The Impact of Electronic Learning on the Biological Education: A review

Ashwak I. AL-Obaedi
AL-Iraqia University- Research & Islamic Studies Center. Baghdad, Iraq

تأثير التعليم الألكتروني على التعلم البيولوجي : مقال مراجعة

أشواق أبراهيم بشير

الجامعة العراقية / مركز البحوث والدراسات الإسلامية

الملخص

هذه الدراسة تتحرى عن تأثير أستخدام التعليم الألكتروني في تدريس العلوم، والدور المهم لأستخدام تكنلوجيا المعلومات والأتصالات في التعليم والتعلم. و تستعرض بعض المساهمات التي تم أجراؤها من قبل العديد من المؤسسات والباحثين حول مفهوم التعليم الألكتروني. كما تكشف النقاب عن بعض الأراء التي شاركها الناس على مستوى العالم حول التكيف ودمج تقنيات التعليم الألكتروني في التعليم من خلال استعراض المراجع وغيرها من الملاحظات. وبينت هذه الدراسة تعاريف التعليم الألكتروني كما قدمها مختلف الباحثين والدور الذي يلعبه التعليم الألكتروني في التعليم العالي في العمليات التي لها علاقة في عملية التعلم، وكما تتضمن هذه الدراسة مزايا وعيوب أعتماده وتنفيذه.

Abstract

This study investigates the efficiency of using electronic learning in science teaching, and the important role of use information and communication technologies for teaching and learning. This study is reviewing some contributions made by various institutions and researches on the concept of electronic learning. It exposes some views which people have shared globally on the adoption and blending of electronic learning technologies in education through literature review and other observations. It shows at the definitions of electronic learning which have given by different researchers and the role that electronic learning plays in higher educational in relation to learning and teaching processes, this includes the advantages and disadvantages of electronic learning and its adoption and implementation .

Key words: Information and Communication Technologies (ICT), E-learning Biological Education.

Introduction

One of the teaching methods of science is lecture, which was severely criticized by many researchers for encouraging passive learning in the learning process and it does not enable the students to make their own understanding (1), ignoring individual differences, needs of the learners, critical thinking and not paying attention to problem solving (2). They also certain that the unstimulating teaching methods which adopted by science teachers lead not only to low achievement in the sciences but also to disabled students from developing required skills necessary for originative thinking .

Improving technology was imparted large facility together in every field from health to education and from military to industry, especially the prevalence and spread of computer technology and the usability for multipurpose targets supply not only speed and economy but also the sound and visible chance. (3).The growth of technology and the technological products being brought with them forced education systems to be varied and put on new ones to means and tools used(٤)

Internet was one of the essential ways to make available resources to learning and research for both teachers and students to participate and gain information (5). Electronic learning (e-learning) which based on technology contain the use of internet and other important technologies to control courses in an organization, make materials for learning and teaching the learner .(٦)

Now a days, the students are growing with visible apparatus such as: computer, video, television and internet. It is impossible to get these students interest by traditional methods of teaching used in the past. The development of technology have resulted in a big gap between the methods of teaching at school and of getting the information in society at the end quarter of 20th century.(٧)

Science and Technology

Science and Technology were always known as the critical factors in the development process. Through the application, services all over the world and the country resources were transformed into good (8) noticed that the way of development in the science and technology were very influenced the living of human being who is ignorant of the basic known of these developments to live empty, senseless, and possibly unrealistic life (9) found that for any nation to gain the status of self- reliance, the science must be an important constituent of the knowing to be given to all people of that nation regardless sex, race and creed .

Biology was considered as an essential part of natural science which is needed for the breakthrough of our population technology. Nsofor, 2010 (10), was reported that biology covers a wide range, serves as a spring board for many future careers in science end technology and has application in nearly every field of life. Biological education was faced many challenges over the years. Studies shown high enrolment rates and low achievement of students in the internal and external of biological examination (11, 12). Ibe, 2004 (13) referred that noticeable deterioration in students achievements in biology must have been provided by the strategies of teaching biology.

In diverse field of study, the Internet has been largely applied by teachers to advance students learning results (14), science is no exclusion. Therefore, the Internet-based science instruction has been widely applied, and students learning methods and results of Internet-based science learning environments (ISLEs) have been increasingly taking into consider by teachers and researchers in science education (15). ISLEs have been applied in numerous forms, such as the uses of online resources, discussion forums, simulation/animation, online game-based learning, and video -conferencing.

