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Effects of E-Learning Media on Cognitive Skills Enhancement of Students

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Abstract *The significant time that leraners spend on using e-learning media for teaching learning purpose at schools and homes creates some thought provoking questions like how the use of e-learning media may influence cognitive skills enhancement?, and if it does have influence, then how much? The study evaluates the effects of e-learning media on cognitive skills enhancement of science students respectively, and compares the impact of e-learning media on cognitive skills enhancement of male & female science learners. The study is experimental in nature. Results of the study are tested at significance level alpha: α = 0.05. After conducting pre-tests, treatment and post-tests, it is found that the post-test results of male and female science students are better than their pre-test. It is also found that the cognitive skills enhancement score of both genders of students of experimental group is higher than the score of both genders of students of control group on the basis of post-tests scores. It is also found that there was no difference between cognitive skills enhancement score of male students of experimental group and that of female students of experimental group on the basis of post-tests scores. Consequently, it is concluded that the use of e-learning media has considerable positive effect on the achievement of male and female science students and it enhances their cognitive skills, but no considerable difference was observed between the cognitive skills enhancement of male and female students using e learning media.*

Key Words:

E-Learning media, Traditional classroom, E-learning media based classroom, Effects, Cognitive Skills, Cognitive Skills Enhancement

Introduction

The use of educational media and especially e-learning media in the field of education has become a norm. The integration of e-learning media in the educational discipline has wonderful potentials to provide the best possible

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outcomes equally for both the trainers and learners in classroom (Isman, Baytekin, Balkan, Horzum & Kiyici, 2002). The use of electronic technology for learning keeps students and trainers active, motivated and involves them in learning practice; to build and enhance knowledge and comprehension, to find out variety of solutions (Ozmen, 2008). Technology performs an eminent role in the education of human beings, makes learning activities pleasant and resultantly ensures meaningful learning. The rapid development of e-learning resources like computer and information technologies including hardware and software convinced the educators to change their traditional ways of teaching learning process and use emerging innovations in education for better results of students (Bitter & Pierson, 2009).

Related Studies

E-learning media have positively impacted education as well as teachers' education in general and students' performance / achievements in the society in particular. Olojo (2012) narrated that media is a vast, flourishing and a huge potentials. In lengthy research conducted in the year 1996 till 2008, he discovered that by using e-learning technology/media students achieved good results than the students without it. According to Mayer (2001), theory of E-learning explains the principles of cognitive science of useful multimedia based learning using educational equipments. Study of cognition suggests that the choosing of appropriate use of multimedia may enhance learning, like the application of some other principles.

Holmes and Gardner (2006) described that e-learning facilitates connectivity by engaging learners for locating information and resources, regarding educational opportunities; it helps developing a range of skills, promote credibility and confidentiality through evaluation of the quality of digital education resources by locating needed information in the boundless domain of cyberspace a learner assimilates appropriate information, and by appreciating the transformative cultural potential of technologies he/she realizes needs of collaboration and networking as described cross cultural delivery of e-learning. Lajoie (2000) argue that there are a number of learner centred online opportunities having maximized option and flexibility for acquiring new knowledge and skills anytime and everywhere. Thus e-learning manages online interactions to maximize learning opportunities, creates cohesive learning communities and encourages active learning. Nick Bostrom(2009) narrated that the scale of cognitive augmentation comprise of not only medical involvement but also psychosomatic interference such as learned techniques or intellectual strategies as well as enhancement of external technological and institutional organization that sustain cognition.

Results of one study revealed that KG kids were on the target, ninty percent

of the time on computer work. PCs also provide repeated motivation Computers let students to busy autonomously at choice and speed (Parette et al., 2000). Scaffolding is very essential in enhancing cognitive skills and software programs often give wide spread scaffolding of learning. By using PC kids join in virtual games and use variables that are not possible possible in the real world (Scoter et al., 2001). Researchers found that using a PC with helping activity promote kids potentials more .Attainment of skills such as logical thinking and team work are the positive impact of technology. Polly (2011) described that tools has been revealed positive influence learner learning when learners discover equipment based tasks reqiirs HOTs. Balannskat (2006) said that different studies explain that effect of ICT on the progress of competency particularly, team work, self-regulating learning and HOTS In the year 2000, a study organized by the SIIA(Software and Information Industry Association), Sivin-Kachala and Bialo (2000) evaluated total 311 researches on the usefulness of ICT on students' performance and achievement. Their results exposed encouraging and consistent patterns when students were exposed and involved in technology rich situations, comprising considerable achievements in all subject areas, improved achievement in Pre School through high school for both regular and special needs students, and enhanced attitudes toward learning and improved self-esteem.

