International Journal of Integrated Research in Education (IJIRE) www.ijired.com

Ukeh et al. Ijired
Vol. 2 (2)
Pg 110-117 (2020)

Integrating YouTube Tutorials in teaching of Computer Programming course: Effects on Students' Achievement and Interest

[3] Okechukwu, Oliver, [6]Orie, Maduabuchukwu John,[4]Eziokwu, Patricia Nkiruka,[5]Onovo, Nonso Emmanuel, [2]Okeke, Henry Kelechi and [1]Ukeh, Bartholomew Oluchi,.

[1,2,3,5]Department of Mathematics and Computer Education, Enugu State University of Science and Technology (ESUT), Enugu, Nigeria
[4]Department of Computer Education, Annunciation Secondary School Nkwo Nike, Enugu
[6]Department of Computer and Robotics Education, Federal College of Education (Technical), Omoku Rivers State

ARTICLE INFO

Article history:
Received Ocotber 10, 2020
Received in revised form October 28, 2020
Accepted Novermber 13, 2020
Available online December 18, 2020

Keywords:
YouTube
Multimedia
Computer Programming
Achievement
Interest

Corresponding author's email :
ukehbartholuchi@gmail.com

https://doi.org/10.36265.ijired.2020.020215

Www.ijired.com

ABSTRACT

This study sought to ascertain the effect of integrating YouTube in teaching and learning of computer programming course on students' achievement and interest. The study adopted pre-test, post-test quasi experimental design while the area of the study is Enugu State, Nigeria. From a population of 1,600 undergraduate students offering Computer Education course in seven Colleges of Education. 180 first-year students were drawn from two government-owned institutions which were purposively sampled. Two instruments known as Computer Programming Achievement Test (CPAT) and Computer Programming Interest Inventory (CPII) were developed by the researcher and validated by two Computer Educationists from Enugu State University of Science and Technology (ESUT) and one Measurement and Evaluation expert from the same institution. Reliability coefficients of 0.82 and 0.78 were determined for CPAT and CII using Pearson Product Moment Correlation and Cronbach Alpha respectively. Mean and standard deviation were used for answering the research questions while Analysis of Covariance was used to test the hypotheses. The results revealed that the students who were taught computer programming by integrating YouTube in the teaching process recorded increased achievement and interest than their counterparts who were taught with the conventional teaching approach. The test of hypotheses also showed that the mean differences in achievement and interest were significant, in favor of the students in the experimental group. Recommendations were presented

1.0 Introduction

The content and process of education has evolved due to the advent of Information and Communication Technology (ICT). What is taught in schools, as well as how they are taught, have recorded tremendous improvements over the years. ICT is, therefore, considered as one of the most significant offspring of Science and Technology;

and has largely permeated, if not improved, every aspect of human endeavour. United Nations Educational, Scientific and Cultural Organization (UNESCO) in Ratheeswari, (2018) defined ICT as a scientific, technological and engineering discipline and management technique used in handling information, its application and association with social, economic and cultural matters. Integration of ICT in education has led to several remarkable progresses among which are increased collaboration among scholar's globally thereby, paving ways for borderless exchange of ideas and information. Learners are also not left out, as they are enabled to access and share information from different sources. This leads to enhanced retention of the learnt contents thus enhancing attainment of set educational objectives.

The persistent use of conventional teacher-centered methods for teaching has been reported to make students passive, rather than active learners. Researchers such as Ahmed (2008), Ahmed and Abimbola (2011), Umar (2011) and Gambari, Yaki, Gana and Ughovwa (2014) submitted that the popularly used teacher-centered method does not promote insightful learning and long–term retention of some abstract concepts. As a measure to address this anomaly, there has been the growing calls for, as well as experimental trials of alternative methods. One of such alternatives is the integration of ICT in the teaching process.

Today's students are born into the digital age (Duvenger & Steffes, 2012). They have spent most of their lives surrounded by digital communication technology. They represent the first generation to grow up with this new technology and have been characterized by their familiarity and confidence with respect to ICT (Gallardo-Echenique, Maques-Molias, Bullen & Strijbos, 2015). As a generation of hyper-connected learners, they consider web-based technologies integral to the information gathering process (Buzzetto-More, 2013) with a particular preference for user generated content (Jones & Shao, 2011). One of the most widely consumed web-based contents among today's learners is social media (Okeke, 2017). The video streaming platform "YouTube" is a social media that has grown in popularity over the past ten years, including its use in the classroom as an educational tool (Fleck, Beckman, Sterns & Hussey, 2014; Okeke, 2017).

