to complete the test. The answer-sheets were scored with the help of scoring key. After the completion of test students were thanked for their full cooperation. The experiment and control group scores were compared according to their pre-test and post-test scores and difference was called as gain achievement scores of the experiment and control group.

Fifthly, after a period of 30 days, same achievement test in English grammar was administered as retention test to the students of both the groups to get measures of their retention. The answer-sheets were scored with the help of scoring key and scores were obtained. The experimental and control group scores were compared according to their pre-test and retention test scores. The difference was called retention scores.

STATISTICAL TECHNIQUES USED

The following statistical techniques were employed to analyze the data obtained from the experiment in order to test the hypotheses:

(i) Descriptive statistical techniques such as mean, standard deviation, kurtosis and skewness were used to determine the nature of the distribution of the scores.
(ii) A three way Analysis of Variance (2×2×3) was employed on the scores of the students to test the hypotheses related to instructional strategies, computer anxiety and self-concept for immediate performance and retention test scores of the students.

(iii) For the significant F-ratios, the t-test was used for testing the significance between the means related to different groups and different variables.

(v) Graphical techniques were used for descriptive analysis and visual perception of the data.

**FINDINGS**

The following conclusions were drawn which are described below such as:

(i) The performance in English of computer based multimedia instructional strategy group was found to be significantly higher than that of group taught through conventional teaching strategy.

(ii) The performance in English of low computer anxiety group was found to be significantly higher than that of high anxiety group of students.

(iii) The performance of students with different self-concept was found to be significantly different from one another in English. Further analysis revealed that:

- The mean gain achievement score was not found significant for high and average self-concept groups.
- The mean gain achievement score was significantly higher for high self-concept group than that of low self-concept group.
- The mean gain achievement score was not found significant for average and low self-concept groups.

(iv) There was no significant interaction effect of instructional strategies and computer anxiety on achievement in English.

(v) There was significant interaction effect of instructional strategies and self-concept on achievement in English. Further analysis revealed that:

- The high self-concept group of experimental group exhibited higher mean gain scores than high, average and low self-concept groups of control group.
- The average self-concept group of experimental group exhibited higher mean gain scores than high, average and low self-concept groups of control group.
• The low self-concept group of experimental group exhibited higher mean gain scores than average and low self-concept groups of control group.

• The high self-concept group exhibited higher mean gain scores than average and low self-concept groups of control group.

• The average self-concept group exhibited higher mean gain scores than low self-concept group of control group.

• Rest of the combinations of instructional strategies and self-concept groups did not yield significant difference in mean gain achievement scores.

(vi) There was no significant interaction effect of computer anxiety and self-concept on achievement in English.

(vii) There was no significant interaction effect among instructional strategies, computer anxiety and self-concept on achievement in English.

• RETENTION

(i) The retention of group taught through computer based multimedia instructional strategy was found to be significantly higher than that of group taught through conventional teaching strategy in English when measured after an interval of 30 days.

(ii) The retention of low and high computer anxiety groups of students in English was not found to be different when measured after an interval of 30 days.

(iii) The retention of students with different self-concept was found to be significantly different from one another in English when measured after an interval of 30 days. Further analysis revealed that:

• The achievement of high self-concept group was not significantly different than that of average self-concept group in respect of retention scores.

• The achievement of high self-concept group was significantly higher than low self-concept group in respect of retention scores.

• The achievement of average self-concept group was not significantly different than that of low self-concept group in respect of retention scores.

(iv) There was no significant interaction effect of instructional strategies and computer anxiety on retention in English when measured after an interval of 30 days.
(v) There was significant interaction effect of instructional strategies and self-concept on retention in English when measured after an interval of 30 days. Further analysis revealed that:

- The high self-concept group of experimental group exhibited higher retention scores than high, average and low self-concept groups of control group.
- The average self-concept group of experimental group exhibited higher retention scores than high, average and low self-concept groups of control group.
- The low self-concept group of experimental group exhibited higher retention scores than average and low self-concept groups of control group.
- The high self-concept group exhibited higher retention scores than average and low self-concept groups of control group.
- The average self-concept group exhibited higher retention scores than low self-concept group of control group.
- Rest of the combinations of instructional strategies and self-concept groups did not yield significant difference in retention scores.

