EFFECTS OF WEB-BASED INSTRUCTION ON JUNIOR SECONDARY SCHOOL STUDENTS' ACADEMIC PERFORMANCE IN BASIC TECHNOLOGY IN NIGER STATE, NIGERIA

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Abstract

The study investigated the Effects of Web-Based Instruction on Junior Secondary School Students' Performance in Basic Technology in Niger State, Nigeria. Quasi-experimental design (pretest-posttest, non-equivalent, non-randomized control group design) was adopted in this study. The sample for the study consisted of 119 JSS II students drawn from four co-educational registered private secondary schools in Minna Metropolis, Niger State. Three research questions with corresponding hypotheses were formulated and tested at 0.05 level of significance. Basic Technology Achievement Test (BTAT) which consists of 50-items, multiple choice objectives questions were used for data collection. Web-based instruction (WBI) and BTAT were validated by education technology experts, computer experts, industrial and technology education lecturers, and secondary school basic technology teachers. BTAT was subjected to pilot test and 0.90 reliability coefficient was obtained using Pearson Product Moment Correlation Coefficient. BTAT was administered on students in experimental and control groups and data obtained were analyzed using Analysis of Covariance (ANCOVA) to test the hypotheses. The results of the study indicated that students exposed to Web-Based Instruction performed significantly better than their counterparts exposed to Conventional Teaching Method. There was no significant difference between the mean scores of male and female students; high, medium, and low achievers' students exposed to WBI. Based on the above findings it was recommended that Web-Based Instruction should be encouraged for teaching and learning of Basic Technology.

Keywords: Web-Based Instruction, Basic Technology, Performance, Achievement Level, Gender

Introduction

Introductory Technology is one of the core subject offers in the Junior Secondary Schools in Nigeria. Basic Technology provides learners the opportunity to discover themselves and develop their potentials to benefit the

society. The three main objectives of Introductory Technology as stated in the national policy of education are: to Provide pre-vocational orientation for further training in Technology; to provide Basic Technology literacy for everyday living; and to stimulate creativity (FRN, 2013).

Presently in Nigeria, the 6-3-3-4 system of education has been replaced by the 9-3-4 System of Education. In this new system of education Introductory Technology is called Basic Technology and made a compulsory subject just as English Language and Mathematics in the Nine (9) year Basic Education Programme (NERDC, 2007). Its purpose is to contribute to the achievement of the National Education goals by: Inculcation of Technological literacy that is basic understanding of and capacity in Technology; Exposure of students to the world of work to match their talents and interests for wise vocational choice; and inculcation of positive attitudes towards work as a source of human identity, livelihood and power (Clark, & Ausukuya, 2013). This revised Basic Technology Curriculum became necessary due to technological development and national policy orientation to the teaching of Technology as an integral part of world increasingly driven by Information and Communication Technology (ICT). However, this would be a disaster for any person or society not to inculcate Basic Technology skills (Adeniyi, 2010).

Information and Communication Technology has made the world to become a global village because whatever happens in one part of the globe is transmitted very quickly to other parts through the media and the internet. Michael and Samson, (2014) defines ICT as the different means, methods and tools that people have used throughout history to help manage information, conduct business and communicate with others and better understand the world. In support of this, Olaore (2014) views ICT as electronic technologies for collecting, storing, processing and communicating information.

Presently in Nigeria, education sectors such as schools, ministry of education, examination bodies (NECO, WAEC and JAMB) are using ICT for registration of students. Nigeria has joined the global race in the growth and usage of ICT (Salami et al., 2008; FRN, 2013). This is evident by the growth in the use of the internet and the adoption of computer in schools. For instance, there is a proposed MTN Education bundle (a laptop) pre-loaded with rich educational content specially designed for children from pre-

Primary to senior Secondary. Similarly, an ICT innovation by the Osun State government that introduced 'Opon-Imo', an e-learning computer tablet which comprises the entire educational needs of students in the Senior Secondary School classes was introduced into Nigerian Education system. It contains over 63,000 e-books, covering 17 subjects, a whole English dictionary, video tutorials, past questions for the last 10 years and lots more which enable students access to web-based instruction.