Social media has been shown to be effective for learning. Learners, according to DeWitt, Alias, Siraj, Yaakub, Ayob and Ishak (2013), are able to develop higher level thinking skills such as decision making and problem solving, as well as communicate and collaborate using social media. In addition, connections can be made to what they learnt in their classrooms and learning becomes more engaging. Research suggests that targeted YouTube videos enhance the engagement, depth of understanding, and the overall satisfaction of students (Buzzetto-More, 2015).

YouTube is an online video-sharing platform which allows users to upload, view, rate, share, add to playlists, report, comment on videos, and subscribe to other users. It offers a wide variety of user-generated and corporate media videos comprising of contents such as video blogging, short original videos, and educational videos etc. Although much of the content on YouTube is for entertainment purposes, there exists an enormity of educational content (Gupta, 2019). Evidence suggests that YouTube as an educational tool has extended to the medical field, field of language learning, educator training, and has been used to promote cross-cultural understanding (Fleck, et al., 2014). With such broad applicability, YouTube has become an integral part of the education system.

Buzzetto-More (2015) revealed that the incorporation of YouTube in course instruction enhanced students' learning efficacy and increased engagement. The study also found that course delivery method impacts student opinion, students who favor fully online instruction demonstrate a predilection to want YouTube integrated into course instruction. The students also considered course-embedded videos more favorably than traditional lessons. Zboun, Al Ghammaz and Al Zboun (2018) cited the possible uses of YouTube in the educational process, stating that YouTube videos can be used directly in the classroom as part of the teaching process. They can be used to introduce new concepts, display information during instruction, or at the end of the lesson to confirm points. YouTube videos can also be used as an educational resource, where the teacher uses the video as a model for classroom activities and discussions. It, therefore, becomes imperative to attempt to integrate it in the teaching of various courses, with the aim of improving students' achievement and interest.

The effectiveness of online video in enhancing academic achievement has been established by a number of studies. A study sponsored by Cisco Systems (Greenberg & Zanetis, 2012) found online videos to be an educational "enabler and complimentary tool" in the teaching and learning process

that stimulates greater interactivity with content, increased engagement, more rigorous discourse, enhanced knowledge transfer, and memory building - the result of which is increased neural development and academic performance. The study further concluded that contemporary students are visual spatial learners who are motivated by, and able to multi-task with multimedia. They are, thus, inspired and motivated by online video usage (Greenberg & Zanetis, 2012). Also, examining the impact on learning, Berk (2009) as cited in Buzzetto-More (2014), concluded that the verbal and visual components of a video provide a best fit to the characteristics of the "Net Generation" of students and a valid approach to tap their multiple intelligences and learning styles. Berk's assertions are similar to the findings of Miller (2009) who examined the incorporation of multimedia content in a sociology course, concluding that educational videos help students to conceptualize key ideas so as to enhance understanding.

Programming is the act of coding in a given language to instruct the computer to solve a problem (Adeniyi, 2005; and Okeke, 2010). A programming language is a set of specialized notation for communicating with the computer system; typical examples are BASIC, FORTRAN, COBOL, PASCAL, and C++ programming languages. Programming is part and parcel of Computer Science and its related programmes in education. It is an essential skill that must be mastered by anyone interested in studying computer science and related courses such as Computer Education, Computer Engineering, Information Technology, etc (Sarpong, Arthur & Owusu, 2013). Normally, in teaching computer programming, students will first be introduced to the concept of programming and data structure where they are taught on how to analyze problems, use specific techniques to represent the problem solution and validate the solution (Ismail, Ngah & Umar, 2010).