Researches conducted by (Perez-Prado and Thirunarayanan 2002) also revealed that learners can gain from technology improved shared learning modes and the students centered learning. COM (Challenging Our Minds) is a system used for cognitive skills augmentation. This system was made particularly for use with children of about six to eighteen years age. Dr Odie Bracy, a clinical neuropsychologist made this system based on research on cognitive skills enhancement.The project was started in the year 1990 in an Indiana middle school, Yorktown, USA. The findings of the project disclosed that the learning process becomes easier and pleasing because the student is better equipped, then the learning process is less boring and a lot more advantages for the child performance. Total 86 per cent of educators in Europe stated that students are higher stimulated & thoughtful when in classrooms PCs are used. ICT has a positive and great effects, manners, process and communication skills (Balannskat, 2006).

In Japan a report (2002) published by the NIM education, revealed that exposing learners to educational technology based curriculum has an important and encouraging effect on students achievements in different main subjects like science, mathematics, social study and other fields of education particularly in terms of their level of knowledge, comprehension, practical and presentation skills. Case research by Khuram (2015) discovered the teachers' views on the application of visual tools like animation videos, pictures; films and projectors increase motivation, the attention of in literary texts. It was found that the most of the students the teachers had optimistic opinions of the use of visual aids in

increasing attention of students and obtaining better scores. Study reveals that disclosure to the increase of images may have shared to the incresea in scores of inteluctual in the previoust century (Flynn, 1994). Balanskat (2006) described that learners presume better learning when tools of ICT, functioning more freely and successfully. Different researches conducted on CAI on the attention and withholding (Liaqat & Umar Ali, 2012, p.336), effects of CAL on students(Atif, 2014, p.272), effects of PC on students attitude and achievements (Husamettin & Burak, 2006, p.44), the influence of CAI on students achievement(Muzammila and Murad, 2011, p.426) and the effects of the computer based instructions on the achievements and problems solving skills of technical education learners(Oguz Serin, 2011, p.183) showed positive impact of technology on different cognitive and social skills enhancement ofstudents. Studies on the differences in academic achievements of male and female learners explain various findings, whereas significant variation exists in some other studies. While some studies show no differences between male and female students.

Statement of the Problem

In teaching learning process, still it is not clear and debates are going on that whether e-Learning media is really helpful in enhancing students' cognitive skills or not. The objectives were; to evaluate the effects of E-Learning media on cognitive skills enhancement of male science students at secondary level, to measure the effects of E-Learning media on cognitive skills enhancement of female science students at secondary level and to look at the diversity between the usefulness of E-Learning media on cognitive skills enhancement of male science students and female science students at secondary level.

H_o1: There is no significant difference between the cognitive skills enhancement of male science students exposed to e-learning media and those male science students who were exposed to traditional learning media at secondary level.

H_o2: There is no significant difference between the cognitive skills enhancement of female science students exposed to e-learning media and those female science students who were exposed to traditional learning media at secondary level

H_o3: There is no significant difference between the cognitive skills enhancement of male science and female science students exposed to e-Learning media at secondary level.

Methodology

To evaluate the effects of e-learning media on cognitive skills enhancement of

secondary level students, experimental study was conducted. The design selected by the researcher of study is given in symbolic representation is as:

R1 O1 E O2

R2 O3 C O4 Where as

R1 = Randomly selected experimental sample group
R2 = Randomly selected control sample group
O1 = Observation of experimental group/test scores (pre-test)
O3 = Observation of control group/test scores (pre-test)
E = Experimental group treatment (teaching with EL media in e learning class)
C = Traditional group treatment (teaching with Traditional way in traditional class)
O2 = Observation of experimental group/test scores (post-test)
O4 = Observation of control group/ test scores (post-test)

Population And Sample Of The Study

It was taken from KPK province genderwise students and teachers of science groups of the secondary level classes. Total enrolment was 11212 in class-9 and their respective 315 science teachers.

