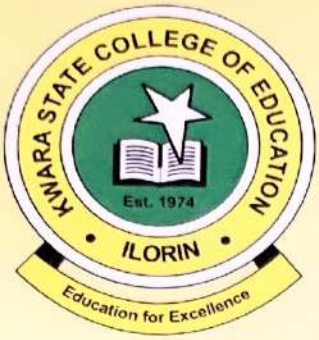

"THE AFFILIATE"

JOURNAL OF THE DIRECTORATE OF UNDERGRADUATE STUDIES

KWARA STATE COLLEGE OF EDUCATION, ILORIN.

Volume 1, Number 1
July,2021

SOURCES OF MISCONCEPTIONS AND ALTERNATIVE CONCEPTIONS OF BIOLOGY CONCEPTS: A REVIEW

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Abstract

Studies have established that misconceptions and alternative conceptions held by students are major barriers to meaningful learning of difficult concepts in Biology, and their sources have been traced to teachers, students, and Biology textbooks. Misconceptions and alternative conceptions are equally known to be resistant to change. The existence of Biology topics perceived difficult to teach and learn by the teachers and students, respectively is another major concern in Biology education at secondary school level. Prominent among the hard- to- teach and hard-to- learn Biology topics are, photosynthesis, evolution, genetics, reproduction, respiration, ecology and so forth. Therefore these identified biological concepts constitute a larger percentage biology concepts searched for by students, teachers and researchers via the internet. A large number of online Biology resources are available and dedicated to the service of teachers, students and researchers in the cyberspace. Many of the online Biology resources are owned by educational institutions, corporate organizations and bloggers, among others. 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. Sensitizing Biology students to the need to avoid regarding the contents of online Biology resources to be flawless or perfect is imperative. This could propel the students to consult their teachers and other sources of information to ascertain the quality of the contents of online Biology topics before learning the contents. When students are aware that the contents of online Biology resources hosted on some categories of website may not be entirely free from errors, they will be careful in their selection of websites for extra information on Biology topics.

Keywords: Alternative Conceptions, Biological Concepts, Internet and Misconceptions.

Introduction

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 need to adequately address this unacceptable situation.

Concepts of Misconception and Alternative Conception

Misconceptions are ideas or thoughts that are in conflict with scientific ideas or knowledge and are, therefore, regarded as incorrect whereas, alternative conceptions refer to idiosyncratic knowledge, which are not necessarily in conflict with the accepted scientific knowledge but have their value and cannot be considered entirely wrong (Abimbola, 1984; Hewson, 1981 and 2007).

According to Abimbola (2015), a word that is totally not understood is called "misconception" while, a word that is wrongly understood is referred to as "alternative conception".

Sources of Misconception and Alternative Conception

Misconception: Misconception is when students', teachers' or anybody's idea differs from the definitions accepted by experts. Educators and examiners often discover that many students show misunderstanding of some concepts. When they have this misunderstanding in their mind it is and persistent, it can affect the students' understanding of the lesson/subject (Boyes, & Stanisstreet, 1991).

In the last three decades, our understanding of the misconceptions and alternative conceptions that students bring with them to the classroom has been well documented in literature. It has now been established that misconceptions and alternative conceptions are major obstacles to meaningful learning and common among Biology students, teachers, and researchers and in Biology textbooks. Misconceptions and alternative conceptions are equally known to be resistant to change and that Biology teachers use of everyday language in a scientific context, compartmentalization of concepts, teaching strategies, and textbooks are prominent sources of students' misconceptions and alternative conceptions (Abimbola, 2013).

The existence of Biology topics perceived difficult to teach and learn by the teachers and students, respectively is another major concern in Biology education at secondary school level. Prominent among the hard- to- teach and hard-to- learn

Biology topics are, photosynthesis, evolution, genetics, reproduction, respiration, ecology and so forth (Koba & Tweed, 2009). Reasons adduced for the difficulty in teaching and learning of difficult Biology topics include the fact that most of the topics are broad and conceptually complex; abstractedness of the topics which makes visualization by the students difficult; and students' preconceptions that are often misconceptions and highly resistant to change (Abimbola, 2013). Other reasons include, the learning environment, inappropriate mode of instruction, and insufficient exposure of students to laboratory and field activities (Abimbola, 2013; Koba & Tweed, 2009). It is evident from the preceding discussion that misconceptions is also associated with Biology topics that are hard-to- teach and hard-to-learn by teachers and students, respectively. It is thus, imperative to identify and analyze misconceptions and alternative conceptions in the contents of online Biology resources on hard -to -teach and hard-to-learn Biology topics. 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 Burcin acar-Sesen and Elifince (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.

