EXAMINING THE EXTENT OF TEACHERS' USE OF CONTEXT-BASED INSTRUCTIONAL STRATEGY IN BIOLOGY TEACHING: BARRIERS TO IMPLEMENTATION AND WAY-FORWARD

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Abstract
The curriculum recommends that Biology instructional processes should be context-based. The efficacy of context-based instructional strategy has been discovered empirically. However, there is a need to examine the extent of teachers' use of this strategy in their Biology teaching so that students cease to be alienated in science classrooms including Biology, and benefit optimally thereof for the general good of the public. This study focused on examining the extent of teachers' use of context-based instructional strategy in Biology teaching: Barriers to implementation and way-forward and was studied in Nsukka Local Government Area of Enugu State. Guided by three research questions, the study adopted a descriptive survey research design. The population of the study was all the 56 Biology teachers in the Area. The study purposively used the 56 Biology teachers as a sample size for the study. The instrument for data collection was a questionnaire on a four-point scale which has three clusters whose reliability indices determined using Cronbach's Alpha were 0.97, 0.95, and 0.90 respectively; with the overall reliability of 0.75. Data were analyzed using mean and standard deviation. Results exposed that although teachers use context-based instructional strategy in Biology teaching, their use of the strategy was not holistic. The results also revealed the barriers to the teachers' use of context-based instructional strategy and identified possible solutions. It is recommended among other things that service teachers should be trained on how to write context-based lesson plans and on how to contextualize students' assignments and assessments.

Keywords: context-based instructional strategy, traditional teaching method, innovative teaching method, Biology

Introduction

The study of Biology has applications in various fields of human endeavor especially in those that are concerned with life and the general wellbeing of the individual and the society at large. For instance, the knowledge and skills from Biology can be applied in the diagnoses of agents of disease causation, disease prevention, and their treatment as well as in environmental protection. Biology is also applied in agriculture and biotechnology where it has helped to improve crop yield and animal production, crops' pests and diseases control, food preservation, and production of genetically engineered crops among others (Nzewi & Okereke, 2019).

The applications of Biology as stated above have useful hints that Biology as a science subject is a beneficial good for the good of the general public. A cursory look at the Biology Curriculum for Senior Secondary Schools used in Nigeria, one observes the robustness of the contents and their spiral organization into themes for in-depth coverage by the students through the teachers who are curriculum implementers. However, a well-planned Biology curriculum having desirable content for the good of the students may be marred at the implementation stage just because of the teaching methods and/or strategies used by the teachers.

As a result, the way Biology is taught becomes important to curriculum experts since it is the most effective means of ensuring that curriculum contents are delivered to learners in a meaningful manner capable of enhancing the transfer of learned contents for sustainable development. Teaching methods are various approaches through which the teacher presents the curriculum contents to the learners for better understanding which they subsequently apply to solve problems in the environment. Teaching methods could be broadly grouped into traditional and innovative teaching methods (Nworgu, 2009). Traditional teaching method simply defined as the common or usual ways of teaching across schools (Dairianathan & Subramaniam, 2011) involves the use of direct instruction in which the teacher is at the center of the instructional process. In the use of the traditional method, the students remain more docile than being active. It also involves lecturing and demonstration (Pedagogy, 2018) that are mostly done by the teacher with little or no involvement of the learners in the instructional episodes. The traditional teaching method emphasizes students' rote memorization of the contents and reproducing the same during tests/examinations (Yap, 2016). Chiang, Chapman, and Elder (2010) observed that transformation to a less traditional method of teaching is being found hard to do by many teachers. Perhaps, because of its use in helping the teachers cover the curriculum contents. This attitude provokes some issues in the classrooms. Among these issues as noted by Devinder and Zaitun (2006) as well as Damodharan and Rengarajan (2017) are:

- It limits the room for more creative thinking and rarely considers individual differences.

- Learning is from memorization instead of understanding.
- There is insufficient interaction with students in the classroom.
- Teachers continuously talk most of the time without knowing students' responses and feedback.

To redress the aforesaid issues existing in the classrooms, there should be a paradigm shift in the use of traditional teaching methods to the innovative ones that encourage students to participate actively during the teaching/learning process.

The innovative teaching methods shift attention from the teacher to the learner. They facilitate activity-oriented classroom interactions where the teacher plays the role of a facilitator who only guides instruction. Teaching methods like project-based learning, inquiry-based learning, and computer-assisted instructions among others (Pedagogy, 2018) are said to be innovative and learner-centered. Science teaching generally including Biology is expected to be carried out using participatory approaches because of their nature. This could be why the Biology Curriculum for Senior Secondary Schools used in Nigeria suggested that the teaching of curriculum contents could be done using guided discovery, field studies, and laboratory techniques among others (Nigeria Educational Research and Development Council [NERDC], 2009). The curriculum recommendations notwithstanding, teachers' use of the traditional teaching method in science teaching is common across schools. Chiang, Chapman, and Elder (2010) have noted teachers' reluctance in applying the less traditional methods of science teaching. In any case, the traditional teaching methods will continually be used in science but there is a need for their improvement through the integration of learner-centered strategies such as context-based instructional strategy.