The learning environmental of science teaching was conducted in three types: classroom, laboratory and outdoors (16). The significance of science classroom learning environment (SCLE) was recognized by many teachers and researchers during the past two decades. The main criteria for a science learning environment would depend on many factors, such as the needs of the students and the characteristics of the science program (17). Online teaching and learning can also contribute to a good learning science environment and can bring about good science education standards through proper designing and effective utilization of technology .

Applications of Information and Communication Technology (ICT) in Science Education

The importance of ICT in our society today is very wide. Adebayo, 2010 (18) was pointed that ICTs is a necessary part of modern society, allows access to information anywhere in the world, support the networking which is not restricted by border, culture and language, developing societies and spreading knowledge. ICT provide people the mean to organize themselves and produce cultural codes to represent themselves.(١٩)

Several applications of ICT in learning and teaching depending on the knowing of the user. Nguyen and Williams (2012) (20) classification of these application in the teaching classroom contain the resources of learning, instructional organization of learning and communication .

The classifications made use of educational computer- based testing system, software, e-mail system, telephone, internet, radio etc… Commonly ICT will be applicable in Computed Aided Design (CAD), Library Computer System (LCS), Computer Assisted Instruction (CAI) and Teleconferences .

These applications were conducted on biological education whereby computers which help students to imaging objects that are difficult or impossible to view, such as computer can be used to show human anatomy, internal structure of human and animal cells. The software are already developed that shows the actions of viruses and bacteria which if teacher were to teach such, a part from the danger case to the health of teacher and student, these microorganisms cannot be well learnt without seen them in action.(٢١)

Inadequate financial support, teacher factors, and corruption and insecurity are the major problems against the application in the learning of science

The Role of ICT in Biology Education

Natural science was presented special learning and teaching opportunities. The experimentation, practical orientation and the advantages of an interdisciplinary method can be observed as possibilities for a more effective transfer of the curriculum and for supporting known gaining. In the issue of biology, the application and practice of the required knowledge, as well as allowing the student to use their knowledge in daily life, are the key consideration. Hence, it is important that teachers may develop methods of biological education with the most effective methods. The biology classes of university are often taught in one large group, the ICT enabled online questionnaires, and hundreds of student can be reached simultaneously.(٢٢)

Kubiatko, 2006 (23) pointed that the use of ICT by biology teachers on 270 Slovakian students from 9 schools filled out questionnaires. According to the students, there is a big difference between teachers with the regard to the didactic tools used. The use of presentation and projectors proved to be very common, but in certain case these tools were not used in biological classes at all. The students were also asked to indicate the purpose of the use of ICT by the teacher. Two responses were marked with an exceptionally high frequency, namely the introduction of a new topic (34.44%) and the complete lack of ICTs (35.19%). This study showed that the use of ICT in biological lessons was very limited .(٢٣)

As Rotbain et al, 2008 (24). Proved in there study, a better understanding of the abstract of molecular biology concept and processes can be achieved by the students by using computer animation. Students preferred ICT because it helped them to imaging the processes. The efficiency of booklets made the lessons more interesting for them. They also emphasized the tasks, repeatability as a positive contributor of their studies .(٢٤)

The Concept and Definition of E -learning

Concept of e -learning was involved in the applications, learning methods and processes (25). The term e - learning was referred to the use of variety types of information and communication technologies (ICT) and electronic strategies in education. It is a common term for learning and teaching activity that uses network or any electronic strategies completely or only partially. E -learning is alternating from the traditional education to ICT- based personalized and flexible education systems. E –learning was also referred to as digital education, distance learning, virtual education, Internet based training (IBT), web - based training (WBT), computer - based training (CBT) or technologically improved learning depending on the assurance of the delivery method or the components. The form of delivered learning materials may be images, text, animations video lessons or even a computer program.(٢٧ ,٢٦)

Types of E-learning

Depending on the use of the source or the delivery medium, e- learning can be of different types :
•Online completely: no face - to - face meetings
•Blended learning: distance learning or a gathering of online and face - to - face
•Synchronous: the instructor was led online courses
•Asynchronous: personal – placed education methods placed on the network, internet or storage devices
 •Teacher- led group: distance education where students from different locations and study from an individual teacher
 •Personal - study: education by visiting lessons or websites information
 •Personal - study with topic matter professionals: education by visiting orderly some professionals blogs or up- to - date sites
 •Web based: education purely by looking up on the Internet with the use of search engines or social media groups such as Facebook
 •Computer based: education by retrieving study materials from diverse storage devices like USB or CD ROM in the computer
 •Video/audio tape: education by retrieving multimedia files concluded from YouTube or any other video/audio sharing websites .(٢٩ ,٢٨)

Why is E -learning Important for High Education?

