

## ROLE OF CAI ON THE INTEREST AND RETENTION OF STUDENTS AT SECONDARY SCHOOL LEVEL

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### ABSTRACT

*The researcher investigated the role of computer assisted instructions on the interest and retention of secondary school students. It was an experimental study conducted on the 80 female students of St.Helen High School. The sample was divided into control and experimental groups on the basis of pre-test. One group (Control) was taught the course contents of physics with the traditional lecture method and the other group (experimental) was taught with the computer assisted instructions. After one month treatment both the groups were exposed to interest inventory. To check the retention a delayed post-test (retention test) was administered six weeks after the post-test. The results shows that in the computer assisted instructions the students showed more interest and they retained the concepts for a long period of time as compared to the traditional lecture method. When the location (Rural and Urban) differences were analyzed the result shows that there were significant location differences on the interest but not on retention of students.*

**Keywords:** Computer Assisted Instructions, Interest, Academic achievement, Retention

### INTRODUCTION

The advancement in science and technology and their application in education have yielded rich dividends in almost all disciplines related to the management and organization of education system. This applied aspect of technology in the educational discipline has tremendous capacity to provide the best possible output for both the teachers and students. It is now not a matter of secrecy that there has been a continuous shift in the nature and use of technology for improving the processes and products of education depending upon the type of excellence attained by the members of the society and community all over the globe in terms of scientific, philosophical, psychological and technological progress and advancement. There remain always a shift from the old to the new methods of teaching and learning in the education in different periods of time (Mangal & Mangal, 2011, p.2).

Computer is the finest and most important gift of science and technology to the mankind. It has done miracles in almost all walks of human life. There is no area which remains untouched by the benefits of computer. The use of computer for the instructional work is called computer assisted instructions (Mangal & Mangal, 2011, p .530). CAI is one step ahead of teaching machines and two of the uses of programmed text-books. The roots of CAI are in the work of B.F.Skinner (1950) who first of all introduced the concept of programmed instructions. The CAI has now taken so many dimensions that it is not simply considered as the teaching machine ( Hilgard & Bower, 1977 as cited in Mangal & Mangal, 2011, p .531).

In CAI course contents are divided into “frames” which enabled the students to master the content in a specific sequence. Psychologist B.F. Skinner is known as an early champion of programs instruction. Most of the CAI strategies are computerized version of teaching techniques which are usually performed by persons/teachers. The oldest instructional application of computer is CAI which provides instruction and drill and practice in basic computation and language skill. In CAI information is presented on computer’s display, students are asked to respond, and there response is evaluated. If response is correct, student moves ahead, if in correct, similar problems are presented till correct response is elicited.

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Today we are enjoying the benefits of science. Science makes our life very comfortable. Most of the benefits of science are due to physics, which is the most beneficent and ever developing field of science. Physics make our life very easy and comfortable. Physics brought such wonderful changes in the social life of human being that could not be thought in past. Man of today sitting in home watches the changes taking place in different continents of the world through satellite communication. It is due to physics that we are living in the word of electricity, air conditioners, refrigerators, radio, wireless, telephone, telegraph and computers. Which made our life most comfortable. Physics also helped in transportation and due to it man can cover the thousands km distance in minutes and seconds. Physics also helped in the space exploration and astronomy, and that is why man step on moon on one side and the deepest earth of the sea on the other. He has been able to observe the moments of smallest particles of the atom such as electron, proton, and neutron on microscopic level and observes the farthest stars and galaxies with telescope. The energy plays a vital role in the human life. The physics had made possible to achieve energy not only from the coal, petrol etc. but it has also extracted energy from the core of the atom. It is due to physics that developments in the field of energy are being made and new weapons are being developed which put the word in a new era, which is truly called the era of computer and technology Khatak (2007. p.4).