Purposive/convenience sampling practice was adopted. It was selected from two schools, one each from district Peshawar and district Nowshera. Total sample size of 320 science students was taken. The total sample was separated into two equal sets through pair random sampling techniques. Each experimental and control group was consist of 160 students (80 male and 80 female). Also 08 science teachers, similar in qualification and teaching experience, were selected as research assistants for the teaching and treatment purpose.

Instruments

The following tools were used:

a. Researcher-made Pre-tests in the subject of Physics of Class-9 was prepared and conducted.
b. Researcher-made tests were administered to determine the differences of cognitive skills enhancement of students.

Data Analysis of the Study

The data were tabulated, analysed and interpreted by numerical method applying different statistical tools. For making decision regarding accepting or rejection of

null hypotheses, calculated the mean scores, standard deviations, variances and t-tests of the data collected. T-test was used because it is commonly used for independent samples. Significance level alpha: $\alpha = 0.05$ was used for testing hypothesis. SPSS Version-17 and MS-Excel Version-16 were used for the analysis of the data.

To evaluate the effectiveness of e-learning media on cognitive skills' enhancement of male and female students, the following hypothesis were tested and the data analysis was given in the subsequent tables and paragraphs:-

(A) Testing Of Hypothesis

H_o1:

Table 1. Difference Between the Scores of Exp Group & Cont Groups on Pre-Test With Respect to Cognitive Skills' Enhancement of Male Science Students

Groups	N	Mean	SD	δ^2	df	p Value	t-value	
							Table value	Calculated value
Male EG (Pre test)	80	10.725	3.958	15.670	158	0.302	1.654	0.518
Male CG (Pre test)	80	11.037	3.661	13.403				

Table No.1 illustrates that the cal(t) is < the tab(t), p = 0.302 is > $\alpha = 0.05$. Therefore, hypothesis $H_0$1 was accepted because no difference between the scores(mean) was found.

H_o2:

Table 2. Difference between the Scores of the Exp and Control Group on Pre-Test with Respect to Cognitive Skills' Enhancement of Female Students

Groups	N	Mean	SD	δ^2	df	p Value	t-value	
							Table value	Calculated value
Female EG (Pre-test)	80	11.762	3.242	10.512	158	0.391	1.654	0.276
Female CG (Pre-test)	80	11.912	3.600	12.966				

Table 2 illustrates that the cal(t) is < the tab(t). Moreover, p is greater than α. Therefore, hypothesis $H_0$2 was accepted because no difference between the scores(mean) was found.

H_o3:

Table 3. Difference between the scores of the male (exp) and female (exp) groups on pre-test with respect to cognitive skills' enhancement.

Groups	N	Mean	SD	δ^2	df	p Value	t-value	
							Table value	Calculated value
Male EG (Pre test)	80	10.725	3.958	15.670	158	0.035	1.654	1.813
Female EG (Pre test)	80	11.762	3.242	10.512				

Table 3 illustrates that cal(t) is > the tab(t). Moreover, p is less than α. Therefore, hypothesis $H_0$3 was rejected because difference between the scores(mean) was found.

(B) Control and Experimental Groups Comparision (Pre Test & Post Test)

H_o1. There is no difference between the Pre-test & Post-test scores of male control groups.

Table 4.

Groups	N	Mean	SD	δ^2	df	p-value	t-value	
							Table Value	Calculated Value
Male CG (Pre Test)	80	11.037	3.661	13.404	155	3.835^{-41} Appx= 0	1.654	18.407
Male CG (Post Test)	77	21.987	3.792	14.381				

Table 4 illustrates the cal (t) is greater than the tab (t). Moreover, p is less than α. Therefore, hypothesis **Ho1** was rejected because significant difference were found between the scores (mean) of male control groups on pre test & post tests.

