A SURVEY OF MISCONCEPTIONS AND ALTERNATIVE CONCEPTIONS FROM ONLINE SENIOR SECONDARY SCHOOL BIOLOGY RESOURCES ON THE CONCEPT OF EVOLUTION

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ABSTRACT: *The proliferation of e-learning in recent time due to COVID 19 pandemic has mount more pressure on the need for online resources consumption. Literature has it that difficult topics in biology were the most online resource visited frequently which the concept of evolution falls into difficult topic to teach and to learn in Biology.Studies have established that misconceptions and alternative conceptions held by students are major barriers to meaningful learning. The survey type of descriptive research method was adopted in the study. Multistage sampling procedure was used to select 90 online Biology resources which were grouped into three categories based on ownerships i.e. educational institutional, corporate organization, and blogger websites. Three instruments, namely; Misconceptions in Online Biology Resource Content Analysis Template (MOBRCAT), and Alternative Conceptions in Online Biology resources Content Analysis Template (ACOBRCAT) and a questionnaire, "Students' Frequently Visited Biology Websites (SFVBW)" were the researcher designed instruments used for data gathering. Data collected were analyzed using inter -rater analysis and percentages. The findings of the study were that:misconceptions and alternative conceptions existed in the contents of senior school online resources on Evolution on websites hosted by bloggers (100%), and none on educational institution websites and corporate organization websites. This implies that online resources are also a source of misconceptions and alternative conceptions of Biology concepts, which could contribute to students' poor performance in Biology. It was therefore recommended that Biology students, teachers, and researchers need to be sensitive and selective on the categories of websites that hosted online Biology resources.*

Keywords: *Alternative Conceptions, Biology Resources Misconceptions, e-Learning,Evolution, and Online Biology Resource*

Introduction

Biology, like other science subjects, was recently delisted from the list of core subjects in the Nigerian senior secondary school curriculum, as indicated in the sixth edition of the National Policy on Education (FRN, 2013). It is however, a compulsory subject to be studied by those who wish to pursue a career in several Biology-related disciplines, like, medicine, agriculture, nursing, pharmacy, and environmental studies, among others. They must pass the subject at credit level at the Senior School Certificate Examination. It is thus, imperative to improve students' interest and academic achievement in Biology as a measure to sustain the aforementioned invaluable benefits of Biology at individual, national and global level. It is obvious that no matter what one does, Biology is link to day-to-day activities; hence, the public outcry against the persistent poor performance of students in Biology is not a surprise. Indeed, Abimbola (2013) noted that there is growing public outcry about the poor level of scientific literacy and

students' academic achievement, especially in Biology among Nigerian youths. Reasons adduced for the students' poor achievement in Biology include: misconceptions and alternative conceptions of Biology concepts, poor mode of instruction, misconceptions in science textbooks, lack of textbooks, students' poor attitude, and lack of science laboratory, among many others (Abimbola, 2013). Biology teacher educators and Biology teachers certainly needs to adequately address this unacceptable situation.

Background to the Study

According to Abimbola (2015), a word that is totally not understood is called "misconceptions" while, a word that is wrongly understood is referred to as "alternative conception". Misconceptions and alternative conceptions in science are closely associated with intuitive cognitive construct and both are noted to be highly resistant to be corrected or changed as reported by Abimbola (2013). Indeed, cognitive and developmental psychologists postulated that humans make use of intuitive conceptual system to reason about the living things. Intuitive conceptual system is the use of teleological, essentialist, and anthropocentric thinking to provide explanations about the natural phenomena.

Efforts to stem the negative impacts of misconceptions and alternative conceptions in Biology and science in general on students' academic achievement led to series of international seminars and conferences on misconceptions in science and mathematics. Misconceptions and alternative conceptions related to Biology concepts are widely spread among pre-service and in-service Biology teachers; students at every level of educational ladder; and even Biology textbooks (Bello, Bello, & Abimbola, 2018) several studies were conducted on sources of students' misconceptions in Biology and other science subjects (Daniel, 2015 &Susanti, 2018). However, studies are yet to be focused on identifying misconceptions from online Biology resources hosted in the websites of various organizations and individuals that serve as resource materials for students, teachers and researchers. Therefore, the task accomplished in this study was the search for the existence of misconceptions and alternative conceptions related to Biology in online Biology resources. The fact that most internet users, including science teachers, students and researchers may not be selective in the use of online resources as noted by Acar-Sesen and Ince (2010) can also be a factor that contributed to the prevalence of misconceptions and alternative conceptions in Biology. This is because most internet users often take the credibility of online resources for granted.