The World Wide Web can be used to provide instruction and instructional support. Web-based instruction offers learners unparalleled access to instructional resources, far surpassing the reach of the traditional classroom. It also makes possible learning experiences that are open, flexible, and distributed, providing opportunities for engaging, interactive, and efficient instruction (Olson & Wisher, 2002). Web-based instruction offers multiple dimensions of use in education and training environments. It is capable of providing direct instruction to meet individual learning objectives. Due to its networking capability, the Web can play additional roles. These include promoting and facilitating enrollment into courses, availing the syllabus or program of instruction, posting and submitting assignments, interacting with instructors and fellow students, collaboration on assignments, and building learning communities (*Akayuure &Apawu,* 2015). The web-based instruction is relatively new in Nigerian public secondary schools. WBI is a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported. WBI is delivered via the computer using the Internet that enables interactivity, updating, uploading, downloading, distribution, and sharing of information (Khan, 2011).

In spite of the potentials of web-based instruction, empirical study on effect of web-based instruction is conflicting. For instance, Güzeller and Akın (2012) reported that students taught Mathematics using WBI achieved better in the post-mathematics achievement test, post-mathematics attitudes, anxiety, and self-efficacy than their counterparts exposed to the conventional instructional strategy. Thrasher, Coleman and Atkinson (2012) reported that students taught Business Education in project group outperformed their counterparts in WBI classroom. Yamauchi (2008) observed that students in

the experimental group taught food production (table service and beverage preparation procedures) using multimedia had no significant mean gain scores than those in the control group. Kutlu and Menzi (2013) reported that web-based instruction environments enhanced learning than traditional method when used to teach information technology courses at 7th grade in primary schools. Erdogan, Bayram and Deniz (2008) reported that web-based instruction had positive effects on the improvement of academic achievement and motivation of e-MBA class than their counterparts in conventional method. However, Okeke and Osuagwu (2012) also reported that Engineering students who taught in the traditional way performed marginally better than the WBI students. Young and Duncan (2014) reported that students taught communication course are rated higher than those with traditional Face-to-face. Furthermore, Ni (2010) reported no significant difference in comparing the effectiveness of classroom and online learning in a public administration course. Similarly, Wagner (2011) and Stack (2015) reported no significant difference in student performance between the online and traditional instruction in an introductory information systems course, and criminology class respectively. Zacharis (2010) reported no significant statistical differences in learning styles and learning performance between web-based and campus based courses in a computer science class. McGready and Bookmeyer (2012) observed that online and on-campus course formats of an introductory biostatistics course in a graduate school of public health can achieve similar student outcomes.

Gender issue as regards students' performance is one of the prevailing factors in education (Imhof, Vollmeyer, and Beierlein, 2007). Studies on the influence of gender is yet to be ascertained, for instance, Huang (2002) found that students learning achievement from the use of Web-based instruction did not differ in relation to gender. Similarly, Ajai and Imoko (2015) reported that male and female students taught algebra using Problem-Based Learning did not significantly differ in achievement and retention scores, thereby revealing that male and female students are capable of competing and collaborating in mathematics. Also, Amro, Mundy, and Kupczynski (2015) found out that neither Age nor Gender impacted students' grade. Adigun, Onihunwa, Irunokhai, Sada, and Adesina (2015) reported that even though the male students had slightly better

performance compared to the female students, it was not significant. However, Oludipe (2012) reported no significant difference in academic achievement of male and female students at the pretest, posttest, and retention test respectively. In an earlier study conducted by Gregory (1997), it was reported that there was male dominance on students' achievement exposed to web-based instruction. While, Erdogan *et al.* (2008) reported that academic achievement of female students in web-based education were higher than male students. In contrary, Onu and Daluba (2013) reported that male students performed better than their female counterparts when taught introductory technology at the junior secondary school certificate examination (JSSCE) in Ankpa Local Government Area of Kogi State, Nigeria.

Students' achievement level as a cause of differential learning outcome has attracted the attention of educational researchers. For instance, Guzeller (2012) reported that the performance of the three groups (high, medium and low) was all enhanced by the WBI, when taught using web-based portfolio. Similarly, Chen (2007) found that students of lower learning abilities benefited more from using online learning than those of higher learning abilities. However, Gambari, James and Olumorin (2013) reported significant difference in the achievement of high, medium and low academic achievers. Based on the foregoing discussion, this study examined the effects of web-based instruction on junior secondary school students' performance in basic technology in Niger State, Nigeria.