Researchers such as Okeke (2010) and Oroma, Wanga and Ngumbuke (2012) have lamented the difficulties and increasing failure rate of students in computer programming courses, and therefore called for measures to address the trend. Corroborating the reports, Ala-Mutka (2010) also opined that learning to program is generally considered hard, and programming courses often have high dropout rates. Oroma et al. (2012) and Ukeh (2016) explained that the students' learning outcomes and difficulty in learning to program is attributed to factors such as poor study methods, low self-efficacy, different kind of motivation to learn the course, lack of early exposure or previous experiences with computers, learners abilities and attitudes, nature of the course itself, limited access to computer facilities such as computer laboratories during time for their revision and image. One of the measures recommended for addressing the challenges facing the teaching and learning of Computer programming is the integration of multimedia into the teaching process (Okeke, 2010; Ala -Mutka, 2010; Sarpong, et al, 2013). Based on the importance of technology integration in education, the researchers found it necessary to assess the integration of YouTube tutorials of computer programming: its effects on students' achievement and interest. Academic achievement is an indication of level of retention ability of the students. It is a measure of the degree of success in performing specific tasks in a subject or area of study by students after a learning experience (Ali, 2013). On the other hand, Interest is a powerful motivational process that energizes learning, guides academic and career trajectories, and is essential to academic success. Renninger and Hidi (2002) in cited Kpolovie, Joe and Okoto (2014) defined interest as a psychological state of having an affective reaction to and focus attention for particular content and or the relatively enduring predisposition to engage repeatedly in particular classes of objects, events or ideas. Interest has been viewed as emotionally oriented behavioural trait which determines a student's vim and vigour in tackling educational programmes or other activities (Chukwu, 2002 in Igweh, 2012). Given the reported efficacy of YouTube in some other courses, this study adopted its use in the teaching of computer programming, with the aim of ascertaining its effect on students' achievement and interest.

1.1 Statement of the Problem

There is no gainsaying that the internet has become an indispensable part of youths, especially in the 21st century. Young Nigerians, including undergraduate's students, have made the use of the internet a part of their daily routine. This is evident as most advertisements and programmes targeting youths are placed on the internet especially on the social media.

Social media has made inroad into several aspects of human endeavour including business, government, religion and education. There is hardly any academic field and content that cannot be accessed over the internet. Academic and non-academic contents are always at the disposal of users, and have been found to be useful in supplementing curricula contents in schools. Sometimes, the contents provided on the internet are adjudged to be more

Table 1: Mean Achievement Scores and Standard Deviations of Students Taught Computer Programming by Integrating YouTube in the Teaching Process and Those Taught Using Conventional Approach

Groups	Number	Pre-test		Post-test	
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)
Experimental Group	94	41.04	9.81	71.72	14.35
Control Group	86	44.08	10.34	66.98	13.65
Total	180				

elaborate, rich and concise to learners. Tutorials and lectures are available in almost any discipline from content creators in various countries across the world, and are mostly available for free.

Given the challenges students face in learning Computer programming, it has become imperative to explore innovative technology-based teaching approaches which could be useful in ameliorating the trend. YouTube, given its popularity and resourcefulness, stands out as a promising social media tool that can be integrated into

Table 2: Mean Interest Scores and Standard Deviations of Students Taught Computer Programming by Integrating YouTube in the Teaching Process and Those Taught Using Conventional Approach

Groups	Number	Pre-test		Post-test	
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)
Experimental Group	94	2.34	0.33	3.74	0.45
Control Group	86	2.43	0.34	2.90	0.38
Total	180				

conventional lessons with the aim of improving students' achievement, retention and interest in Computer programming. This study, therefore, sought to ascertain whether the integration of YouTube tutorials into Computer programming lessons will have effects on the achievement, retention and interest of students in the course.

1.2 Research Questions

The following research questions that guided the study are as follows:

Table 3: Analysis of Covariance on the Mean Achievement Scores of Students Taught Computer Programming by Integrating YouTube in the Teaching Process and Those Taught Using Conventional Approach.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision
Corrected Model	1011.882a	1	1011.882	5.151	.024	Rejected
Intercept	863987.882	1	863987.882	4397.921	.000	
GROUP	1011.882	1	1011.882	5.151	.024	
Error	34968.762	178	196.454			
Total	904314.000	180				
Corrected Total	35980.644	179				

What are the mean achievement scores of undergraduate students taught Computer programming by integrating YouTube in the teaching process and those taught using conventional approach?

What are the mean interest scores of undergraduate students taught Computer programming by integrating YouTube in the teaching process and those taught using conventional approach?

1.3 Research Hypotheses

The following null hypotheses tested at $P < .05$ are as follows:

Ho1. There is no significant difference in the

Table 4: Analysis of Covariance on the mean Interest scores of students taught Computer Programming by Integrating YouTube in the Teaching Process and Those Taught Using Conventional Approach

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision
Corrected Model	31.664a	1	31.664	178.211	.000	Rejected
Intercept	1975.751	1	1975.751	11120.088	.000	
GROUP	31.664	1	31.664	178.211	.000	
Error	31.626	178	.178			
Total	2065.290	180				
Corrected Total	63.290	179				

achievement scores of undergraduate students taught Computer programming by integrating YouTube in the teaching process and those taught using conventional approach.