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. The results of the study carried out by Coley and Tanner (2012) indicated linkages between the pupils' intuitive conceptual system of thinking and their misconceptions in discipline-based reasoning.

When students fail to understand a concept, they tend to employ a rote learning strategy to pass their examinations (Duit, & Treagust, 2003). The question to ask is: where are students' misconceptions from? Sources of these misconceptions can in many cases be traced to textbooks or to teachers, who may have presented the concepts incomprehensibly or incorrectly. Students can also get their misconceptions from the media, where the reporters don't use the right definitions for the concepts.

Misconception is a main concern of constructivism in science education, including folk mechanics, folk Biology that enable humans to interact effectively with the world in which they evolved. Folk sciences do not totally conform to modern scientific discovery and fact is not unexpected. Another source of scientific misconceptions is instruction-induced. Misconceptions can be therefore split into five main categories (1) preconceived notions; (2) nonscientific beliefs; (3) conceptual misunderstandings; (4) vernacular misconceptions; and (5) factual misconceptions (Zoller, 1990).

Alternative Conceptions

Alternative conceptions are tenaciously held, and often resistant to change. Only intentional efforts by teachers can adequately address them.

Alternative Conceptions: Students come to school with non-traditional ideas that deal with the natural world that is not easy to change in the students' cognitive structure and strongly influence acquisition of new knowledge (Pfundt & Duit, 1991). It is these improper interpretations that are collectively known as alternative conceptions.

Blogs as a Source of Misconceptions and Alternative Conceptions

A blog can be described as a publication like a journal or bulletin. Blog is said to have been promoting open dialogue and encourage communal building in which the bloggers and blog user exchange ideas and views.

Blog's feature that distinguishes it from other forms of computer based instructions includes; instant publishing of text or graphics to the Web, people to provide comments or feedback to each blog post and ability to archive past blog posts by date, and external links to other bloggers' pages (Henning, 2003).

Henning (2003) indicates that a person does not have to be well knowledgeable before he/she can upload online resources and this was the main focus of this research study, to find out and analyse possible misconceptions and alternative conceptions present in the learning resources being uploaded. In fact a study finds that 40% of blog creators are less than 20 (Herring, Scheidt, Bonus, & Wright, 2004). Since blogs seem so popular with the youth, it is hard to ignore the implications for educational technology (Crystal, 2001).

Fast Growing Trends on the Use of Internet for Teaching and Learning by Nigerian Teachers and Students

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 represents 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 represents 50.2% penetration. It is obvious that more and more Nigerians are embracing the use of the internet daily.

Nigerian students and teachers are already making use of ICTs for educational services (Ali, 2005). Instances of such services include; online Computer Based Test (CBT), online result checking, and e-registration for public examinations by candidates, among others. It has been established that Nigerian lecturers, teachers and students are no longer relying entirely on textbooks as a source of research material and knowledge. They are making use of ICT facilities especially, the Internet, to search for knowledge and equally contribute to knowledge construction. (Eke, & Agbo, 2014).

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 provide avenue for students to improve their learning experiences, since, they can gain access to 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 negative consequences on meaningful learning by the students.

Conclusion and Recommendations

In spite of all the literature reviewed in this article, it could be easily deduced that internet is also a source of misconceptions and alternative conceptions of biology concepts and a contributor to students' poor performance in the subject. Therefore, the following are recommended:

1. Teachers, students and internet users should never take the accuracy and reliability of biology online resources especially those hosted on blogs and corporate organization websites for granted by consulting various Biology learning resources sources and standard textbooks to check the accuracies of the resources.
2. Biology teachers should regularly sensitize students to 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.
3. Teachers, students and internet users should regularly update their knowledge on how to ascertain the accuracy and reliability of information from internet sources. This will present the establishment of new misconceptions and

alternative conceptions or the reinforcement of existing ones in their cognitive structures after reading online biology resources.

4. Educational institutions should continue to promote accurate and reliable content of online biology resources through seminars, workshops and short courses for major stakeholders including Scholastic Bloggers.
5. Efforts should be made by authors of existing online Biology resources that were laden with misconceptions and alternative conceptions to revise the contents of their online resources.

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