The student who using Information and Communication Technologies (ICTs) are using e-learning. These technologies support variety types of skill such as; easy access to digital form of materials which is absent locally, search and transactional data, adaptive lesson or reactive analytic. ICTs were considered as a good tools for original talent and design, data analysis, support self-education, simulating the scientific system, and communication with the teacher and other learning(٣٠)

The improvement of information technologies and multimedia, and the use internet as a new technique of teaching, has made essential changes in the traditional methods of teaching (31). Improvement in the technological information was generated more selections for today education (32). Programs of educational institutions and school have recognized e-learning as having the probability to transform people, knowledge, performance and skills (33). Love and Fry, 2006 (34) pointed that colleges, universities, and other institutions of higher education are racing to advance online course ability in a speedily developing cyber education market. E-learning was become very important in college and institutions of higher education. The development and extension of the range of e-learning tools has been starting numerous changes in higher education, mainly when it comes to their instructive delivery and support procedures .(٣٥)

 Advantages and Disadvantages of E -learning

1 -Advantages or Benefits of E-learning

 The adoption of e -learning in education, especially for higher educational has several benefits, and given its several advantages and benefits. Numerous studies were supplied the benefits and advantages resulting from the adoption of e-learning technologies into schools .(٣٨ ,٣٧ ,٣٦)

Several studies give benefit of e-learning as its capability to focus on the requirements of individual learners. Marc, 2002 (38) was mentioned in his book review on e-learning strategies for delivering knowledge in digital age pointed that one of the benefits of e-learning in education it its focus on the requirements of individual learners as an significant factor in the process of education rather than on the teacher needs. Several advantages of e-learning in education, obtained from the literature review includes the following :

1 .It is a flexible way for learning because the time and place are taken into consideration .

2 .E -learning promote the efficiency of knowledge and qualifications .

3 .It is able to provide a chance for relations between learners by the use of discussion meeting. E -learning exclude the barriers that have the potential of hindering participation containing the fear of talking to other learners. E learning stimulates students to interact with other, discussion different point of views. E-learning facilities communication and also increases the relationships that sustain learning.

4 -E -learning is usually a cost- efficient way of learning for most students as they can choose from a large range of courses and make the selection depending on their needs .

5 .E -learning always takings into consideration the individual differences among learners .

6 .E -learning helps less expenses for deficiency of academic staff, including teachers, facilitators, lab technicians etc …

7 .E-Learning allows self-pacing. For example the asynchronous way allows each student to study at the own pace and speed whether slow or quick .(٣٩)

The previous benefits of e-learning has been summarized by Holmes and Gardner, 2006 (40) by noting that the ability of e-learning to estimate the students as they learn, and increasing their understandings in education, through suitable interaction to education of community, eradicating boundaries of place and time, and cultural diversity and globalization .

 The effect of e-learning on educational ethics according to Khan (2005) (41) are ensured. Due to the tolerance of e-learning environmental, good ways of proposing equal access to the information world regardless the location of the users so their ages, race and their ethnic origins (41). The environment for e-learning also helps students to depend on themselves for the reason that teachers are no longer the lonely known source. They instead become advisors and guides .(٤٢)

  Zhang et al, 2006 (43) and Judahil et al, 2007 (44) gave the positive effect of e-learning from the perspectives of the students or learners. Zhang et al, 2006 (43) was pointed that e-learning licenses the exploration of much flexible learning ways with much reduced need for travel to go to classes. Brown et al, 2008 (45) and Judahil et al, 2007 (44) were noted that e –learning was offered the teachers with some ways of interacting with students and to give them instantaneous feedback. E -learning is essential for those who embrace the advanced technology during the procedure of learning and teaching has a variety of skills in Information and Communication Technology .(٤٤)