A context-based instructional strategy is one in which the contents to be learned are related to contexts drawn from the students' environment, culture, and/or experiences to foster their understanding of the concepts as well as bring into focus the relevance of such contents to the society. The strategy also links science concepts to situations of daily life experiences that students are familiar with and consider vital (Kazeni & Onwu, 2013). For this study, a context-based instructional strategy is a situation whereby Biology teachers relate curriculum contents to the students' daily life experiences, culture, and/or to their environment to enable them to learn meaningfully. Through the context-based teaching strategy, students understand the link between what they learn in schools and the larger society. The contexts in learning could be diversified to include the environment, stories, common practices, situations, theme, societal and health issues, or problems that are within the ambit of students' experiences (Bulte, Westbroek, De Jong & Pilot, 2006). The application of context-based instructional strategy while teaching students in any instructional episode involves some stages or steps. The steps include the introduction of contexts, interrogation of the contexts, introduction of content, linkage of content and contexts, and assessment of learning (Kazeni & Onwu, 2013). The authors further explained that the first stage involves designing a narrative to arouse students' interest and focuses their thinking about a familiar related situation to be used as context in what is to be taught. The second stage involves students working in miniature groups to attempt to answer some pertinent questions emanating from the context already introduced. The third stage enables the teacher to introduce the content or concept derived from the curriculum. At the fourth stage, the students in their small groups revisit the context and content by linking the duo thereby confirming or repudiating their previous answers before the introduction of the content. The fifth and the final stage exposes students to an assessment in which they are given tasks requiring the application of the content learned to solve problems in real-life situations. The use of context-based instructional strategy in teaching curriculum contents could be propelled by some reasons.

Among these reasons are: students are often alienated in science lessons initiated by the teaching methods used by the teacher, concepts taught in science appear not to be related to students' everyday lives, students' inability to transfer the knowledge they learned to situations other than the one they learned the knowledge, as well as loaded curriculum whose contents are somewhat imported in the context they are delivered to the students (Gilbert, Bulte & Pilot, 2011). From the stated reasons, it could be deduced that context-based instructional strategy is advantageous in science teaching. It tends to make science learning less abstract. It helps students to link science concepts they learn to their daily lives in an out-of-school setting, and as such motivates the students (Gutwill-Wise, 2001). Apart from enhancing motivation, it fosters students' successful accomplishment of learning outcomes thereby strengthening meaningful learning. Studies have been advanced on the effect of context-based instructional strategy on students' learning outcomes as are evident in the literature.

For instance, Eshetu and Assefa (2019) in their study discovered that a context-based instructional approach enhanced students' problem-solving skills in rotational motion more than students exposed to the traditional method irrespective of gender. Kazeni and Onwu (2013) revealed that the context-based teaching approach boosted students' achievement in genetics more than the traditional teaching approaches. Also, Braund (2012) reported a positive impact of context-based teaching of science on students' attitudes, interests, and motivation. The foregoing empirical reports also recommended the use of context-based instructional strategy in teaching and learning processes across schools. The Biology Curriculum for Senior Secondary Schools in support of the use of context-based instruction encouraged the teachers to enrich the curriculum contents with relevant materials and information within the learners' immediate environment (NERDC, 2009). Nonetheless, the application of context-based instructional strategy is limited as a limited range of everyday contexts are used in teaching at secondary schools (Kasandaa, Lubbenb, Gaoseba, Kandjeo-Marengaa, Kapendaa, & Campbell, 2005). Contextualized instructions are hampered as trivial contexts may be generated (Gilbert, Bulte & Pilot, 2011). As a result, the application of context-based instructional strategy is a major challenge for teachers (Avargil, Herscovitz & Dori, 2011) and as such, training of teachers becomes necessary for its effective implementation (Parchmann & Luecken, 2010). Therefore, tackling the challenges to the use of context-based instructional strategy has become imperative.

This is because the persistence of such limitations bars the students from benefiting in the relevance of contextualized instructions already established. Since the curriculum recommended contextual-based instruction and evidence from the literature showed a gap that more needs to be studied on context-based instructional strategy by exploring its extent of implementation in the teaching and learning process, this study focused on examining the extent of teachers' use of context-based instructional strategy in Biology teaching, barriers to its implementation and way-forward.