Keeping in view the importance of physics, the interest and retention of the students in the subject is not up to the mark. There may be many reasons for that but the experts suggest that the main reason of it is that the physics is taught with the traditional lecture method and new methods of teaching are totally rejected. This situation calls for a change in the teaching method of physics. The method of teaching in the science curriculum should be such that it compel the students on thinking, and through their efforts, interests and practical work the student be able to reach the conclusion.

Therefore the resent study was undertaken to see whether the computer assisted instructions method of teaching physics by using the computer programs, in different modes of CAI (Drill and practice, tutorial, problem-solving, Games and simulation and discovery learning) has a positive role in enhancing the interest and retention of the secondary school students.

### **STATEMENT OF THE PROBLEM**

In the resent study Role of CAI on the interest and retention of students at secondary school level in the subject of physics has been investigated.

### **OBJECTIVES OF THE STUDY**

The main objectives of the study were to:

1. To explore the role of CAI in enhancing the interest of students at secondary school level
2. To explore the role of CAI in maintaining the learning retention of the students at secondary school level
3. To investigate the effects of location (Rural and Urban) on the interest and retention of students.

### **SIGNIFICANCE OF THE STUDY**

Although there are lots of research studies in the area of educational technology but there is a lack of research in this specific area in Pakistan therefore this study specifically focuses the effectiveness of technology in the educational discipline in the developing countries like Pakistan.

In the absence of research of incorporating educational technology in the educational discipline in Pakistan and specifically on this specific topic to investigate the role of CAI on the interest and retention in the subject of physics this study will play the role of candle in the real darkness. In the last two decades there are arguments on whether to integrate the technology in the educational discipline and how to integrate it to gain more effective results (Hoyer, 2005).

In developed countries the effectiveness of CAI is established in various fields like mathematics, nursing, science and languages but in developing countries the studies in the field of educational technology can be counted on the finger tips. In developed countries the quality of education is being

made by practicing different innovative techniques but in countries like Pakistan this study will encourage educationist for the implementation of CAI in the education discipline.

It is the age of technology and technology has been incorporated in different fields of life to make the effective output. There is also rapid advancement of computer technologies in different parts of the world. This rapid development of computer technologies and software development convinced the educators to change their traditional ways of teaching (Bitter & Pierson, 1999).

To face the challenges of future every nation struggles to improve their system of education so this study which is exploring new dimensions of educational technology is an attempt in this direction.

## CONTEXT AND REVIEW OF RELATED LITERATURE

The content is just like the body and the method is just like the soul in the body. The body without soul is of no importance therefore the teaching without the proper method of teaching has zero value. In the lower level grades the drill and practice method is effective and fruitful while at the higher stages the method should be according to the demands of the subject and the interest of the students (Tishna, 1997, p.195).

Majority of the studies which are conducted on the role and effectiveness of computer assisted instructions are in line with the present study. A view of some of the studies is presented here; CAI in its any form provides chances for learning by doing. Learning by doing is more effective than learning by watching the teacher. Also in CAI program, students are more interested (Iqbal, 1999, p.142). Drill and practice promotes the acquisition of knowledge or skill (Digital, 1984, p.23). Discovery learning encourage participation, arouse awareness and interest (Bichler & Snowman, 1986). When drills are used inappropriately, then often give impression that science is difficult (Woerne *et al.*, 1991, p.23)

Motivation and interest of the students play an important role in the teaching learning process. In comparison of computer assisted instructions with the traditional lecture method experts suggest that the lesson becomes interesting with the use of computer assisted instructions, CAI programs motivate the students and arouse their interest in teaching learning process (Iqbal, 1999, p.24).

Time of the class play an important role in the teaching learning process, in the traditional lecture method teaching is teacher centered and most of the time teacher speaks and the students are passive listeners, whereas in the computer assisted instructions the learning time is reduced when compared to regular classes (Ellington and et-al, 1993). The potential advantage of CAI is better and faster learning, learning at the students own pace, and better instruction, eliminating routine drudgery for the teacher, and thereby allowing her more time for "true" teaching (Margolin & Misch, 1970; Gerard 1967; Filep, 1967). Alpert & Bitzer (1970), describing their evaluation of the Plato system, state that the interactive capacity of the computer absorbs the attention and encourages the total involvement of students of all ages and grade levels. One of the advantages of using CML is improvement of motivation. Initially children are keen to have their turn and therefore motivation is high. Even after long use of computer, motivation level does not fall. Increased motivation does mean better individual performance (Michael, 1989, p.160).