Ho2. There is no significant difference in the interest scores of undergraduate students taught Computer programming by integrating YouTube in the teaching process and those taught using conventional approach.

2.0 Methodology

This study was carried out to examine the effect of integrating YouTube in teaching and learning of Computer programming on students' achievement and interest. The study adopted pre-test, post-test quasi experimental design. Quasi experimental research design is described by Dodo (2007) in Uba (2014) as the design where the treatment variable is manipulated but the groups not equated prior to manipulation of independent variables. The area of the study is Enugu State, in the South eastern part of Nigeria. The study population comprised 1,600 undergraduate students offering Computer Education course in the seven (7) Colleges of Education in Enugu State. 180 first-year undergraduate students were drawn from two (2) government-owned Colleges of Education which were purposively sampled for the study. The Colleges of Education were chosen due to the availability of functional computer laboratories needed for the study. The experimental group was taught computer programming by integrating YouTube tutorials in the teaching process. This was done by giving the students' access to YouTube Videos on selected computer programming tutorials. They were permitted to visit the computer laboratory within the duration of the treatment to view the videos while being supervised by the laboratory attendants. On the other hand, the control group was taught using the conventional teaching approach.

Two instruments known as Computer Programming Achievement Test (CPAT) and Computer Programming Interest Inventory (CPII) were developed by the researcher and validated by two experts from computer education from Enugu State University of Science and Technology (ESUT) and one other from measurement and evaluation from same institution. CPAT contained two sections. Section "A" contained demographic information of the respondents, while section "B" contained a 40 multiple choice questions which respondents answered by indicating correct answers. CPII contained 20 items. Pearson Product Moment Correlation Coefficient was used to determine the reliability of the CPAT which yielded a reliability coefficient of 0.82, while Cronbach Alpha was used to determine that of CPII. This yielded a reliability coefficient of 0.78. Mean and standard deviation were used for answering the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses. All the analyses were done with the Statistical Package for Social Sciences (SPSS).

Research Question 1: What are the mean achievement scores of students taught computer programming by integrating YouTube in the teaching process and those taught using conventional approach?

Results in Table 1 show that the mean achievement scores of students in the experimental and control groups were 41.04 and 44.08 respectively, at pretest. The values of the standard deviation were 9.81 and 10.34 for the experimental and control groups respectively. At the post-test, the experimental group had mean achievement score and standard deviation of 71.72 and 14.35 respectively while the control group had 66.98 and 13.65 respectively. This indicates that students in the experimental group recorded higher achievement than their counterparts in the control group.

Research Question 2: What are the mean interest scores of students taught computer programming by integrating YouTube in the teaching process and those taught using conventional approach?

Results in Table 2 show that the mean interest scores of students in the experimental and control groups were 2.34 and 2.43 respectively, at pretest. The values of the standard deviation were 0.33 and 0.34 for the experimental and control groups re-

spectively. At the post-test, the experimental group recorded mean interest score and standard deviation of 3.74 and 0.45 respectively while the control group recorded 2.90 and 0.38 respectively. This indicates that increase in interest was higher in the experimental group than in the control group.

Hypothesis 1: There is no significant difference in the mean achievement scores of students taught computer programming by integrating YouTube in the teaching process and those taught using conventional approach

Results in Table 3 show that group (experimental and control) as main effect, gave an f-value of 5.151 and was significant at 0.02. Since 0.02 is less than 0.05, it means that at 0.05 significant level, the f-value was significant. Hence, Hypothesis 1 was not accepted as stated. It is therefore, concluded that there is significant difference between the mean achievement scores of students taught computer programming by integrating YouTube in the teaching process and those taught using conventional approach. The difference is significant in favour of students taught by integrating YouTube in the teaching process.

Hypothesis 2: There is no significant difference between the mean interest scores of students taught computer programming by integrating YouTube in the teaching process and those taught using conventional approach

Results in Table 4 show that group (experimental and control) as main effect, gave an f-value of 178.211 and was significant at 0.00. Since 0.00 is less than 0.05, it means that at 0.05 significant level, the f-value was significant. Hence, Hypothesis 2 was not accepted as stated. It is therefore, concluded that there is significant difference between the mean interest scores of students taught computer programming by integrating YouTube in the teaching process and those taught using conventional approach. The difference is significant in favour of students taught by integrating YouTube in the teaching process.

3.0 Discussion of Findings

The results of data analysis showed that the students who were taught computer programming by integrating YouTube in the teaching process recorded increased achievement and interest than their counterparts who were taught with the conventional teaching approach. The test of hypotheses also showed that the mean differences in achievement and interest were significant, in favor of the students in the experimental group. This implies that the integration of YouTube in the teaching process was an effective approach for teaching computer programming.