(vi) There was no significant interaction effect of computer anxiety and self-concept on retention in English when measured after an interval of 30 days.

(vii) There was no significant interaction effect among instructional strategies, computer anxiety and self-concept on retention in English when measured after an interval of 30 days.

EDUCATIONAL IMPLICATIONS OF THE FINDINGS

The findings of the present study revealed that computer based multimedia instructional strategy as an instructional strategy geared towards students' needs, interests and expertise. It provided flexible learning environment and enhanced achievement in English grammar. In the present research, students taught through computer based multimedia instructional strategy exhibited better gain in achievement and retention in English grammar as compared to students taught by conventional teaching strategy. Following are the educational implications of the present study:

(i) Potential of computer based multimedia instructional strategy should be utilized to enhance quality of education at school level.
(ii) Parents should encourage their children to utilize educational packages available in the market.

(iii) Development of computer based multimedia instructional material is not an expensive affair because once the package is developed; it can be used for many years with the required updating. So schools should make one time investment in the development of the material.

(iv) Most of the teachers are not computer literate. Further, those who are computer literate are not equipped or trained to develop and use computer based multimedia instructional material in teaching learning process. Therefore, computer should be the compulsory course in the pre-service teacher training programmes. In-service computer literate teachers can be given an opportunity to enhance their skills and competencies required for the development and use of computer based multimedia instructional material.

(v) Computer based multimedia instructional material can be helpful to create positive teaching learning environment in classroom as it increases the concentration and interest of the learners towards learning process.

(vi) School administrations should utilize such programmes in their school.

(vii) School administration should arrange for providing technical and software training to teachers so that they can create multimedia instructional material to support students’ learning.

(viii) Students with low computer anxiety achieved higher scores than those who exhibited high computer anxiety. One approach to counter computer anxiety is to involve learners themselves in confronting their beliefs, fears and assumptions and help them to develop strategies to overcome their anxieties. A metacognitive approach is one such strategy.

(ix) Students with high computer anxiety should be identified and for alleviation of computer anxiety special seminars, additional classes, individual classes and group therapy should be organized.

(x) Students with high computer anxiety can be paired with students with low computer anxiety. This would enable students to learn from their peers and increase their confidence in the presence of a friend rather than an educator.

(xi) Self-concept has direct relation with academic achievement. So, schools should make provisions for good training programme for personality development.

(xii) Schools should make provision for individual counseling as it can serve as an effective intervention to improve self-concept.
SUGGESTIONS FOR FURTHER RESEARCH

In the light of the findings revealed and conclusions drawn from the study, the following suggestions may be considered for further studies:

(i) Research studies may be undertaken to determine the effectiveness of different forms of computer based multimedia instructional strategy for various subject areas and at different grade levels.

(ii) The effectiveness of computer based multimedia instructional material may be studied on a sample of students from different ecological backgrounds.

(iii) The present study may be replicated on a wider range of sample for more valid generalizations.

(iv) The present study was conducted to see the effect of computer based multimedia as instructional strategy in teaching of English. Such studies are needed to be planned and conducted in other subject areas such as mathematics, sciences and social sciences.

(v) In the present study, computer based instructional material was developed only on five topics of English grammar; the same may be replicated on the whole syllabus.

(vi) In the present study, the effect of computer based multimedia instructional strategy was studied in relation to computer anxiety and self-concept only. Further studies can widen scope by incorporating other variables like gender, achievement motivation, study habits, problem solving ability, learning style, multiple intelligence and etc.

(vii) The studies comparing the effectiveness of computer based multimedia instructional strategy with other instructional strategies i.e. computer assisted instruction, web based instruction and computer based cooperative learning etc. can be conducted.

(viii) Diagnostic and remedial work can also be carried out in the field of education with the use of computer based multimedia instructional strategy.

(ix) The present study was conducted in private schools of Amritsar city. The further study can be extended to government schools and comparisons can be made on the effect of computer based multimedia instructional strategy on achievement of students in private and government schools.