According to Iqbal (2000, p.129) There are two major types of CAI-adjunct (first used by Victor Bunderson) and Primary. Adjunct CAI consists of materials that supplement or enrich the learning situation e.g. short CAI programmes. Primary CAI materials conversely provide instructions of a substitute and of usually longer duration. It is also part of distance learning throughout the world.

Contribution of CAI is made through different teaching strategies: Drill and practice, dialogue, testing, problem solving, games simulations and discovery learning, for detail, each will be discussed with its specific characteristics.

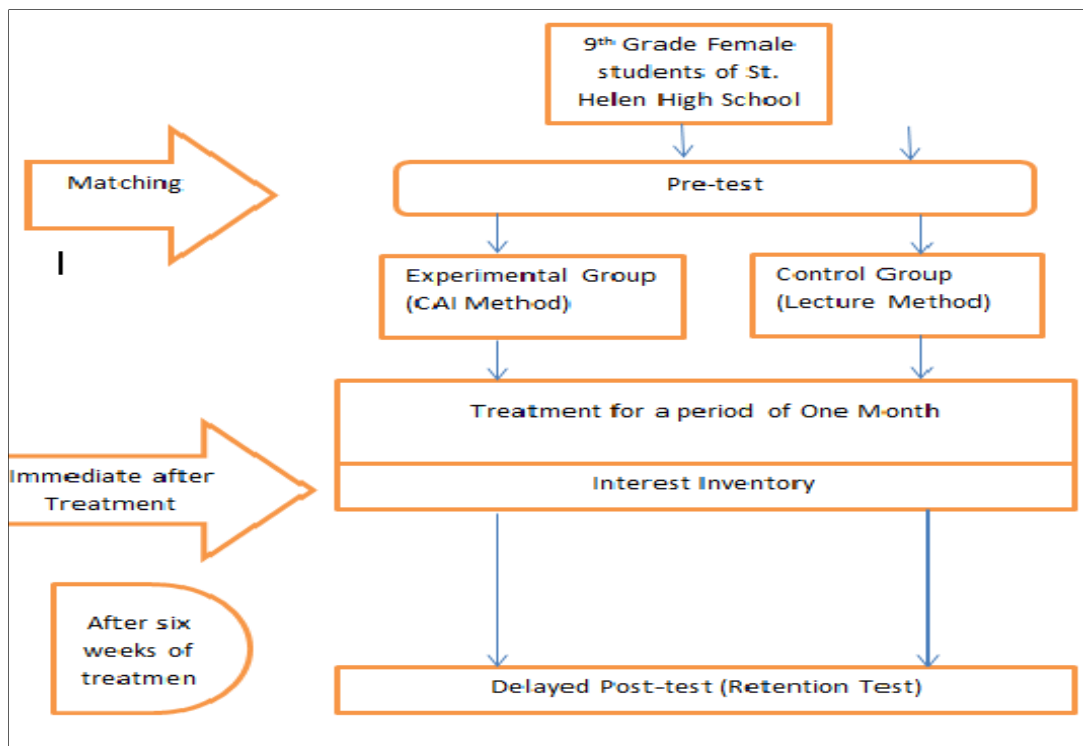
The power of computer in the shape of computer assisted Instructions is yet to be utilized but Tinker (1987, p.66) view it "a radical new approach in the schools instruction throughout the entire curriculum. As the hardware and the software technology mature, there are new possibilities for broad-scale, technologically enhanced changes in the mathematics and science curriculum" (Aggrawal, 1995, p.352).



