Innovations

Application of Web-Based Tools by Secondary School Teachers for Teaching and Learning of Basic Science and Technology in Ekiti State, Nigeria

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Abstract: *There is no doubt that inventions and innovations in information and communications technology have brought a tremendous breakthrough in teaching and learning. The web-based technology has been considered the main key to academic excellence in recent times. This study is an attempt at assessing teachers' application of web-based tools as medium for effective teaching and learning of Basic Science and Technology in Ekiti State. Three research questions were raised and two corresponding hypotheses were formulated to guide the study. The study made use of descriptive research design of the survey type. The population of the study comprises all Basic Science and Technology teachers in Ekiti State. A sample of 120 Basic Science teachers was selected using random sampling technique. Data for study were collected using structured questionnaire which was developed by the researcher and validated by experts in test and measurement. The results showed that teachers do not possess adequate knowledge of web-based tools and as a result do not use web-based learning tools for teaching and learning of Basic science and technology. The researchers recommended that web-based tools should be integrated into junior secondary schools curriculum.*

Keywords: *Application, Web-Based Tools, Teachers, Basic Science and Technology*

Introduction

The integration of web-based tools into educational practices has becomes increasingly prevalent worldwide, offering unique opportunities to enhance teaching and learning experiencesin the context of Nigeria, where education serves as a cornerstone for social-economic development, leveraging web-based in secondary education presents a promising venue for improving the quality and effectiveness of science and technology (Gulati,2019).

Web-based tools encompass a wide array of digital resources accessible through the internet, offer a promising means to supplement traditional teaching methods and enrich the learning experience of students from interactive simulations and virtual laboratories to multimedia presentations and collaborative platforms. These tools provide avenues for engaging students,fostering critical thinking, and facilitating deeper conceptual understanding(Basar etal,2021).The 21st century is an era of globalization that enabled empowered and enjoined individual using web-based tools.

Kaplan &Heinlein, (2013) said unlike in the past the people of the world are told living in global village because of various breakthroughs in information technology. The development of technology toward the end of 20th century has made possible the emergence of internet with various forms of web-based tools. A web-based tool is therefore an online platform that focus on facilitating the building of social network among people who share interest and activities on real life connections(Ardac & Akaygam,2014). It allows the creation and exchange of users generated content; also a web-based platform is a form of electronic communication which facilitates interaction based on certain interest and characteristics(Etesike,2018).This implies not only the essential or necessary information could be communicated.

Web-based learning is a form of e-learning which makes use of e-learning tools with which Basic Science education is delivered(Aboderin, 2015). Njoku &Okoro,(2013) opined that nothing has captured the imagination and interest of educators rapidly around the globe more than the world wide web. The web-based learning is now a tools which enable educators from various schooling foundation to graduate with ease.

Yusuf,(2010) equally defined a web-based tool as an electrical application of computing, communication and satellite technology that offers a constructive approach to learning through the provision of interactive learningexperience. Hence using a web-based tool for Basic Science delivery can provide visualization aids and understanding of some difficult concept and inculcate a process which gives an opportunity for providing links between theoretical learning and practical learning. Examples of such web- based tools includes: Facebook, Twitter, Wikipedia, cousera.com, blog, Flicker and e-mail.

Facebook was developed by Mark Zuckerberk a student of Harwarred University and was launched on February 4, 2004 for the students' community to create fun. This was improved upon and used in other universities by year 2006. According to Facebookstatistics (2012), Facebook has grown to become the biggest and most popular web-based tools with a population of over 500 million active users.However, despite the potential benefits, the adoption of web-based tools in Nigerian schools remains relatively limited. Factors such as inadequate infrastructures, limited internet connectively and lack of teacher training presents significant barriers to wide spread implementation. Additionally, there is a need to explore the specific challenge and opportunities associated with integrating web-based tools into teaching and learning of Basic Science and Technology in the Nigerian context.This study seeks to address these challenges by examining the current landscape of web-based tools usage among secondary teacher in Ekiti-State exploring experiences, perceptions and challenges.

Statement of Problem

The integration of web-based tools into secondary education holds significant promise for enhancing teaching and learning of Basic Science and Technology in Nigeria. However, several challenges hindered the effective implementation of web-based tools by secondary school teachers ranging from limited access to technology, teachers' competences and training, curriculum alignment and integration, institutional support and environmental to social- economic disparities among the teachers: however it seems the level of awareness and the frequency or level of use will go a long way in influencing the application of these web-based tools by secondary school teachers in Ekiti-state.The study therefore sought to find out the application of web-based tools by Basic Science and Technology teachers in the teaching and Learning of Basic Science and Technology in Ekiti-state.