2 -Disadvantages of E-learning

 Despite of the benefits of e –learning in education, several studies support that e-learning have some disadvantages (46, 47, 48). For instance: Dowling et al. (2003) (48) argued that making learning resources available online results in improved learning results only for specific forms of collective assessment. Mayes (2002) asked a question if the e - learning is simply a support device for existing methods of teaching. The most perceptible condemnation of e-Learning is the complete absence of vital personal relations, not only between learners and teachers, but also among coworker learners (49, 50). Irrespective of all the disadvantages of e-learning, there are a lot of benefits which stimulate its use and also induce the search for ways to reduce disadvantages (51). The disadvantages of e-learning were obtained from studies include the following :

1 .E -learning was made the learners tolerate remoteness, contemplation, and lack of relation .

2 .E -learning was less effective method compared with traditional method of learning .

3 .Tests in the e-learning are most likely done with the use of proxy, it will be difficult if not impossible to control or regulate bad activities such as cheating .

4 .E-learning may similarly be misled to piracy and plagiarism, predisposed by insufficient selection skills, in addition to the ease of copy and paste .

5 .E-learning may also deteriorate universities role socialization role and similarly the role of instructors as the directors of the method of education .

6 .Furthermore not all fields or discipline can employ the e-learning technique in education. For example the purely scientific fields that include practical cannot be appropriately studies through e-learning. Researches have claimed that e-learning is more suitable in social science and humanities than the fields like medical science and pharmacy, where there is the need to improve practical skills .

7 .E-learning may similarly lead to heavy use of some websites. This may bring about unexpected costs both in time and money disadvantages (٥١, ٤٧, ٤٦)

 Virtual Laboratory in Teaching Biology

The experiments in science laboratories can expose students to danger especially when it includes the use of microorganism sample and chemical reagents. Several accidents that might happen when conducting experiments in the laboratories such as electrical shocks, burns, gas leaks, adverse chemical reactions and infections (52). So, the use of information and communication technologies for teaching science objects such as biology, Physics and chemistry because these objects involve many practical. Though the hands-on activities are considered significant for a student. Using computers as education materials contain: computer learning packages for lesson and review, web sites, virtual laboratories (VL) also let students to engage the experiment which are not available in the lab. VL is easier inexpensive and can interest student attention in the teaching method.(٥٣)

Some studies were carried out on the impact of virtual laboratory on students performance. Kerr, et al, 2004 (54) pointed that pupils performance in chemistry was developed when taught using virtual laboratory. Murniza, et al, 2010 (55) noted that virtual laboratory developed pupils performance in biology. The potential benefits of virtual laboratory environment for science practical cannot be underestimated in the contemporary world. Virtual laboratory was made the students more active in their learning, offer opportunities for them to construct and understand difficult ideas more easily. Moreover, it affords the learners some opportunities to overcome mistakes that occur as a result of such laboratory conditions or misuse of the laboratory and enable them to easily overcome the possible dangers that can be seen in the real laboratory conditions.(٥٦, ٥٧)

Pyatt and Sims, 2012 (58) explain that using virtual laboratory increases motivation and desire for the lectures in the process of learning .

In review of empirical studies on virtual laboratory, Tatli and Ayas, 2012 (59) found significant improvement in the performance of students exposed to virtual laboratory. Tuysuz, 2010 (60) found that virtual laboratory made positive effects on student performance compared to traditional laboratory method. Karamustafaoglu, Aydin and Ozmen, 2005 (56) found that the teaching by the virtual laboratory package with an applied dynamic system is more successful than the teaching implement by Research in Curriculum Studies (RICs) traditional laboratory method. The use of computer-simulated experiments and interactive video disc simulation in science education classrooms develop students problem solving ability and other higher -order thinking skills when compared to traditional science laboratory activities .(٦١)

In contrast Jimoyiannis and Komis, 2000 (62); Bayrak, Kanlı & Kandilİngeç, 2007 (63) did not detect any variance between the performance of students taught with traditional laboratory and those taught with virtual laboratory method. Likewise, Moslehpour, 1993 (64) pointed no important difference between the students taught using conventional class laboratory method and those taught using computer simulation in an electronics class laboratory. Finally, most studies from developed countries show that virtual laboratory could be an active instructional apparatus for enhancing students' achievement in sciences.