**Figure 1. Different Modes of CAI**

Traditionally, teachers have assumed that students learn science subjects through lectures, assignment reading, problem sets, and lab work. Yet we have all been frustrated by the frequent failure of our students to learn basic concepts of science. Because of the pace and large enrollment of many science courses, students are often not able to discuss and reflect on difficult materials. Evidence is mounting that these traditional methods are less effective than we once thought in helping our students to develop understanding of the science concepts that we are teaching (Siddiqui, 2005, p.250).

**RESEARCH METHODOLOGY**



**Figure 2. Research Design of the study**

## Population

All the 9<sup>th</sup> grade students of Government High and Higher Secondary Schools of Dera Ismail Khan City comprise the population of the study.

## Sample

In this experimental study St.Helen High School of Dera Ismail Khan was selected as the sample out of the six Government High and Higher Secondary Schools of the Dera Ismail Khan city. The school was selected on random basis using draw method technique. 80 Female students of St. Helen High School were selected as the sample of the study. These 80 students were divided into two groups on the basis of pre-test and matched pair sampling. One group was randomly assigned as the experimental group and the other as control group.

Similarly two teachers similar in qualification, teaching experience, age, socio-economic status and their reputation at the school were selected for the teaching purpose. One teacher was randomly assigned as the experimental group teacher and the other as the control group teacher.

## HYPOTHESIS

Following research hypothesis were tested:

Ho1: There is no significant difference in the Interest of the students taught physics through computer assisted instructions and through traditional lecture method.

Ho2: There is no significant difference in the Retention of the students taught physics through computer assisted instructions and through traditional lecture method.

Ho3: There is no significant difference in the interest of rural and urban students.

Ho4: There is no significant difference in the learning retention of rural and urban students.

## INSTRUMENT

Following instruments were used for the study.

- Teacher made objective type achievement test (pre-test) to divide the sample into two equal groups.
- Interest inventory to check the interest of the students in both control and experimental groups.
- Teacher made objective type achievement test for retention (Delayed Post-test) to check the achievement of both the experimental and control groups after experiment.

## PROCEDURE

A sample of 80 students was divided into two equivalent groups on the basis of academic achievement test (Pre-test). One group was called the experimental group and the other as control group. The experimental group was taught using the computer assisted instructions and the control group was taught using the traditional lecture method. The duration of the experiment was one month. After treatment interest inventory was administered to both the control and experimental groups. The delayed-post test for retention was administered six weeks after the treatment to check the retention of concepts (As shown in the Fig. 2)

The following formula was used to convert the interest inventory scores into average scores.

$$\text{AVERAGE SCORE} = \frac{\text{SA} \times 5 + \text{A} \times 4 + \text{U} \times 3 + \text{D} \times 2 + \text{SD} \times 1}{\text{Total No of responses}}$$

Where SA = strongly agree

A= agree

U= Undecided

D= Disagree

SD= strongly disagree

## RESEARCH STATISTICS

Mean, Standard deviation and the difference between two means independent sample t-statistic was applied (using SPSS 16.0 version) to compare interest and retention in two different methods of instructions.