The findings of this study corroborates the observations of Chang, Quintana and Krajcik (2010), Ebied, Kahouf and Rahman (2016) and Chukwuani (2019), all of which observed positive effects of multimedia instruction on students' achievement. The finding is, however, in contrast with the submissions of Guan (2009), Montazemi (2006) and Rasch and Schnotz (2009), who reported poor achievement of students taught with multimedia.

The results for research question 2 hypothesis 2 agrees with the results of Yunis (2005), Shah and Khan (2015), Ebied, Kahouf and Rahman (2016) and Chukwuani (2019), which showed significant statistical differences in the average academic achievement of the experimental (multimedia) and control groups in the test conducted after the experiment in favor of experimental group.

Given the observed empirical evidence from this study, there is, therefore, no gainsaying the fact that the integration of YouTube in the teaching process is a viable approach for enhancing the achievement and interest of students in computer programming.

4.0 Conclusion

The findings of this study clearly corroborates existing contemporary studies on the positive effects of integrating multimedia in the teaching process, especially with regards to students' achievement and interest. This study is unique in its coverage of computer programming, which is one of the important courses in the area of computer science. The availability and free access to educational videos on YouTube from various experts across the globe, means that today's learners have an abundance of resources from where to access rich and quality information, irrespective of geographical and other limiting factors.

5.0 Recommendation

Based on the findings from the study, it was recommended that:

Tertiary institutions should provide lecturers with relevant facilities for integrating YouTube tutorials in teaching various courses.

Students should be encouraged by lecturers to explore recommended educational videos that are relevant to their fields of study from YouTube with the aim of complementing what they are taught in class.

References

Adeniyi, D.A. (2005). *Rudiments of programming using QBASIC and Visual BASIC*. The Lord Printing 'N' Publishing, Kaduna.

Ahmed, M.A. (2008). Influence of personality factors on biology lecturers' assessment of difficulty levels of genetics concepts in Nigerian colleges of education. *Unpublished doctoral thesis.* University of Ilorin, Ilorin, Nigeria.

Ahmed, M.A., & Abimbola, I. O. (2011). Influence of teaching experience and school location on biology teachers' rating of the difficult levels of nutrition concepts in Ilorin, Nigeria. *JOSTMED*, 7(2), 52- 61.

Ala-mutka, K. (2010). *Problems in learning and teaching programming.- a literature study for developing visualizations in the codewitzminerva project.* http://www.cs.tut.fi/~edge/literature_study.pdf.

Ali, S. (2013). Factors affecting academic achievement of students. *American Journal of Educational Research;* 1(8), 283-289.

Buzzetto-More, N. (2013). Student Attitudes towards the integration of YouTube in online, hybrid, and web-assisted courses: an examination of the impact of course modality on perception. *MERLOT Journal of Online Learning and Teaching*, 11 (1), 55-73.

Chang, H.Y., Quintana, C., & Krajcik, J.S. (2010). The impact of designing and evaluating molecular animations on how well middle school students understand the particulate nature of matter. *Science Education*, 94 (1), 73-94.

Chukwuani, N.A. (2019). Integration of multimedia in teaching and learning of computer studies: effects on students' achievement, interest and retention. *Unpublished M.Sc. thesis*, Enugu State University of Science and Technology (ESUT), Enugu, Nigeria.

DeWitt, D., Alias, N., Siraj, S., Yaakub, M.Y., Ayob, J. & Ishak, R. (2013). The potential of YouTube for teaching and learning in the performing arts. *Procedia - Social and Behavioral Sciences*, 103, 1118-1126.

Duvenger, P., & Steffes, E. (2012). Using YouTube videos as a primer to affect academic content retention. Working Together Works: Partnering for *progress 2012 CUMU national conference,* 51-66.

Ebied, M.M.A., Kahouf, S.A.A. & Rahman, S.A.A. (2016). Effectiveness of using YouTube in enhance the learning of computer in education skills in Najran University. *International Interdisciplinary Journal of Education,* 5(3), 619-625.

Fleck, K.B., Beckman, L.M., Sterns, J.L. & Hussey, H.D. (2014). YouTube in the Classroom: Helpful Tips and Student Perceptions. *The Journal of Effective Teaching*, 14(3), 21-37.