Purpose of Study

The purpose of this study is to investigate the application of web-based tools by secondary school teachers for the teaching and learning of Basic Science and Technology in Ekiti-state, Nigeria.The study specifically want to:

(i) Explore the current landscape of web-based usage among secondary school teachers in Ekiti-state for teaching and learning of Basic Science and Technology.

(ii) Investigate into the level of awareness of web-based tools by Basic science technology teachers in Ekiti-state secondary schools.

(iii) Examine the challenges faced by Basic Science and Technology teachers in their quest to adopt and effectively use web-based tools in teaching

and learning of Basic Science and Technology in Ekiti- state secondary schools.

Research Questions

The following research questions were raised to guide the study:

(I) What is the level of awareness of web-based tools by Basic Science and Technology teachers in Ekiti-state secondary schools?

(II) How frequent do the Basic Science and Technology Teacher use web-based tools in their instructional process in Ekiti-state secondary schools.

(III) What are the challenges encountered by Basic Science and Technology teachers in their quest to effectively adopt the use of web-based tools for the teaching and learning of Basic Science and Technology in Ekiti-state secondary schools.

Research Hypotheses

The study tested the following hypotheses:

(i) There is no significant difference between the level of awareness of web-based tools and their utilization by Basic science and Technology in Ekiti-state secondary schools.

(ii) There is no significant difference between in the perceived problems faced by Basic science and technology and the level of use of web-based tools in Ekiti-state secondary schools.

Researchmethod.

The study utilized descriptive research of the survey type. The population consists all the Basic science and Technology teachers in Ekiti-state secondary schools.The study sample consists of 120Basic science and technology teachers which were selected using multi-stage sampling technique.Three research questions were raised and two research hypotheses were formulated to guide the study. A Self designed questionnaire titled ‘‘Application of web-based tools for Basic Science and Technology teachersQuestionnaire’’(AWBTBSTQ) (r=0-75) was used to elicit relevant information from the respondent. The questionnaire was made up of two sections namely A and B.Section A was on a personal data of the respondents while section B was constructed to elicit information in three basic area which include:

(i) level of awareness of web-based tools by Basic Science and Technology teachers in Ekiti-state secondary schools.

(ii) level of use of web-based tools by Basic Science and Technology teachers in their instructional process.

(iii) What are the challenges encountered by Basic Science and Technology teachers in their ability to integrate web-based tool in the instructional process.

Responses were based on the modified 4-point rating scale.The instrument was validated by experts from test and measurement and two experienced educational technology expert.The reliability of the instrument was ascertained through test-retest method in which the questionnaire was administered twice with a space of two weeks on subjects outside the target population.The responses were collected and analyzed using Pearson product moment correlation analysis and a reliability of 0.75 was obtained.This value was considered high enough for the study.Data collected were analysed using frequency counts, percentages, mean and standard deviation while the null hypotheses were tested at 0.05 level of significance using t-test and analysis of variance (ANOVA).

Results:

The results of the data analysed is presented based on the responses of the respondents on the application of web –based tools by secondary school teachers in the teaching and learning of Basic Science and Technology in Ekiti-state.

Research Question1: What is the level of awareness of web-based tools by Secondary school teachers for the teaching and learning of Basic Science and teachers in Ekiti-state.

Table: Level of awareness of web-based tools for teaching and learning Basic Science and Technology in Ekiti-state.

S/N	Web-based tools	Strongly aware	Fairly aware	Neutral	Not Aware	$\bar{X}$	Decision
1.	common. Wikipedia	10 (8.33%)	30 (25%)	10 (8.33%)	70 (58.33%)	1.83	Not Aware(N.A)
2.	Infogr.am	11 (9.17%)	21 (17.5%)	20 (16.67%)	68 (56.66%)	1.79	N.A.
3.	Edx.org	14 (11.67%)	22 (18.35%)	23 (19.17%)	61 (50.83%)	1.91	N.A.
4	Facebook	71 (59.17%)	20 (16.67%)	5 (4.14%)	10 (8.33%)	3.13	Aware
5.	Coursera.com	14 (11.67%)	20 (16.67%)	19 (15.83%)	67 (55.83%)	1.84	N.A.
6.	Blog	15 (12.5%)	10 (8.33%)	25 (20.83%)	70 (58.33%)	1.75	N.A.
7.	Penguin.com	16 (13.33%)	11 (9.17%)	10 (8.33%)	83 (69.17%)	1.67	N.A.