Conclusions

Hundreds of universities, continuing education institutes, and countless commercial organizations are turning to online learning for very valid reasons. Online learning does provide the opportunity to reach new markets both for selling their program and educating students. Lifelong learning in the 21st century can be characterized by the convergence of diverse global learners using web-based technology tools to develop and sustain virtual communities of practice. Virtual communities can link geographically and demographically various individuals from higher education, school and the workplace to collaboratively attain common purposes or resolve real problems. Online program or courses to be benefits, successful and limitations to the organization and to the student should be appropriately balanced. It is important not only to focus on the costs of developing and delivering an online course or program, but also to focus on potential performance and value added benefits to both the institution and more importantly to the student.

E-learning include the use of smart tools for teaching and learning. It enable the use of technological tools to learners study in anytime and anywhere. It eases communication and improves the relationships that sustain learning. Despite some challenges discussed, the literature has sought to explain the role of e-learning in particular and how e-learning has made a strong impact in teaching and learning. The overall literature which explains the advantages and disadvantages of e-learning suggests the need for its implementation in higher education for faculty, administrators and students to enjoy the full benefits that come with its adoption and implementation.

Reference

1 -Oke, M. (2005).An overview of some practical approaches/teaching strategies for teaching and learning of Genetic concepts. In Ango, M.L., O deyemi, J.O,Nwosu, A.A & Etokebe, L.J.(Eds).STAN Biology Panel Series, pp7-10.STAN Publication.

2 -Hannum, W., & Brig gs, L. (1982). How does instructional system design differ from traditional instruction? Educational Technology, 22(1), 9-14.

3 -Demirci, A. (2009). How do Teachers Approach New Technologied: Geography Teachers Attitude towards Geographic Information System (GIS). European Journal Educational Studies, 1(1), 210-213.

4 -Anonim, (2007). Science technology and Society. http//www.wikipdia.com/ Science technology and Society (diakses tanggal 20 Februri 2008).

5 -Richard, H., & Haya, A. (2009). Examining student decision to adopt web 2.0 technologies: theory and empirical tests. Journal of computing in higher education, 21(3), 183-198.

6 -Fry, K. (2001). E-learning markets and providers: some issues and prospects. Education Training, pp233-239.

7 -Chukwuedozie, B. C. (2016). Effect of Computer Assisted Instruction on Secondary School Students Achievement and Interest in Chemistry in Nassarawa Educational Zine, Kano State. Faculty of Education, Ahmadu Bello University, Zaria.

8 -Abudulkadir, A. A. (2011). Youths' Interest in Business and Technical Skill Acquisition. It's Implication for National Development. Journal of Science Technology and Mathematics Education, 7 (3), 238-244 .

9 -Nsofor, C. C. (2001). Cultural Impediments on Women in Science, Technology and Mathematics Education. 42nd Annual Conference Proceeding of STAN Ilorin.

10 -Nsofor, C. C. (2010). Effects of Improvised Instructional Media on Secondary School Students' Achievement in Biology Concepts in Niger State. An Unpublished Ph.D Thesis, Department of Science Education, Federal University of Technology, Minna.

11 -Kareem, L. O. (2003). Effects of audio – graphic self -instructional packages on Senior secondary school students' performance in biology in Ilorin, Nigeria. Unpublished Ph.D Thesis, Faculty of Education, University of Ilorin, Ilorin.

12 -Ezekannaya, G. N., & Ikeagu, C. N. (2004). Constraints on STM Research Effectiveness in Nigeria. Proceedings of the 45th Annual Conference Of STAN.

13 -Ibe, E. (2004). Effects of Guided - Inquiry and Demonstration on Science Process Skills Acquisition among Biology Secondary school Students. Unpublished M. ED. Thesis University of Nigeria, Nsukka.

14 -Tsai, C.-C. (2001b). A review and discussion of epistemological commitments, metacognition, and critical thinking with suggestions on their enhancement in Internet-assisted chemistry classrooms. Journal of Chemical Education, 78, 970–974 .

15 -Riffell, S., & Sibley, D. (2005). Using web-based instruction to improve large undergraduate biology courses: An evaluation of a hybrid course format. Computers & Education, 44(3), 217–235.

16 -Orion, N., Hofstein, A., Tamir, P., & Giddings, G. J. (1997). Development and validation of an instrument for assessing the learning instrument for assessing the learning environment of outdoor science activities. Science Education, 81 (2), 161-171.

17 -National Research Council. (1996a). National science education standards. Washington, D. C.: National Academy Press.