H_o2. No difference between the scores of male exp groups

Table 5.

Groups	N	Mean	SD	δ^2	df	p-value	t-value	
							Table Value	Calculated Value
Male EG (Pre Test)	80	10.725	3.958	15.670	155	3.3^{-71} Appx= 0	1.654	32.398
Male EG (Post Test)	77	29.143	3.093	9.571				

Table 5 illustrates calculated t is greater than the tabulated t. Moreover, p is less than α. Therefore, hypothesis **Ho2** was rejected because difference was found between the scores of male (exp group) on pre-test & post-test.

H_o3.

Table 6.

Groups	N	Mean	SD	δ^2	df	p-value	t-value	
							Table Value	Calculated Value
Female CG (Pre Test)	80	11.912	3.600	12.966	155	2.131^{-39} Appx= 0	1.654	17.718
Female CG (Post Test)	77	22.558	3.925	15.407				

Table 6. Cal t is greater than the tab t. Moreover, p is less than α. Therefore, hypothesis **Ho3** was rejected because difference was found between the scores of pre-test & post test of female (control groups). Therefore, it is concluded that female control group Post test score was more than the female control group Pre test scores with respect to their cognitive skills' enhancement.

H_o4: There is no t difference between Exp groups of female

Table 7.

Groups	N	Mean	SD	δ^2	df	p-value	t-value	
							Table Value	Calculated Value
Female EG (Pre Test)	80	11.762	3.242	10.512	155	8.467^{-70} Appx= 0	1.654	31.627
Female EG (Post Test)	77	28.727	3.477	12.095				

Table 7 illustrates, the cal t is greater than the tab t. Moreover, p is less than α. Therefore, hypothesis **Ho4** was rejected because difference was found between the scores of pre-test & post-test of female (exp groups).

(C) Testing Of Hypotheses of Post-Test Scores

H_o1:

Table 8:

Groups	N	Mean	SD	δ^2	df	p-value	t-value	
							Table Value	Calculated Value
Male EG (Post Test)	77	29.142	3.093	09.571	152	2.685^{-26} Appx=0	1.654	12.830
Male CG (Post Test)	77	21.987	3.792	14.381				

Table 8 illustrates, Cal t is > the tab t. Moreover, p is less than α = 0.05 Therefore, hypothesis Ho1 was rejected because difference was found between the scores of male (exp and cont groups).

Ho2:

Table 9:

Groups	N	Mean	SD	δ^2	df	p Value	t-value	
							Table value	Calculated value
Female EG (Post Test)	77	28.727	3.4778	12.095	152	$1.47E^{-19}$ Appx= 0	1.654	10.321
Female CG (Post Test)	77	22.558	3.9252	15.407				

Table 9 depicts that the cal t is > the tab t. Moreover, p is less than α. Therefore, hypothesis Ho2 was rejected because difference between the scores of female exp and female cont groups were found.

H_o3:

Table 10:

Groups	N	Mean	SD	δ^2	df	p Value	t-value	
							Table value	Calculated value
Male EG (Post Test)	77	29.142	3.093	9.571	152	0.217	1.654	0.783
Female EG (Post Test)	77	28.727	3.477	12.095				

Table 10 illustrates, the cal t is < the tab t. Moreover, p= 0.217 is greater than α = 0.05 . Therefore, hypothesis $H_0$3 was accepted because no difference was found between the scores of (exp male and exp) female groups.

Findings

The findings made from the study were:-

(A) Testing of Hypotheses of Above Section-A

1. No difference was observed between the cognitive skills enhancement of male (exp group) and male (cont group) on pre-test (Table 1).
2. No difference was observed between cognitive skills enhancement of female (exp group) and female (contl group) on pre-test (Table 2).

3. Female science students (experimental group) insignificantly outscored male science students (experimental group) with respect to their prior cognitive skills' enhancement on pre-test (Table 3).