8.	Slide share.net	20 (16.67%)	15 (12.5%)	11 (11.67%)	74 (61.66%)	1.84	N.A.
9.	Flicker	17 (14.17%)	14 (11.67%)	5 (4.14%)	84 (70%)	1.70	N.A.
10.	e-mail	75 (62.5%)	25 (20.83%)	-	20 (16.67%)	3.29	Aware

Result of data analysis on Table 1 shows the level of secondary teachers' awareness of web-based tools in teaching and learning of Basic science and technology in Ekiti-state.

The table shows that about 58.33% of Basic science and teachers were not aware of commons Wikipedia.org as a web based tools with a mean score of 1.83 as revealed in the responses to item one. Similarly in item two, i .e Infogram it was revealed that 56.66% of the Basic Science andtechnology teachers were not aware of infogram as a web-based tools with low mean score of 1.79. In the same vein , it was equally revealed that 50.83% of the teachers with a mean score of 1.91 were not aware of Edx.org as aweb-based tool which is one of the most popular online tools where teachers can get free self-paced course on anything they want to teach and learn. However, the table shows that 59.17%, of the basic science and technology teachers are aware of face book as a web-based tool; with a mean score of 3.13.

Also on item five i.e. cousera.com, 55.83% of the respondent were not aware of cousera.com as a web-based tools with a low mean score of 1.84. This web-based tool can help the teachers to discover a number of free open online courses from reputed educators. Furthermore, on table 1, It was revealed that 58.3% of the basic school and technology teachers were not aware of a web-based tool called blog, with a low mean score of 1.75. Blogs are web 2.0 internet tools that can be used for teaching and learning process through a course or degree program. The tools can be used to facilitate a place where learners can come together to rub minds andcome out withnew ideas based on theirexperiences .

Again, it was revealed from the table 1 that the teachers were not aware of the web-based tool called penguim.com as over 65.17% of the teachers with mean score of 1.67 indicates non-awareness of this tool .This tool can help teachers to download popular books on courses for free in pdf format.

On item eight considered which is slideshare.net it was revealed from table 1 that 61.66% of the respondent were not aware of this web-based tool. This tool could assist the teacher to share and watch presentation on a particular concept virtually.

Result on table 1 equally shown that 70% of the basic science and technology teachers were not aware of web-based tools called flicker. The means score as indicator by the respondent was 1.70.Lastly table 1 shown that basic science and

technology teachers in Ekiti-state are strongly aware of email as a web-based tool with a mean score of 3.29% and the percentage score of 62.5% as indicated by the respondent.

Research Question 2: What is the level of use of web-based tools by secondary school teachers for the teaching and learning of Basic Science and technology in Ekiti-state.

Table 2: Frequency of use of web –based tools by secondary teachers for the teaching and learning of Basic Science and Technology in Ekiti-state secondary schools

S/N	Web-based tools	Daily	Twice a week	Once a week	Occasionally	$\bar{X}$	Decision
1.	commons. Wikipedia	5 (4.17%)	11 (9.17%)	20 (16.67%)	84 (70%)	1.48	Not in use.
2.	Infogr.am	4 (3.33%)	6 (5%)	10 (8.33%)	100 (83.33%)	1.28	Not in use.
3.	Edx.Org	3 (2.5%)	5 (4.17%)	7 (5.83%)	105 (87.5%)	1.22	Not in use.
4.	Facebook	100 (83.33%)	10 (8.33%)	3 (2.5%)	7 (5.83%)	3.69	Highly in use
5.	Coursera.com	10 (8.33%)	7 (5.83%)	11 (9.17%)	92 (76.67%)	1.51	Not in use.
6.	Blog	14 (11.67%)	12 (10%)	19 (15.83%)	75 (62.5%)	1.71	Not in use.
7.	Penguin.com	10 (8.33%)	12 (10%)	16 (13.33%)	82 (68.33%)	1.58	Not in use.
8.	Slide share.net	10 (8.33%)	16 (13.33%)	15 (12.50%)	79 (65.83%)	1.64	Not in use.
9.	Flicker	5 (4.17%)	14 (1.67%)	17 (14.17%)	84 (70%)	1.50	Not in use.
10.	e-mail	80 (66.67%)	25 (20.8%)	3 (2.5%)	12 (10%)	3.44	Highly in use

Result of data analysis on table 2 shows the frequency of use of the web-based tools in the teaching and learning of Basic science and technology by the teacher in Ekiti state secondary schools. The table reveal that 70% of the teachers teaching basic science and technology occasionally used web-based tools called common Wikipedia, 16.17% of the teachers makes use of the tool once in a week while 9.17%

of the teachers used common Wikipedia twice a week. The level of use was grossly low with a mean score of 1.48.