18 -Adebayo, S.A. (2010). Meeting the challenges of special education through ICT as a means of achieving sustainable development in Nigeria. South- West Journal of Teacher Education, 3, 299-308.

19 -Ajayi, I. A & Ojo, F. F. (2010). Information and communication technology: a catalyst for democratized system of government. South- West Journal of Teacher Education, 3, 692-708.

20 -Nguyen, N, Williams, J & Nguyen, T. (2012). The use of ICT in teaching tertiary physics: technology and pedagogy. Asia-Pacific Forum on Science Learning and Teaching.13 (2) Article 6, 1

21 -Aina, J. K, (2013). Effective Teaching and Learning in Science Education through Information and Communication Technology [ICT]. IOSR Journal of Research & Method in Education (IOSR-JRME), 2(5), 43-47.

22 -Tanner, L. (2004). Moving theory into practice: A reflection on teaching a large, introductory biology course of majors. CBE Life Sciences Education,10 (2),113-122 .

23 -Kubiatko, M., Halakova, Z. (2009). Slovak high school students' attitude to ICT using in biology lesson. Computer in Human Behavior, 25(3), 743-748.

24 -Rotbain, Y., Marbach-Ad, G., &Stavy, R. (2008). Using a computer animation to teach high school molecular biology. Journal of Science Education and Technology, 17(1), 49-58.

25 -Rossi.P.G. (2009). Learning environment with artificial intelligence elements. Journal of e-learning and knowledge society, 5(1), 67-75.

26 -Ghana Ministry of Education (2008). ICT in Education. November, Accra: Ghana

27 -Webb, J. P. (2000). Technology: a tool for the learning environment, campus- wide information system, 18(2), 73-8.

28 -Zeitoun, H. (2008). E-learning: Concept, Issues, Application, Evaluation. Riyadh: Dar Alsolateah publication.

29 -McCombs, B. (2011). Leaner-Centered Practices: Providing the Context for Positive Learner Development, Motivation, and Achievement (Chapter 7). Handbook of Research on school, Schooling, and Human Development. Mahwah, NJ: Eribaum.

30 -Laurillard, D. (2002). Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies (2nd edition) (London: RoutledgeFalmer).

31 -Wang, Y. S., Wang, Y. M., Lin, H. H., & Tang, T. I. (2003). Determinants of user acceptance of Internet banking: An empirical study. International Journal of Service Industry Management, 14, 501–519.

32 -Yang, N. & Arjomand, L. H. (1999). "Opportunities and Challenges in Computer- Mediated Business Education: An Exploratory Investigation of Online Programs," Academy of Educational Leadership Journal, 3 (2), 17-29.

33 -Gupta, M. & Lata, P. (2014). Effectiveness of IT-enabled Instructional pack-age (ITEIP) on science achievement of X class students in relation to their gender. British J. Educ., 2(4), 17-30.

34 -Love, N. & Fry, N. (2006). Accounting Students Perceptions of a Virtual Learning Environment: Springboard or Safety Net? Accounting Education: An International Journal, 15 (2), 151-166.

35 -Dublin, L. (2003). If you only look under the street lamps. Or nine e-Learning Myths. The e-Learning developer journal. http://www.e Learning guild.com.

36 -Klein, D. & Ware, M. (2003). E-learning: new opportunities in continuing professional development. Learned publishing, 16 (1) 34-46.

37 -Algahtani, A.F. (2011). Evaluating the Effectiveness of the E-learning Experience in Some Universities in Saudi Arabia from Male Students' Perceptions, Durham theses, Durham University.

38 -Marc, J. R. (2002). Book review: e-learning strategies for delivering knowledge in the digital age. Internet and Higher Education, 5, 185-188.

39 -Amer, T. (2007). E-learning and Education, Cairo: Dar Alshehab publication.

40 -Holmes, B. & Gardner, J. (2006). E-Learning: Concepts and Practice, London: SAGE Publications.

41 -Khan, B. H. (2005). Managing E-learning: Design, Delivery, Implementation and Evaluation, Hershey, PA: Information Science Publishing.

42 -Alsalem, A. (2004). Educational Technology and E-learning, Riyadh: Alroshd publication.

43 -Zhang, D., ZHOU, L., BrIggs, R. & Nunamaker, J. (2006). Instructional video in e-learning: Assessing the impact of interactive video on learning effectiveness. Information & Management, 43 (1), 15-27.