There is no doubt that modern digital Information and Communication Technologies (ICTs) is now a dominant feature of day-to- day life activities globally. There is hardly any aspect of human enterprises that is not driven by ICTs. Jegede (2004) rightly observed that the global community is witnessing paradigm shift on how knowledge and information are transmitted, distributed, accessed and processed. Hence, knowledge is now view as non-linear, socially negotiated and constructed, and accessible to everybody through ICTs devices, like the internet.

The education industry is now driven by ICTs leading to the emergence of new paradigms like, e-education, e-learning, e-library, virtual classroom, and smart books, among others. In Nigeria, the Federal Ministry of Education ministerial initiative on e-Education observed that the global community is embracing the e-Education framework. (FME, 2004). The United Nations Educational, Scientific and Cultural Organization (UNESCO) (2002) equally, observed that, educational systems are under intense pressure to employ modern ICTs to teach students the knowledge and skills they need in the 21st century. Nigerians are not standing aloof in embracing these new paradigms ushered in by modern ICTs (Ajuwon, 2003). For instance, in Nigeria there are 86,219,965 Internet users as at July, 2016.This figure represent 46.1% penetration and 2.5% share of world Internet users (Internet Live Stats, 2016). According to the Internet World Stats (2018, June 2) there were 98,391,456 internet users in Nigeria as at 31st December, 2017 which represent 50.2% penetration. It is obvious that more and more Nigerians are embracing the use of the internet daily.

Many of the online Biology resources are owned by educational institutions, corporate organizations and bloggers, among others. As noted by AIR State Assessment Services (n. d.) online resources in educational institutions websites are primarily for the delivery of

educational services; to promote meaningful learning by the students; promote effective and efficient teaching by the teachers; and equally, provide opportunity for parents to monitor activities taking place at school with respect to contents that their children are learning. Online resources in educational institutions websites generally provides avenue for students to improve their learning experiences, since, they can gain access to the material not available in class. The online resources often serve as an extension of the classroom (CSI Media, n. d.). It is reasonable to assume that students would most likely regard the contents of educational institutions online resources to be of good quality and highly reliable information. It is obvious that the existence of misconceptions and alternative conceptions in online resources owned by educational institutions can result into negatives consequences on meaningful learning by the students.

Although, online resources are integral part of educational enterprise, but unlike journals, and textbooks, the contents of online resources may not go through rigorous academic review before uploading for public use. There are indications that they may contain valuable, very reliable information sources as well as unreliable, biased sources of misinformation. This is due to the fact that anyone can own a website to post any information. The burden of determining the reliability and accuracy of the contents of online resources rests on users (Easelly 2018 March 30; Lee College library n. d.).

Statement of the Problem

It has been well established in Biology education literature that misconceptions and alternative conceptions are major barriers to learning of Biology concepts by students (Abimbola, 2013). Most internet users, including science teachers, students and researchers may not be selective in the use of online resources as noted by Acar-Sesen and Ince (2010) can also be a factor that contributed to the prevalence of misconceptions and alternative conceptions in Biology. This is because most internet users often take the credibility of online resources for granted. Also misconceptions and alternative conceptions are not only highly resistant to change because whatever experience the students brought classroom tend to interfere with the current learning concepts, meanwhile misconceptions and alternative conceptions they are widely spread across many print and electronic Biology resources, such as textbooks, and internet (Abimbola, 2013; Ojo, &Akande, 2005;Susanti, 2018).This study, therefore, was directed towards identification and the analyses of misconceptions and alternative conceptions present in evolution uploaded online resources, to improve students' achievement in Biology.

Purpose of the Study

The main purpose of this study was to identify and analyze Misconceptions and Alternative Conceptions present in the concept of evolution available online

Specifically, the study;

1. sought to identify and analyze misconceptions and alternative conceptions on Evolution as contained in online senior secondary school Biology resources hosted on; Institutional websites, Corporate Organization websites, and blogs.

Research Questions

In this study, an attempt was made to provide answers to the following under listed research questions:

1. Research Question 1: What are the misconceptions on Ecology in the contents of senior secondary school online Biology resources?
2. Research Question 2: What are the alternative conceptions on Ecology in the contents of senior secondary school online Biology resources?
3. Research Question 3: What difference exists among the number of Alternative Conceptions on Ecology in the contents of senior secondary school online Biology resources in educational institution, corporate organization and blog websites?