Statement of the Problem

The problem of poor performance in Basic Technology has been traced to a number of factors such as inadequate participation of students due to the method of instruction, inability of the teachers to put across the concepts to the students, non-availability and utilization of instructional materials, lack of skills and competence required for teaching, shortage of qualified Basic Technology teachers among others. Nworji (2008) identified non-utilization of media in teaching Basic Technology in Nigeria as one of the factors responsible for poor performance in Basic Technology. Based on this, the Federal Government of Nigeria in the National Policy of Education recommended the development of innovative materials in schools to enhance the teaching and learning processes (FRN, 2013). Such innovative teaching materials

include the use of ICT (web-based instruction) as a medium of delivering instruction in schools. However, most schools do not have modern instructional equipment and media. The few schools that have are unable to use them effectively due to erratic electric power supply and at times the inability of some teachers to operate some of this instructional media. Therefore, the search for a more efficient and effective method of teaching becomes imperative. Web-based instruction as one of the student-centered strategies is yet to be embedded in teaching and learning in Nigerian junior secondary classrooms. Therefore, this study investigates the effects of web-based instruction on junior secondary school students' performance in Basic Technology in Niger State, Nigeria.

Aim and Objectives

This study was to investigate the effects of web-based instruction on junior secondary school students' performance in Basic Technology in Niger State, Nigeria. Specifically, the study was designed to achieve the following objectives:

(i) Determine the effect of web-based instruction and traditional method on the performance of Basic Technology students in the junior secondary school.

(ii) Find out the influence of gender on the performance of Basic Technology students taught using web-based instruction.

(iii) Determine the influence of web-based instructional package on students' achievement levels (high, medium, low) when taught basic technology?

Research Questions

The following research questions were formulated to guide the study:

(i) What is the mean performance scores of students taught basic technology using web-based instructional package and those taught with traditional method?

(ii) What is the influence of gender on students' mean performance scores when taught basic technology using web-based instructional package?

(iii) What is the influence of web-based instructional package on students' achievement levels (high, medium, low) when taught basic technology?

Research Hypotheses

The following null hypotheses were

formulated and tested at 0.05 alpha level of significance:

Ho_1 There is no significant difference in the performance scores of students taught basic technology using web-based instructional package and those taught with traditional method.

Ho_2 There is no significant difference in the performance scores of male and female students taught basic technology using web-based instructional package.

Ho_3 There is no significance difference in the achievement levels (high, medium, low) of students taught Basic Technology using web-based instruction.

METHODOLOGY

Research Design

The research design adopted for the study is a true experimental in nature involving pre-test, posttest, control group using a single treatment factorial design. A 2 x 2 x 3 factorial design was employed to test the three hypotheses in the study. This involved two levels of independent variable (experimental & control groups), two levels of gender (male & female), and three levels of achievement (high, medium & low). The factorial design is shown in Table 1.

Table 1: 2 x 2 x 3 Factorial Design

Groups	Gender	Ability levels		
		High (1)	**Medium (2)**	**Low (3)**
Experimental Group (WBI)	Male 1	111	112	113
	Female 2	121	122	123
Control Group (TM)	Male 1	211	212	213
	Female 2	221	222	223

All the groups (experimental and control) were given pretest before the treatment. Experimental group 1 was exposed to the use of Web-based Learning instructional (WBL) strategy while the control group was exposed to Conventional Teaching Method (CTM). The posttest was administered on the groups after four weeks' treatment. The research design layout is as shown below in table 2.

Table 2: Research Design Layout

Groups	Pre-test	Treatment	Posttest
Experimental Group	O_1	X_1	O_2
Control Group	O_3	X_o	O_4

Where:

O_1 & O_2 represents the pre-test and posttest of the experimental group,

O_3 &O_4 represents the pretest and post-test of the control group,

X_1 represents the treatment (Web-based instruction) for the experimental group,

X_o represents the traditional teaching method for the control group.