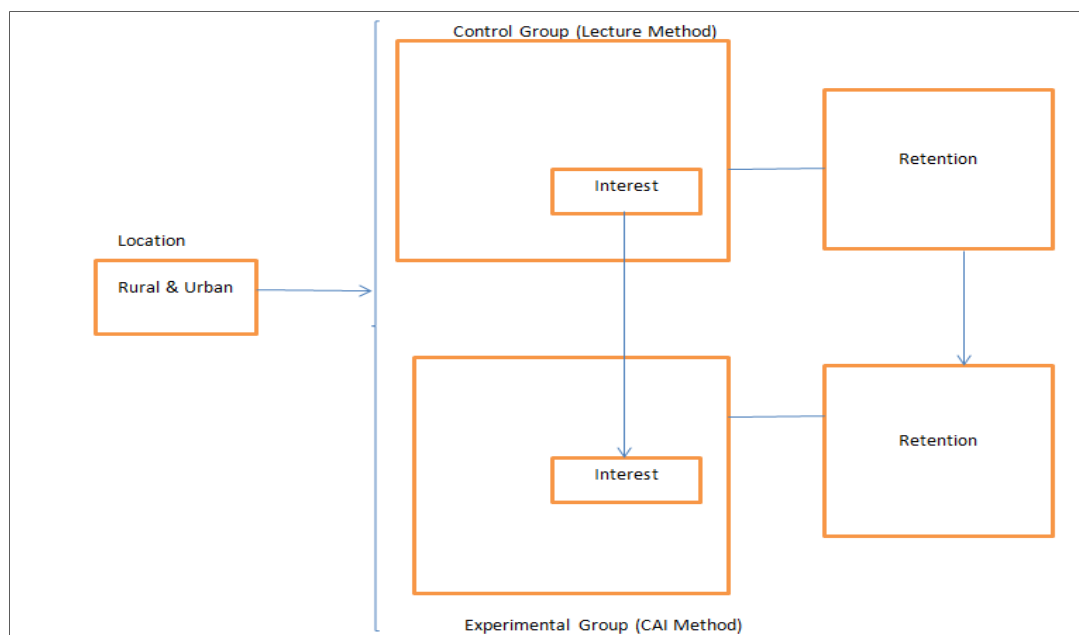


Figure 3. Theoretical Model of the study

## FINDINGS

Table 1. Mean Interest Inventory Score (Control and Experimental) Groups

Variable	N	Mean	SD	t	df	p-value
CG	40	3.3	.71	8.1	78	.000*
EG	40	4.2	.70			

\* Significant at 0.05 level

The above table shows the Mean, Standard Deviation t-value and p-value of both the control and experimental group. The t-value computed which is 8.1 > tabulated value 1.976 at the 0.05 level of significance. Also the p value 0.000 is < 0.05 which means that the first null hypothesis of no significant difference between the Interests of the students taught physics through computer assisted instructions and through traditional lecture is rejected.

Table 2. Mean Retention-test Score (Control and Experimental) Groups

Variable	N	Mean	SD	t	df	p-value
CG	40	19	6	5.91	78	.000*
EG	40	25	7			

\* Significant at 0.05 level

The above table shows the Mean, Standard Deviation and t-value of both the control and experimental group. The t-value computed which is 5.91 > tabulated value 1.976 at the 0.05 level of significance. Also the p value 0.000 is < 0.05 which means that the second null hypothesis of no significant

difference in the Retention of the students taught physics through computer assisted instructions and through traditional lecture method is rejected.

**Table 3. Mean Location (Rural & Urban) differences on Interest-inventory**

Variable	N	Mean	SD	t	df	p-value
Rural	40	4.21	0.546	2.075	78	0.03*
Urban	40	4.439	0.404			

\*Significant at 0.05 level

Table above shows that the mean, standard deviation, t-value and p value of the two groups. The computed t-value 2.0754 of the two independent groups is greater than the tabulated value (1.976) at the 0.05 level of significance. Also the p value is less than 0.05 which clearly means that there is a significant difference between the rural and urban students on the interest inventory. Therefore the third null hypothesis that there is no significant difference in the interest of rural and urban students is rejected.

**Table 4. Mean Location (Rural & Urban) differences on Retention-Test**

Variable	N	Mean	SD	t	df	p-value
Rural	40	21.02	7.78	-1.458	78	0.147*
Urban	40	22.80	7.0			

\*Not Significant at 0.05 level

The above table shows that Mean, Standard deviation, t-value, and p-value of both the groups. The p-value .147 is greater than 0.05 level of significance. Also the t-value calculated which is -1.458 is less than the t-value tabulated 1.976 at 0.05 levels, which clearly means that there is no significant difference between the rural and urban students on the Retention-test. Therefore the fourth null hypothesis that there is no significant difference in the learning retention of rural and urban students is accepted.