Significance of the Study

Findings from this study can stimulate Biology teachers to be very sensitive to the degree of accuracy and reliability of the contents of online Biology resources. Hence, they would most likely

make conscious efforts to filter out any misconception and alternative conception contained in online Biology resources before the contents are put into use for teaching and learning in the class. The direct beneficiary of such efforts by the Biology teachers would be their students because they would be less exposed to misconceptions and alternative misconceptions of Biology concepts. Consequently, students' performance in Biology could improve significantly.

Results of this study will provide Biology teachers useful information on categories of websites that hosted online Biology resources, laden with misconceptions and alternative conceptions. Such information could be of help to the Biology teachers in deciding on which category of websites to search for reliable and high quality Biology resources. Findings from this study could provide Biology teachers meaningful insight into the types of misconceptions and alternative conceptions related to Biology concepts contained in online Biology lesson plans and resources.

It is of no doubt that teachers, students, and researchers often solely depend directly on online materials for clarification of thoughts, ideas or as a supplement for what they read in their textbooks or what meaning their instinct tells them about a particular term. Thus, this study may be significant in sensitizing Biology teachers, students, teacher educators, researchers, and other internet users of the need to recognize that online resources may or may not be error free.

Results of this study could be of immense benefits to the following major stakeholders in the field of Biology education: Biology teachers, students, and Biology teacher educators, researchers in the field of Biology education, teacher education institutions, and curriculum experts among others.

Methodology

This study was a descriptive study using the survey method.The population for the study was all available senior secondary school online Biology resources. The target population consisted of all secondary school online Biology resources on Ecology hosted on websites owned by educational institutions, corporate organizations, and bloggers.Purposive sampling technique was used to select 150 Biology students from secondary schools based on the availability of access to the internet in the schools. Fifty (50) students each were purposive selected from three purposively selected senior secondary schools in North-central and South-west geopolitical zones of Nigeria. Only students who were users of online Biology resources were purposively selected to take part in the study.The multistage sampling procedure was used to select 90 senior secondary school online Biology resources on Ecology. Two research instruments were used in this study.The researcher-designed contents analysis templates, which were in to two formats, namely; Misconceptions in Online Biology Resource Content Analysis Template (MOBRCAT), and Alternative Conceptions in Online Biology Content Analysis Template (ACOBRCAT). These instruments were in tabular form consisting of rows and columns where the researcher entered the identified Misconceptions and Alternative conceptions in the content of the downloaded online Biology resources.

The second research instrument was a researcher-designed questionnaire, entitled; Student Frequently Visited Biology Websites (SFVBW) .It was equally designed by the researcher to collect data on the most frequently visited online Biology resources., a column was equally created and made empty where the respondents write the URL of the website in case the websites he or she visited were not listed in the preceding columns.

Data collection and Results

Research questions were first addressed using the percentage, followed by hypothesis testing using Chi-square ( )

Research Question 1: What are the misconceptions on evolution in the contents of senior secondary school online Biology resources?

Table 1
Misconceptions Identified in Secondary School Online Biology Resources on Evolution

SN	MISCONCEPTIONS	WEBSITE
	Evolution	
1	Species are distinct natural entities, with a clear definition, that ca n be easily recognized by anyone.	Corporate Organization
2	Natural selection gives organisms what they need.	Corporate Organization
3	Humans can't negatively impact ecosystems, because species will just evolve what they need to survive.	Corporate Organi zation
4	Evolutionary theory is invalid because it is incomplete and cannot give a total explanation for the biodiversity we see around us.	Blog
5	Most biologists have rejected Darwinism' and no longer agree with the ideas put forth by Darwin and Walla ce.	Blog
6	If students are taught that they are animals, they will behave like animals.	Blog
7	Evolution is slow humans cannot influence it.	Blog

Table 2
Summary of the Number of misconceptions Identified from Online Senior Secondary School Biology Resources on the concept of evolution based on category of website

Topic	Educational Institution	Corporate Organization	Blog
Evolution	0 (0%)	3 (42.8%)	4 (48.2%)
	Grand Total:		**7**

Table 2 presents the number of misconceptions identified from each of the three categories of websites under focus in this study. All outsevenmisconceptions discovered were identified from blog websites and Corporate Organization websites

Research Question 2: What are the alternative conceptions on evolution in the contents of senior secondary school online Biology resources?