Also item 2 of the web-based tools i.e infgr.am shows that majority of the teachers teaching basic science and technology only make use of this tool occasionally (83.3%) with a low mean score of 1.28. In the same vein it was revealed from table 2 that about 87.5% of basic science and technology teachers occasionally makes use of Edx.org an web-based tool to teach their students. The tool ought to be used regularly by the teacher as it offer them opportunity to get free self-paced courses online with regard to the concept they intends to teach.

However, analysis from table 2 shows that majority of Basic science and technology teacher (70%) make use of face book to interact with their student. Furthermore , It was revealed from table 2 that courser.com as a web-based tool was not make use of by secondary school teacher in Ekiti state to teach basic science and technology as the result from the table 2 shows that 76.67% of the teachers occasionally used this tool for teaching and learning process with a mean score of 1.51. This particular web-based tool if it used regularly by the teachers would enable teacher discover a number of open free online courses from reputable authors.

The analysis from table 2 equally shows that other web-based tools such as penguin.com, slideshare.net and flicker were not used regularly by basic science teachers as the result indicate 68.33%,65.85% and 70% respectively occasional use. Lastly the analysis from table 2 indicate that teachers of basic science and technology makes use of e-mail as web-based tool to interact with the student on regular basis as the result shows a mean score of 3.44.

Research Question 3: What are the problem encountered by basic science and technology teachers in their quest to integrate web-based tools in their instructional delivery process.

Table 3: Mean respond of problem encountered by basic science and technology in their quest to integrate web-based tools for instructional delivery process.

S/N	STATEMENT	SA	A	D	S.D	$\bar{X}$	DECISION
1.	Little or no awareness of the numerous web-based tools especially on the part of the teachers for teaching and learning of basic science and technology.	95	20	03	02	3.73	Agreed
2.	Teachers lack expertise knowledge of web-based tool usage.	91	19	06	04	3.64	Agreed

3.	Little or no access to internet services within the school environment.	85	10	15	10	3.42	Agreed
4.	Teachers lack adequate training with the use of web-based tools.	81	15	13	11	3.49	Agreed
5.	Poor electricity supply.	90	20	06	04	3.63	Agreed
6.	Time allocation for teaching basic science and technology concepts make application of web-based tools less effective.	10	10	15	85	1.54	Disagreed
7.	Lack of interest on the part of the teachers handling basic science and technology.	20	05	10	85	1.69	Disagreed
8.	Lack of supports from the school management	82	15	13	10	3.41	Agreed
9.	Teachers lack confidence in using web-based tools	80	10	23	07	3.35	Agreed
10.	Digital literacy on the part of the teachers	15	10	10	90	1.67	Disagreed

Result in table 3 reveals most of the problem encountered by basic science and technology teachers in their quest to applied web-based tools in the classroom setting. It was shown from the table that the most common challenge being by the teachers is lack of awareness of numerous web-based tools by the teachers with a mean score of 3.73, this was closely followed by lack of expertise knowledge of web-based tools by the teachers with a mean score of 3.63.

Other problems faced by basic science and technology teachers in the application of web-based tools for instructional delivery process include Little or no access to internet services within the school environment, lack of professional training by teachers on the use of web-based tools, poor electricity supply, lack of support from the school management and lack of confidence on the part of the teachers in using most of this web-based tools with a mean scores of 3.42, 3.49, 3.63, 3.41 and 3.35 respectively.

However, the respondents disagreed that time allocation for basic science and technology concepts is responsible for non-application of web-based tools by basic science and technology teachers in their instructional process. Also lack of interest on the part of the teachers and digital literacy are not serious challenges faced by the teachers in their quest to integrate web-based tools in their instructional process.

Research Hypotheses

Hypothesis 1: There is no significant difference between the level of awareness of web-based tools and their utilization by Basic Science and Technology teachers in Ekiti-state secondary schools.

Table 4 :summary of paired sampled t-test showing the level of awareness of web-based tools and their utilization by Basic Science and Technology teachers in Ekiti-state secondary schools.

Variables	N	Mean	SD	Df	t-cal	t-table
Level of Awareness	62	1.92	0.313	118	22.6	2.02
Utilization of web-based tools	58	1.00	0.068			

P<0.05

Table 4 indicates that at 0.05 level of significant and degree of freedom of 118, the calculated value (t-cal.) 22.6 while the critical value is 2.02. Since t-calculated is greater than t-table value, this show that the result is significant and hence the null hypothesis is rejected. Therefore there is a significant difference between the level of Awareness and utilization of web-based tools by Basic Science and Technology teachers in Ekiti-state secondary schools.