Sample and Sampling Techniques

The population for the study is made up of the entire population of JSS II students in all the 296 private schools having JSS II classes (source: Annual School Census 2014/2015 Ministry of Education Niger State). The purposive sampling technique was used to select the four schools in Minna Niger State for this study. These schools were selected for the study based on the following criterion: Equivalence (laboratories, facilities and manpower), school type (private schools), gender composition (mixed schools), ICT equipment (computer laboratories under the SchoolNet programme), and candidates' enrolment (the schools have been enrolling students for Junior Secondary School Certificate Examination (JSSCE) for a minimum of ten years). The schools were assigned into experimental group and control group. 119 students were selected using stratified random sampling technique. One arm of intact class was randomly selected from each school.

Research Instruments

The treatment employed for this study was Web-Based Instruction (WBI). The test instrument used for data collection was Basic Technology Achievement Test (BTAT) which was used for pretest and posttest after being reshuffled.

The treatment (Web-based Instruction) was designed and developed by the researchers and the programmer. The researchers and senior teachers outlined the difficult concepts in Basic Technology and formed lesson notes (contents) in computer script format. The programmer on the other hand designed the Website that hosted the contents. The computer programmer designed the user interface that contain static and dynamic web pages using Macromedia Dreamweaver (8) and Macromedia Fireworks (8), PHP programming language and MYSQL software for creating database and finally host the site. The web presents information and displays animation to the learner on each of the unit/lesson after which the students attempted some multiple choice-

objective questions. Each of the units/lessons were presented by the web through interactive mode, that is, exposure to information, facts and practice on the topics and immediate feedback/response to the questions. The students were made to have at least 90% mastery of one topic before moving on to the next.

The Basic Technology Achievement Test (BTAT) has two sections namely A and B. The section A contains the students' biodata and section B consists of 50 multiple choice objective questions with five options (A-E) as possible answers to the questions. The questions were structured from JSS II Basic Technology curriculum on (i) Materials and their uses and, (ii) Wood lathe machine covered in the WBI. The test item covered different levels of understanding based on Bloom's taxonomy of educational objectives (i.e. knowledge of facts, application of knowledge, interpretation of concepts). Students were requested to indicate the correct answers by ticking or circling the correct answers matching the questions and only one option was correct from the options A-E. On the scoring of the multiple-choice items, '1' was awarded for each correct answer and '0' for each wrong answer. The instrument was scored over 50 (1x50 items).

Both WBI and BTAT were validated by experts in Basic Technology Teachers, Industrial and Technical Education Lecturers, Educational Technology specialists, Computer Programmers respectively. Comments, opinions and suggestions of the experts were used to make necessary amendments on the instrument. Field trial validation was carried out on WBI using 83 students from a selected school which is part of the population but not participate in the real study. Similarly, a pilot test was conducted on 42, JSS II students from a school that was not part of the selected schools for the real study. The test was administered twice and the reliability coefficient of 0.90 was obtained using Pearson Product Moment Correlation (PPMC).

Method of Data Collection

The researchers visited the selected schools to sought for permission to carried out the study. The basic technology teachers and students were briefed on the objectives and the modalities of experiment. BTAT was initially administered on sample students as pretest to ascertain the equivalence of the students before the treatment. The students in the experimental group were exposed to web-based instruction. Each of them were allowed to study the contents of basic

technology using computer alone computer in the computer laboratory. Each student interacted with web-based instructional package, studied at his/her own pace, navigate through the animation and response to self-assessment questions before moving to the next lesson. The treatment was lasted for four weeks. However, students in the control group were taught using traditional lecture method where the teacher presents the lesson while students listen and copy the note. Four weeks later, BTAT was administered as posttest to measure the achievement of the students in experimental and control groups. The scores obtained were subjected to data analysis.

Method of Data Analysis

The data obtained from BTAT after pretest and posttest were analyzed using descriptive statistics of mean and standard deviation to answer research questions while Analysis of Covariance (ANCOVA) was used for testing the research hypotheses. The significance of the various statistical analyses was ascertained at 0.05 alpha level.

RESULTS

Research Question One: What is the mean performance scores between students taught using web-based instructional package and those taught with traditional method?

In answering research question one, mean scores of the students in experimental and control groups were analyzed using mean and standard deviation as shown in Table 3.