Table 3
Alternative Conceptions Identified in Secondary School Online Biology Resources on Evolution

SN	ALTERNATIVE CONCEPTIONS	WEBSITES
	Evolution	
1	Natural selection involves organisms tr ying to adapt	Corporate Organization
2	The fittest organisms in a population are those that are strongest, healthiest, fastest, and/or largest	Corporate Organization
3	Evolution is a theory about the origin of life.	Blog
4	Evolutionary theory implies t hat life evolved (and continues to evolve) randomly, or by chance	Blog
5	Evolution results in progress; organisms are always getting better through evolution.	Blog
6	Individual organisms can evolve during a single lifespan	Blog
7	Evolution only occurs s lowly and gradually.	Blog
8	Teachers should teach "both sides" of the evolution issue and let students decide — or give equal time to evolution and creationism	Blog

Research Question 3: What difference exists among the number of Alternative Conceptions on evolution in the contents of senior secondary school online Biology resources in educational institution, corporate organization and blog websites?

Table 4
Summary of the Number of Alternative Conceptions Identified from Online Senior Secondary School Biology Resources on the concept of evolution based on category of website

Topics	**Number of Alternative Conceptions Identified Each Type of Website**		
	Educational Institution	Corporate Organization	Blogger
Ecology	0	2(28.5%)	5(72.5%)

Table 4 presents the number of alternatives misconceptions identified from each of the three categories of websites under focus in this study. All out four Alternatives misconceptionswere discovered on corporate organization website(28.5%) and blogs(72.5%) with the highest alternative conception were identified from blog websites.

Findings
The following were the summary of the major findings of this study

1. There were misconceptions in the contents of secondary school online resources in evolutionon websites hosted by corporate organization and blogs.
2. There were alternative conceptions in the contents of secondary school online resources in evolutionon websites hosted

by corporate organization and blogs.

3. There was no misconception in evolution on educational institutional websites and corporate organization websites.
4. There was noalternative misconception in evolution on educational institutional websites and corporate organization websites.

Discussion or Results

One of the major findings in this study indicated that there were misconceptions and alternative conceptions in the contents of secondary school online biology resources on evolution. This finding was in accordance with the result of a similar study conducted by Acar-Sesen and Elifince (2010) who observed that many websites contained misconceptions on the concepts of radiation and radioactivity. This result indicated that some misconceptions in biology, especially on Ecology are traceable to internet sources in view of the popular use of the internet by students and teachers. This implies that the internet is also a source of misconceptions and alternative conceptions of biology concepts, which could contribute to students' poor performance in biology.

Another major finding in this study revealed that there was no misconceptions and alternative conception in the contents of secondary school biology online resources in Ecology, on websites hosted by educational institutions. This result suggests that the contents of secondary school biology online resources hosted on educational institutions passed through the required rigorous academic peer review exercise before uploading online. The result is not surprising because educational institutions are control and manage by syndicates. Typically, syndicated outfits, such as educational institutions are subject to regulations and are obliged to meet officially set academic standards. In addition, professionals who are under obligation to routinely subject their research findings to peer reviews, editing and vetting of contents, before publication, power educational institutions. Hence, under this situation, misconceptions and alternative conceptions are not likely to be in the contents of the secondary school biology online resources on websites hosted by educational institutions. This finding implies that educational institutions online biology resources are reliable hence; biology students and teachers can patronize resources without fear of exposure to misconceptions and alternative conceptions.

Conclusion

In view of the major findings in this study, it was concluded that: Secondary school biology online resources hosted on educational institutions website were accurate and reliable. Secondary school biology online resources hosted on corporate organizations and blog websites contained misconceptions and alternative conceptions of biology concepts.

Recommendations

On the basis of the findings and the conclusions drawn, in this study, the following recommendations were made:

1. Students should regularly interact with their teachers and peers to discuss the contents of online biology resources they read as part of measures to ascertain the accuracy and reliability of the contents.
2. Bloggers should set standard and self-regulatory mechanisms that will ensure the accuracy and reliability of the contents of their posts. This could be achieved by transforming their job into a globally recognized profession.
3. Biology teachers should regularly sensitize students on the need to be selective on the categories of websites that hosted online Biology resources. Information on categories of websites that are laden with misconceptions and alternative conceptions will help students to avoid assimilating new misconceptions or reinforcement of old ones in their cognitive structures after reading online biology resources from websites hosted by corporate organizations and blogs.
4. Bloggers should synergize with education institutions as part of measures to enhance the accuracy and reliability of their posts. This will also, put an end to or at least minimize misconceptions and alternative conceptions on the contents of blog posts.

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