Gallardo-Echenique, E.E., Maques-Molias, L., Bullen, M. & Strijbos, J. (2015). Let's talk about digital learners in the digital era. In*ternational Review of Research in Open and Distributed Learning,* 6(3), 156-187.

Gambari, A.I., Yaki, A.A., Gana, E.S. & Ughovwa, Q.E. (2014). Improving secondary school students' achievement and retention in biology through video-based multimedia instruction. *In Sight: A Journal of Scholarly Teaching*, 9, 78-91.

Greenberg, A., & Zanetis, J. (2012). The impact of broadcast and streaming video in education. *Report Commissioned by Cisco Systems Inc. to Wainhouse Research L.L.C.* Retrieved from: http://www.cisco.com/web/strategy/docs/education/ciscovideowp.pdf.

Guan, Y.H. (2009). A study on the learning efficiency of multimedia-presented, computer-based science information. *Educational Technology & Society*, 12 (1), 62-72.

Gupta, M. (2019). A Study of YouTube as a teaching and learning tool in the management education. *Research Review International Journal of Multidisciplinary*, 4(1), 808-810 https://en.wikipedia.org/wiki/YouTube

Igweh, A.U. (2012). Combined effect of computer tutorial and drill on senior secondary school students' achievement, interest, and retention in basic electronics in Lagos state. *An Unpublished Thesis,* University of Nigeria Nsukka

Ismail, M.N., Ngah, N.A. & Umar, I.N. (2010). Instructional strategy in the teaching of computer programming: a need assessment analyses. *TOJET: The Turkish Online Journal of Educational Technology*, 9 (2), 569–571.

Jones, C., & Shao, B. (2011). *The net generation and digital natives: implications for higher education.* York, UK: Higher Education Academy.

Kpolovie, P.J., Joe, A.I and Okoto, T., 2014. Academic achievement prediction: Role of interest in learning and attitude towards school. *Inter-*

national Journal of Humanities, Social Science and Education, 1(11); 73-100.

Miller, M. (2009). Integrating online multimedia into college course and classroom: With application to the social sciences. *MERLOT Journal of Online Learning and Teaching*, 5(2), 395–423.

Montazemi, A.R. (2006). The effect of video presentation in a CBT environment. *Educational Technology & Society*, 9 (4), 123- 138.

Okeke, K.H. (2010). Causes of poor performance of students in computer programming. *Unpublished BSc. thesis*, Enugu State University of Science and Technology (ESUT), Enugu, Nigeria.

Okeke, K.H. (2017). Influence of social networking sites usage on the academic performance of senior secondary school students in Enugu State. *Unpublished Ph.D. Dissertation*, Enugu State University of Science and Technology (ESUT), Enugu, Nigeria.

Oroma, J.O., Wanga, H. &Ngumbuke, F. (2012). Challenges of teaching and learning computer programming in developing countries: lessons from Tumaini University. *Proceedings of INTED2012 Conference*. 5th-7th March 2012, Valencia, Spain. 3820-3826.

Rasch, T. & Schnotz, W. (2009). Interactive and non-interactive pictures in multimedia learning environments: Effects on learning outcomes and learning efficiency. *Learning and Instruction*, 19 (5), 411-422.

Ratheeswari, K. (2018). Information communication technology in education. *Journal of Applied and Advanced Research,* 3(1); 45-47

Sarpong, K. A., Arthur, J. K. & Owusu, P. Y. (2013). Causes of failure of students in computer programming courses: the teacher – learner perspective. *International Journal of Computer Applications,* 77(12), 27-32.

Shah, I. & Khan, M. (2015). Impact of multimedia -aided teaching on students' academic achievement and attitude at elementary level. *US-China Education Review A*, 5 (5), 349-360.

Ukeh, B.O. (2016). ICT competencies needed and possessed by academic staff in colleges of education in Enugu State. *Unpublished M.Sc. thesis*, Enugu State University of Science and Technology (ESUT), Enugu, Nigeria.

Umar, A.A. (2011). Effects of biology practical activities on students' process skill acquisition in Minna, Niger State, Nigeria. *JOSTMED*, 7 (2), 118–126.

Yunis, A. (2005). The effectiveness of multimedia software for teaching engineering in the second row preparatory. *Unpublished Ph.D. thesis,* University of Damascus, Damascus.

Zboun, M.S., Al Ghammaz, S.A. & Al Zboun, M.S. (2018). The impact of the use of YouTube and Facebook on students' academic achievement in geography course at the University of Jordan for the Bachelor's Degree. *Modern Applied Science,* 12(3), 164-174.