Table 3: Mean and Standard Deviation of Pretest and Posttest Scores of Experimental and Control Groups

Group	N	Pretest		Posttest		Mean Gain
		Mean	SD	Mean	SD	
Experimental Group	60	19.80	5.38	80.53	8.84	60.73
Control Group	59	18.34	6.30	41.05	9.43	22.71

Table 3 shows the mean and standard deviation of the pretest and posttest scores of the experimental and control groups. The result reveals that the mean and standard deviation of the pretest and posttest scores of experimental group are 19.80 ±5.383 and 80.53 ±8.844 respectively. This gives a mean gain of 60.73 in favour of the posttest. Similarly, the mean and standard deviation of the pretest and posttest scores of the control group are 18.34 ±6.304 and 41.05 ±9.427 respectively. This gives a mean gain

of 22.71 in favour of the posttest. Also from the result, it can be seen that there is difference between the mean posttest scores of the experimental group (80.53) and the control group (41.05). The difference being 38.48 which is in favour of the experimental group.

Research Question Two: What is the influence of gender on students' mean performance scores when taught basic technology using web-based instructional package?

In answering research question two, mean scores of the male and female students in experimental group were analyzed using mean and standard deviation as shown in Table 4.2.

Table 4: The Mean and Standard Deviation of Pretest and Achievement Scores of Male and Female Experimental Group

Group	N	Pretest		Posttest		
		Mean	SD	Mean	SD	Mean Gain
Male	30	20.33	5.851	78.60	9.985	58.27
Female	30	19.27	4.913	81.47	7.592	62.20

Table 4 shows the mean and standard deviation of the posttest scores of male and female in experimental group. From the result, it can be seen that the mean score of the pretest and the posttest score of the male are 20.33 ±5.851 and 78.60±9.985. The mean gain is 58.27 in favour of the male achievement score. Similarly, the mean and standard deviation of pretest and posttest score of female are 19.27 ±4.913 and 81.47 ±7.592. The mean gain is 62.20 in favour of the female posttest score. Also the result reveals the difference of 2.87 between the posttest score of male and female in favour of the female.

Research Question Three: What is the influence of web-based instructional package on students' achievement levels (high, medium, low) when taught basic technology?

In answering research question three, mean scores of high, medium and low level students in experimental group were analyzed using mean and standard deviation as shown in Table 5.

Table 5: The Mean and Standard Deviation of the Pretest and Achievement Scores of Low, Medium and High Level Experimental Group

Group	N	Pretest		Posttest		Mean Gain
		Mean	SD	Mean	SD	
Low Level	21	15.33	5.073	74.86	7.863	59.53
Medium Level	19	19.16	2.853	81.05	7.982	61.89
High Level	20	25.10	1.774	86.00	7.079	60.90

Table 5 shows the mean and standard deviation of the pretest and posttest scores of low, medium and high level experimental group. The result revealed that the pretest and posttest scores for low level students in experimental group are 15.33 ±5.073 and 74.86 ±7.863 respectively while the mean gain is 59.53 in favour of the low level posttest score. Similarly, the mean score for the pretest and posttest score for the medium level students in experimental group are 19.16 ±2.852 and 81.05 ±7.982 respectively while the mean gain is 61.89 in favour of medium level students in posttest score. Also the mean of the pretest and posttest scores for high level students in experimental group are 25.10 ±1.774 and 86.00 ±7.079 respectively while the mean gain is 60.90 in favour of the high level posttest scores. It can also be seen from the result that there is difference between posttest scores of the three levels. The high level students have the highest mean posttest score of 86.00 ±7.079 followed by the medium level with 81.05 while the low level students have the least mean posttest score of 74.86 ±7.863.

Testing of Hypotheses

Hypotheses One: There is no significant difference in the mean achievement scores of students taught basic technology using web-based instructional package and those taught with traditional method. In testing hypotheses one, the mean scores of students exposed to web-based instructional package and those taught with traditional method were analyzed using ANCOVA as shown in Table 6.