44 -JuhadiI, N., Samah, A & Sarah, H. (2007). Use of Technology, Job Characteristics and work outcomes: A case of Unitary Instructors. International Review of business Research papers, 3 (2)184-203.

45 -Brown, C., Thomas, H., Merwe, A. & Dyk, L. (2008). The impact of South Africa's ICT Infrastructure on higher Education. [Online]. Available athttp://sun025.sun.ac.za. Accessed on 27/02/2014

46 -Collins, J., Hammond, M. & Wellington, J. (1997).Teaching and Learning with Multimedia, London: Routledge.

47 -Hameed, S. Badii, A. & Cullen, A. J. (2008). Effective e-learning integration with traditional learning in a blended learning environment. European and Mediterranean conference on information system-٢٥) , .(٢٦

48 -Dowling, C., Godfrey, J. M. & Gyles N. (2003). "Do Hybrid Flexible Delivery Teaching Methods Improve Accounting Students' Learning Outcomes," Accounting Education:An International Journal, 12 (4), 373-391.

49 -Burdman, P. (1998). Cyber U. Anaheim (California) Orange County Register, September 13, sec. 1, p. 9.

50 -Young, J. R. (1997). Rethinking the Role of the Professor in an Age of High-Tech Tools," The Chronicle of Higher Education, 44.(٦)

51 -Almosa, A. & Almubarak, A. (2005). E-learning Foundations and Applications, Saudi Arabia: Riyadh.

52 -Kurikulum, P. P. (1999). Siri Panduan Ke Arah Peningkatan Mutu Pendidikan Sains Pengurusan dan Keselamatan Makmal Sains Sekolah. Kuala Lumpur: Kementerian Pendidikan Malaysia .

53 -Muhamad, M., Zaman, H. B & Ahmad, A. (2012). Virtual Biology Laboratory (VLab-Bio): Scenario-based Learning Approach. Procedia - Social and Behavioral Sciences, 69,162 – 168

-٥٤ Kerr, M.S., Rynearson, K. & Kerr, M.C. (2004). Innovative educational practice: using virtual labs in the secondary classroom. J. Educators Online, 1(1), 1-9.

55 -Murniza, M., Halimah, B., & Azlina, A. (2010). Virtual laboratory for learning biology – a preliminary investigation. Word Academy Science, Engineering & Technology, 1, 272-575.

56 -Karamustafaoğlu, O., Aydın, M. & Özmen, H. (2005). Bilgisayar destekli fizik etkinliklerinin oğrenci kaza nımlarına etkisi: BasitHarmonik hareketorneği. The Turkish. Online Journal of Educational Technology, 4 (4), 67-81.

57 -Kerr, M. S., Rynearson, K. & Kerr, M. C. (2004). Innovative educational practice: using virtual labs in the secondary classroom, The Journal of Educators Online, 1(1) 1- 9.

58 -Pyatt, K. & Sims, R. (2012). Virtual and physical experimentation in inquiry- based science labs: Attitudes, performance and access. Journal of Science Education and Technology, 21(1), 133-147.

59 -Tatli, Z. & Ayas, A. (2012). Virtual chemistry laboratory: Effect of constructivist learning environment. Turkish Online Journal of Distance Education, 13(1), 183-199 .

60 -Tuysuz, C. (2010). The effect of the virtual laboratory on students' achievement and attitude in chemistry. International Online Journal of Educational Sciences, 2010, 2 (1), 37 -53 .

61 -Van- LeJeune, J. (2002). A meta-analysis of outcomes from the use of computer simulated experiments in science education. Unpublished Ph.D dissertation, Texas A&M University.

62 -Jimoyiannis, A. &Komis, V. (2000). Computer simulations in physics teaching and learning: A case study on students' understanding of trajectory motion. Computers & Education, 36, 183 -204.

63 -Bayrak, B., Kanlı, U. & Kandilİngeç, Ş. (2007). To compare the effects of computer based learning and the laboratory based learning on students' achievement regarding electric circuits. The Turkish Online Journal of Educational Technology, 6(1), 15 -24.

64 -Moslehpour, S. (1993). A comparison of achievement resulting from learning electronics concepts by computer simulation versus traditional laboratory instruction. Unpublished doctoral dissertation, Iowa State University.