Hypothesis 2: There is no significant difference in the perceived problem faced by BST teachers and the level of use of web-based tools in Ekiti state secondary schools.

Table 5: Summary of t-test analysis showing difference between the perceived problems faced by basic science and technology school teachers and level of use of web-based tools in Ekiti state secondary school.

Variable	N	Mean	S.D	Df	t-cal	t-table
Perceived problems	120	49.97	12.49	118	41.82	1.98
Level of used web-based tools	120	2.118	0.82			

P< 005

Table 5 shows that computed value (41.82) is greater than t-table(1.98) with degree freedom (118)was statistically significant atp<0.05. The null hypothesis is therefore rejected showing that there is significant difference between the perceived problem faced by the Basic Science and Technology teachers and the level of use of web-based tools by Basic science and technology teachers in Ekiti state secondary schools.

Discussion of the Findings

The findings of this study provide valuable insights into the application of web-based tools by secondary school teachers in Ekiti state for teaching and learning Basic science and technology. The discussion focuses on key themes emerging from the data analysis which include various types of web-based tools ,level of awareness of web-based tools by Basic science and technology teachers in Ekiti-state secondary schools and challenges encountered by Basic science and technology teachers in adopting web-based tools in their teaching and learning process.

The result shows that teachers of Basic science and technology in Ekiti state are not aware of most of the web-based tools, they do not know that they can use some of these tools teach and interact with their students. To ascertain the level of awareness of the web-based tool by secondary school teachers in Ekiti state, items 1-10 were analyzed in table 1. The findings revealed that web-based tools such as Wikipedia, infogr.am, Edx.org, coursera.com, Blog, Pengum.com, slideshare.net and flicker were not aware of by Basic science and technology teachers in Ekiti –state. However the result shows that the teachers are aware of Facebook and email as web-based tools. The application of web-based tools by teachers will improve the quality of teaching and learning process and this keep the teachers and students at aclose contact andhave good rapports with regards to the course content.

This finding agreed with the view of Bazar, etal (2021) whose studies affirmed that teachers' awareness and regular usage of online web-based tools improves secondary school students' achievement.

Again, with regards to the level of use of web-based toolsby secondary school teachers in Ekiti- state, as indicatein table 2, it was revealed that the most of Basic science and technology teachers in Ekiti-state occasionally use web-based tools such as Wikipedia, Infogr.am, Edx.org, Coursera.com, Blog,pengum.com,slideshare.net and Flicker for their instructional process probably because of low level of awareness of these tools. This findings agreed with the submission of Afolabi& Aragbaye,(2022) who affirmed that digital illiteracy among secondary school teachers in Ogun state impedes the application of web-based tools in the instructional process. According to Omotunde,(2015) there has been an increasing importance and attention attached to the potential of how on-line tools can enhance teaching and learning process in teachers training institution, this goes with the researcher findings that students are willing and interested in making use of web-based, when the teachers encouraged them to do so.

However findings from the study as indicated in table 3 revealed that basic science and technology teachers are faced with some challenges which hindered the effective application of web-based tools in their teaching and learning process. These problems include: Little or no awareness of web-based tools by the teachers, poor electricity supply, lack of support from the school management and inadequate professional training. The findings are in agreement with the assertion of Trayek and Hassan (2013) who affirmed that lack of professional training for teachers and irregular supply of power could hinder their awareness of web-based tools and their applications.

Finally the findings of this study as indicated in table 4 shows that there is significant difference between the level of awareness and utilization of web-based tools by basic science and technology teachers in Ekiti -state secondary school. It is

obvious from the study that the teachers find it difficult to use most of the web-based tools for teaching and learning process because they were not aware of them.

Conclusion

The study indicated that application of web-based tools has a great and significant influence on the teaching and learning of basic science and technology if only it is well integrated in the teaching and learning process. The infiltration of incorrect use of web-based tools by the youth have altered how youth socialize, learn and raise a new set of issue for educators. Teachers should therefore improve on the awareness of these web-based tools and apply it in the instructional process.

Recommendations

Based on findings of the study the following recommendations were made:

(i) Professional training and development opportunity should be provided for teachers to enhance their digital literacy, skill and pedagogical knowledge.

(ii) Electricity power supply in Nigeria has becomes a persistent problem, therefore government and stakeholders should endeavor to make regular of electricity a priority.

(iii) Access to technological infrastructure and resources in Educational institution should be improved.

(iv) Aligning digital resources with Nigeria curriculum for basic science and technology in order to ensure relevance and coherence should be a priority for our curriculum developer.

(v) Supportive institutional policy frame work that prioritize technology integration and provide teachers with necessary resources should be the focus of all Educational stakeholders.

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