(B) Comparison of Above Section

4. Difference was found between the scores (pre & post test) of male control groups, as the male cont grps (post test scores) were higher than the male control group (pre test scores) (Table 4).
5. Difference was observed between the pre test & post test of male exp groups, as male (exp group) post test were more than the male (exp group) pre test results (Table 5).
6. Significant difference of female control groups (pre & post test) was noted as female control group post test scores were higher than the female control group (pre test scores) (Table 6).
7. Difference was noted between the pre & post test scores of female (exp groups), as female exp group post test results were more than the female exp group (pre test). (Table 7).

(C) Testing of Hypotheses of Above Section-C

8. Difference was noted between cognitive skills enhancement scores of male science students exp group and control group on post-test, as male expl group post test scores was more than the male control group post test scores(Table 8).
9. Difference was noted between cognitive skills enhancement of female science students (exp group) and (cont group) on post-test, as female exp group post test was more than the female (control group) post test achievements. (Table 9).
10. No difference was observed between the cognitive skills enhancement/post test scores of male science students (exp group) and cognitive skills enhancement/post test scores of female science students (exp group) on post-test (Table 10)

Discussion

The present study has explored how the science students' cognitive skills are augmented by e-learning media. The analyses depend on quantitative data and testing of null hypotheses. Also only science students of specific age and level were taken in the study. This indicates some cause and effects relationship between e-learning media and cognitive skills enhancement. However, the concept of students' cognitive skills improvement is a vast and complex area;

therefore further researchwork in the future is requiredto explore new vistabof the abovementioned skills. The null hypothesis: **Ho1 and Ho2** of research study were discarded. Therefore, it was concluded that the students' cognitive skills enhancement scores when using e-learning media was enhanced than those who were educated through conventional teaching learning process. The results of this study confirmed the views of different authors cited in literature who were the views that technology, computer based teaching, e-learning media and ICT tools enhance students grades/achievements and resultantly enhance their cognitive skills.

Moreover, the null hypothesis: **Ho3** of research study was accepted. The study suggests that the cognitive skills enhancement of male and female were same. So the current study did not expose any significant gender differences in cognitive skills' enhancement. The ground for unsurprising was that, differences between two genders in the academic performance demonstrate mixed results. While some studies infer that considerable differences exist in, others researches find no differences. However, the results of this experimental part of the study confirmed the views of some writers who have the opinions that the lack of differences in achievements between male and female is not surprising.

In over all, the results of the present study under investigation provided support to previous literature and research studies conducted regarding the effects of computer technology, audio-video devices, technology, computer assisted instructions and other different e-learning media and ICT tools and their impact on students performance, learners achievements, learners attitude and retentions, learners and problem solving skills, gender differences, etc. But the findings of these studies have to be interpreted cautiously. Thus it cannot be suggested from the current study and previous studies conducted on the related topics that e-learning media always aid cognitive skills enhancement in different situations and environments. The results of each study may be slightly different to one another.

However, keeping in view the relationships and dissimilarities in the findings of the different research studies conducted before this study in the same disciplines, one can say that generalization of the present study may be made. Furthermore, researches in the social sciences are never final version of the problem. Therefore, future ideas will identify cognitive skills relatation to e-learning media and, also what type of e-learning media is more useful for learning success and enhancement of cognitive skills. Nevertheless, the results are broadly consistents with other findings, guiding to suggestions that the findings can be generalized. In today modern world of science and technology and emerging innovations, it is apparent that e-learning resources is an integeral part of the whole process of learning and education discipline. Therefore, the study has provided a number of insight, guiding principles and caution for conducting research study in the future.

Conclusion

It was concluded from the post-test scores, that male students of experimental group taught through e-learning media outscored the male students of control group. It was also concluded from the resultd of post tests, that female (exp group) outscored the female (control group). Also no difference was found between male and female studenst. So a difference was observed between the cognitive skills enhancement of male (exp group) and male (control group) on the basis of post-test scores. It was also concluded that there was a difference between the cognitive skills enhancement of female (exp group) and female (control group) on the basis of post-test scores. It was also concluded that there was no difference between the cognitive skills' enhancement of male and female learners of experimental group on the basis of post-test. Therefore the current study did not expose any significant gender differences in cognitive skills' enhancement using e-learning media.

Study Recommendations

On the basis of research study the Government should increase the funds and related facilities of E- Learning and its infrastructures at secondary level.

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