## CONCLUSION

In Table-1 the t-value computed which is 8.1 is greater than the t-value tabulated 1.976 at the 0.05 level of significance. Also the p value 0.000 is < 0.05 which means that the first null hypothesis  $H_01$  stating no significant difference between interests of students taught through CAI and through Traditional method is rejected. The table also shows that students in the computer assisted group were more interested as compared to traditional lecture class students. This means that CAI is best method in enhancing the interest of students in the teaching learning process.

In Table-2 the t-value computed which is 5.91 is greater than the tabulated value 1.976 at the 0.05 level of significance. Also the p value 0.000 is < 0.05 which means that the second null hypothesis  $H_02$  stating no significant difference between the retention of students taught through CAI and through Traditional method is rejected. The table also shows that students in the experimental group performed significantly better than control group in the academic achievement (retention-test). This means that CAI enhances the learning retention more than the traditional lecture method at secondary school level in the subject of physics.

Table-3 shows that there is a significant difference between the rural and the urban students. The Urban students were better on interest than the rural students. Therefore the third null hypothesis  $H_03$  stating no significant difference in the interest of rural and urban students was rejected.

Table-4 shows that there is no significant difference between the rural and urban students on retention. Therefore the fourth null hypothesis  $H_04$  stating no significant difference in the learning retention of rural and urban is accepted.



## DISCUSSION

### Interest

As the result of the resent study regarding the interest of students indicate that CAI method increases the interest of the students as compared to the traditional lecture method. Also there is a significant difference between the interest of rural and urban students.

The interest results of the present study are supported by number of studies. A research conducted by Krnel & Bajd (2009) support the result of the present study by saying that CAI programs produce the interest and motivate the students in the teaching learning process.

Research conducted by Achor *et al.*, (2010) on interest and achievement of 158 boys and 129 girls from six out of the 46 secondary schools in Gwer-West LGA of Benue state, Nigeria using games and simulation modes of CAI, shows that there was a significant difference in the interest of male and female students.

A research conducted by Saka (2011) to see the effect of CAI on the academic achievement, interest and attitude of the 159, 9th and 10th grade students in different high schools in Trabzon, shows that CAI was effective in increasing the interest, academic achievement and positive attitude towards learning.

The recent study conducted by Wang *et al.*, (2012) also advocates the present study. According to them the CAI increase the interest of the students and also increases enjoyment and motivation.

### Retention

As the result of the resent study regarding the retention of students indicate that CAI method increases the learning retention of the students as compared to the traditional lecture method. Also there is no significant difference between the retention of rural and urban students.

These retention results of the present study are supported by number of studies. The Kadhivaran & Suresk (2003) conducted a research on the impact of computer with peer interaction on learning Physics the result shows that CAI is effective in enhancing the Retention of learners in the subject of physics.

The Naidr *et al.*, (2004) conducted a study on Long-term retention of knowledge after a distance course in medical informatics at Charles University Prague, the result shows that there was 67% retention of concepts after 12 months using CAI method.

The Akengin (2011) conducted a study on Comparing traditional and computer assisted education in the teaching of color to 6th grade students and determination of its retention. The scores of the retention of education by computer assisted and traditional methods are respectively (Mean = 39.15) and (Mean = 32.40), the difference between the scores of the groups is found to be statistically significant.

## REFERENCES

- Achor *et al.*, (2010). Sex differentials in students' achievement and interest in Geometry using games and simulation Techniques. *Electronic Journal of Science and Mathematics Education* Vol. 4, Issue 1, June 2010, pp. 1-10. Retrieved June 14, 2012
- Aggaraval, J.C. (1995). *Essentials of Educational technology: Teaching and Learning*. Vikas Publishing House pvt.Ltd.
- Akcaay *et al.*, (2006). Effects of computer based learning on student's attitude and achievement towards analytical chemistry. *TOJET, The Turkish Online Journal of Educational Technology*, volume 5 Issue 1 Article 6, Retrieved June12, 2012
- Akengin, G. (2011). Comparing traditional and computer assisted education in the teaching of color to 6th grade students and determination of its retention. *Educational Research and Reviews*, Vol. 6 (5), pp. 432-435, Available online at <http://www.academicjournals.org/ERR>