Table 6: ANCOVA Result of Performance Scores of Experimental and Control Groups

Source	Type III Sum of Squares	df	Mean Square	F-value	P-value
Corrected Model	51692.595	2	25846.297	673.717	.000
Intercept	15242.180	1	15242.180	397.307	.000
Pretest	5319.586	1	15319.586	138.662	.000
Groups (Treatment)	41844.822	1	41844.822	1.091*	.000
Error	4450.195	116	38.364		
Total	498332.000	119			
Corrected Total	56142.790	118			

*: Significant at $p < 0.05$

Table 6 shows the ANCOVA results of the performance scores of groups taught using the web-based instructional package (experimental group) and those taught with traditional method (control group). From the table, the F-value = 1.091 and $p < 0.05$. This indicates that there is significant difference between the mean scores of the experimental group and the control group. Hence, hypotheses one is rejected. Therefore, there is significant difference in the mean performance scores of students taught Basic Technology using Web-based Instructional Package and those taught with traditional method. This reveal that the treatment has effect on the students' performance.

Hypotheses Two: There is no significant difference in the mean performance scores of male and female students taught Basic Technology using web-based instructional package.

In testing hypotheses two, the mean scores of male and female students in experimental group were analyzed using ANCOVA as shown in Table 7.

Table 7: ANCOVA) results of the Performance Scores of Male and Female Experimental Group

Source	Type III Sum of Squares	Df	Mean Square	F-value	P-value
Corrected Model	1941.682	2	970.841	20.701	.000
Intercept	14312.598	1	14312.598	305.178	.000
Pretest	1889.415	1	1889.415	40.287	.000
Gender	133.089	1	133.089	2.838^{ns}	.098
Error	2673.252	57	46.899		
Total	393752.000	60			
Corrected Total	4614.933	59			

ns: not significant at $p > 0.05$

Table 7 shows the ANCOVA results of the performance scores of male and female students in experimental group. From the result, there is no significant difference between the mean performance scores of the male and female experimental group at 0.05 level of significance. ($F = 2.838$; $p > 0.05$). Therefore, hypotheses two is not rejected. Hence, there is no significant difference in the mean performance scores of male and female students taught Basic Technology using Web-based Instructional Package.

Hypotheses Three: There is no significance difference in the mean achievement levels (high, medium, low) of students taught Basic Technology using web-based instruction.

In testing hypotheses three, the mean scores of high, medium and low level experimental group were analyzed using ANCOVA as shown in Table 8.

Table 8: Analysis of Covariance Results of the Achievement Scores of High, Medium and Low Level Experimental Group

Source	Type III Sum of Squares	df	Mean Square	F-value	p-value
Corrected Model	1974.885	3	658.295	11.560	.000
Intercept	7040.260	1	7040.260	123.628	.000
Pretest	578.851	1	578.851	10.165	.002
Levels	83.648	2	41.824	0.734^{ns}	.484
Error	3189.049	56	56.947		
Total	392692.000	60			
Corrected Total	5163.933	59			

ns: not significant at $p > 0.05$

Table 8 shows the ANCOVA results of the achievement scores of high, medium and low level experimental group. From the table, there is no significant deference in the mean achievement scores of the three levels at 0.05 level of significance. ($F = 0.734$; $p > 0.05$). Therefore, hypotheses three is not rejected. Hence there is no significant difference in the mean achievement scores of the levels (high, medium and low) of students taught Basic Technology using Web-based Instructional Package. This also revealed that the package has enhanced the learning outcomes of the students in the three levels especially the medium and the low level learners.

Discussion

The students taught with web-based instructional package performed better than those taught with traditional method. This finding is in agreement with that of Güzeller and Akın (2012) who reported that students taught Mathematics using WBI achieved better in the post-mathematics achievement test, post-mathematics attitudes, anxiety, and self-efficacy than their counterparts exposed to the conventional instructional strategy. Similarly, it is in agreement with Yamauchi (2008) who found that students in the experimental group had a significantly higher gain score than students in the control group when taught food production.