- Biehler, R.F. and Snowman, J. (1986). *Psychology Applied to Teaching*. Boston: Houghton Mifflin Company.
- Bitter, G.G. and Pierson, M.E. (1999). *Using Technology in the classroom*. Fourth Edition. Boston: Allyn and Bacon.
- Digital Equipment Corporation (T984) *Instruction to Computer Based Education* Marlborough, M.A.
- Ellington, H. *et al.*, (1993). *Handbook of Educational Technology*. London: Kagan page Ltd.
- Eng, T.S. (2005). The impact of ICT on learning: A review of research. *International Education Journal*, 6(5), 635-650. ISSN 1443-1475, Shannon Research Press.
- Hoyer, J. (2005). *Technology integration in education: the dilemma of shifting*
- Iqbal, J. (1999). *Allied Material on Computer in Education*, Allama Iqbal Open University. Islamabad: S.T Printers, p.128-300.
- Iqbal, J. (2000). *Computer in Education*, Allama Iqbal Open University. Islamabad: S.T Printers.
- Kadhiravan, S. and Suresh, V. (2003). The impact of computer with peer interaction on learning Physics. *Indian Journal of Open University, India*.
- Kausar *et al.*, (2010). A Comparative study to evaluate the effectiveness of CAI vs. Classroom lecture for computer science at ICS level. *TOJET, The Turkish Online Journal of Educational Technology*, volume 7 Issue 4 Article 2, Retrieved July 05, 2012.
- Krnel, D. and Bajd, B. (2009). Learning and E-materials. *Acta Didacta Journal*, volume 2, no 1. Retrieved April 20, 2012.
- Kulik, C.C. and Kulik, J. (1991). Effectiveness of computer based instruction: an updated analysis. *Computers in Human Behavior*, Vol. 7, pp. 75-94
- Muraina *et al.*, (2011). Computer Assisted Instruction For Teaching /Learning Process and Its Effects On Students' Performance in Tertiary Institutions. *International Journal of Computer Trends and Technology*, Sep to Oct Issue 2011.
- Mangal, S.K. and Mangal, U. (2011). *Essentials of Educational Technology*. HI Learning rivate ltd. P.2
- Naidr *et al.*, (2004). Long-term retention of knowledge after a distance course in medical informatics at Charles University Prague: <http://www.ncbi.nlm.nih.gov/pubmed/15388381> Paradigms. *International Journal of Learning*, Retrieved May 10, 2012, (6), 1-8.
- Saka, A.Z. (2011). Investigation of Student-Centered Teaching Applications of Physics Student Teachers, *Eurasian J. Phys. Chem. Educ.*, Jan (Special Issue):51-58 retrieved May 10, 2012
- Serin, O. (2011). The Effects of the computer based Instructions on the Achievement and problem solving skills of the science and technology students. *TOJET: The Turkish Online Journal of Educational Technology*, January 2011, volume 10 Issue 1, retrieved June 20, 2012
- Siddiqui, M.H. (2005). *Techniques of Classroom teaching*. Volume 1, p.1-54. New Delhi: APH Publishing corporation, offset printers.
- Tishna, A. (1997). *Curriculum and Teaching*, volume 1, Lahore: Yousaf Mukhtar Printing Press. p.135-246.
- Wang *et al.*, (2012). A computer assisted instruction system with a vision-based interactive interface for children. *International Journal of Humanities and Arts Computing* 6.1-2 (2012): 172-183
- Woerner, J.J. *et al.*, (1991). *The Computer in the Science Curriculum*. New York: McGraw Hill Publishing Company.
- Yesilyurt, M. (2011). Meta-analysis of computer assisted studies: a sample of turkey. *Energy Education Science and Technology*, Part B: Social and Educational Studies. 2011 Volume (issue) 3(2): 173-182 retrieved May 15, 2012.