The finding also in agreement with that of Kutlu and Menzi (2013) who reported that web-based instruction environments enhanced learning than traditional method when used to teach information technology courses at 7th grade in primary schools. It also agrees with that of Erdogan *et al.* (2008) who reported that students in e-MBA class performed better in academic achievement and have motivation for learning than their counterparts in traditional MBA class

In contrary, this finding is not in agreement with the finding Okeke and Osuagwu (2012) who reported that the students taught engineering in the traditional way performed marginally better than those taught with web-based instruction. It also in disagreement with the finding of Thrasher, Coleman and Atkinson (2012) who reported that students taught Business Education using project group significantly performed better than those in WBI group. The finding also disagrees with that of Young and Duncan (2014) who reported that students are more satisfied with traditional face-to-face communication course compared to online communication course. Similarly, it disagrees with the finding of Yamauchi (2008) who also reported no significant differences in students' performance grades between the experimental (Multimedia) and control groups (traditional method) in food production course. It also in disagreement with finding of Ni (2010) who reported no significant difference in comparing the effectiveness of classroom and online learning in public administration course. It disagrees with results of studies conducted by Wagner, Garippo, and Lovaas (2011) and Stack (2015) who reported no significant difference in student performance between the two modes of course delivery (online and traditional instruction in introductory information systems and criminology courses respectively. The finding of this study also contradicts the results of Zacharis (2010) who reported no significant statistical differences in learning styles and learning performance between web-based and campus based courses in computer science. It also opposed the opinion of McGready and Bookmeyer (2012) who found that online and on-campus course formats of an introductory biostatistics course in a graduate school of public health can achieve similar student outcomes. The finding also contradicts the result of Porter *et al.* (2014) who reported no significant difference in student performance between the classroom and online sections in an immunization elective course.

The web-based instruction enhanced the performance of both male and female students equally. This finding is in consonance with the finding of Huang (2002) who reported that students learning achievement from the use of Web-based instruction did not differ in relation to gender.It also agrees with the finding of Ajai and Imoko (2015) who reported that male and female students taught algebra using Problem Based Learning did not significantly differ in achievement and retention scores, thereby revealing that male and female students are capable of competing and collaborating in mathematics. The finding also agrees with the results of Amro, Mundy, and Kupczynski (2015) who found out that neither age nor gender impacted students' grade. It also supported the finding of Adigun *et al.* (2015) who reported that male students had slightly better performance compared to the female students but not significant. However, the finding of this study contradicts Oludipe (2012) who found no significant difference in academic achievement of male and female students at the pretest, posttest, and delayed posttest levels respectively. Also not in agreement with the finding of Gregory (1997) who reported that there was male dominance on students' achievement exposed to web-based instruction. Similarly, the finding is not in agreement with that of Erdogan *et al.* (2008) who reported that in relation to gender the academic achievement of female students of web-based education were higher than male students. It also disagrees with the results of Onu *et al.* (2013) who reported that male students performed better than their female counterparts.

The result of this study revealed that web-based instruction improved the performance of high, medium, and low level achievers' students. This finding is in agreement with the findings of *Akayuure and Apawu* (2015) who reported that approximately 6%, 58% and 36% of the modules contained low, moderate and high pedagogical usability attributes**.** This finding is not in line with the finding of Chen (2007) who reported that students of lower learning abilities benefited more from using online learning than those of higher learning abilities. This finding is not in agreement with the finding of Gambari *et al.* (2013) who reported significant difference in the achievement of high, medium and low academic achievers.

Conclusion

This study has critically examined the concepts of basic technology at junior secondary school level in a rapidly changing world. It is the view of the authors that there is still a wide gap to be bridged in the area of teaching and learning. The innovative technology using web-based instruction seems to be the answer. The study showed that, Web-Based Instruction (WBI) improved students' achievement in Basic Technology better than Conventional Teaching Method. The male and female students exposed to WBI achieved equally better in Basic Technology. Web-Based Instruction (WBI) improved students' abilities levels irrespective of high, medium and low levels.

Recommendations

Based on the findings of this study the following recommendations were proffered:

(i) Teachers should be encouraged to teach their students with WBI to enhance the teaching and learning of Basic Technology.

(ii) Teachers should use web-based instruction to overcome gender imbalance in teaching and learning Basic Technology among students.

(iii) Basic Technology teachers should be encouraged to use WBI to bridge the gap within High, Medium and Low achievers' performance.

(iv) Teachers should encourage students on the use of web-based package to learn since it is interactive, student-centred approach and user friendly.

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