The study upholds the principles of social constructivist theory advocated by Lev Vygotsky. The theory underscored the important role of social and cultural contexts in facilitating students' knowledge and understanding of concepts (Pham, 2011). Through social interaction and the learners' environment, for instance, the learners develop interpretations that enable them to successfully learn a piece of new knowledge. Suffice it to say that students' understanding of new knowledge is contextually inclined. In this study, therefore, the practice whereby the teacher relates the new concepts to be taught to contexts derived from the learner' environment and/or to their culture boosts their constructive understanding of such concepts that will enhance the transfer of learning to out-of-school experiences that epitomizes meaningful learning which the theory advocates.

Students are often alienated in science lessons including Biology due to the teaching strategies employed by the teachers to present science concepts to the students. Such strategies may not relate the curricula contents to be taught to contexts derived from the students' environment, culture, or daily life experiences that they are familiar with. The context-based instructional strategy is geared towards closing such an alienation gap thereby boosting students' learning outcomes. To this end, studies have been conducted on context-based instructional strategy and its efficacy reported. Empirical studies and the Biology curriculum for senior secondary schools recommended that teaching of Biology curriculum contents should be contextualized. This study, therefore, explored the extent of teachers' use of context-based instructional strategy in Biology teaching, barriers to its implementation, and way-forward.

The purpose of the study generally is to unravel the extent of teachers' use of context-based instructional strategy in Biology teaching, barriers to its implementation, and way-forward. Specifically, the study investigated:

- The extent of teachers' use of context-based instructional strategy in Biology teaching in secondary schools.
- Barriers to the teachers' use of context-based instructional strategy in Biology teaching in secondary schools.
- Possible solutions to the barriers to the teachers' use of context-based instructional strategy in Biology teaching in secondary schools.

The following research questions were formulated to guide the study:

- To what extent do teachers use context-based instructional strategy in Biology teaching in secondary schools?
- What are the barriers to the teachers' use of context-based instructional strategy in Biology teaching in secondary schools?
- What are the possible solutions to the barriers to the teachers' use of context-based instructional strategy in Biology teaching in secondary schools?

Method

The descriptive survey research design was adopted in this study. This design aims at collecting data on a given population and describing systematically, the characteristics of a given population (Nworgu, 2015). The study was carried out in Nsukka Local Government Area of Enugu State. The area has a population of fifty-six Biology teachers in its public secondary schools. The researcher purposively used the fifty-six Biology teachers in the area as the sample of the study consequent upon the fact that the population is not too large to manage. Data were collected using a structured questionnaire on a four-point scale ordered in three clusters. The first cluster was on the extent teachers' use of context-based instructional strategy in Biology teaching in secondary schools, the second cluster was on the barriers limiting teachers' use of context-based instructional strategy in Biology teaching in secondary schools whereas the third cluster was on the possible solutions to the barriers limiting teachers' use of context-based instructional strategy in Biology teaching in secondary schools. The instrument was face validated by two experts from the University of Nigeria, Nsukka who are experts in science education and measurement and evaluation respectively. The reliability of the three clusters was determined using Cronbach Alpha and the reliability indices obtained were 0.97, 0.95, and 0.90 respectively; with overall reliability (internal consistency) of 0.75. In scoring the four-point scaled instrument, VHE (Very High Extent) was assigned a value of 4, HE (High Extent) attracted a score of 3, LE (Low Extent) was scored 2 and VLE (Very Low Extent) had a score of 1. Also, SA (Strongly Agree) was scored 4, A (Agree) had a value of 3, D (Disagree) attracted a score of 2 and SD (Strongly Disagree) was scored 1. The data were analyzed using mean and standard deviation.

Results

Table 1: Extent of Teachers' use of Context-Based Instructional Strategy in Biology Teaching in Secondary Schools

Item Statements	VHE	HE	LE	VLE	$\overline{X}$	S. D
I use context-based instructional strategy in teaching Biology lessons.	22	23	9	2	3.16	0.83
My Biology lesson plans are context-based.	8	21	13	14	2.41	1.02
I relate the topic of the lesson to contexts familiar to students.	28	18	7	3	3.27	0.88
I give students context-based assignments.	16	9	15	16	2.45	1.19
I give students context-based assessments.	6	24	12	14	2.39	0.98
I pre-inform students about the topic of the lesson for them to ask around and generate appropriate contexts.	14	15	8	19	2.43	1.20

Acceptable Mean =2.50, Cluster Mean = 2.68, Std. Dev. = 0.84, N= 56

Table 1 above revealed the extent of teachers' use of context-based instructional strategy in Biology teaching in secondary schools. "I use context-based instructional strategy in teaching Biology lessons" has a mean value of 3.16 and a standard deviation of 0.83. The mean values and the standard deviation of the remaining items in the above table seeking the extent of teachers' use of context-based instructional strategy are respectively indicated in the bracket: "My Biology lesson plans are context-based (2.41, 1.02), I relate the topic of the lesson to contexts familiar to students (3.27, 0.88), I give students context-based assignments (2.45, 1.19), I give students context-based assessments (2.39, 0.98) and I pre-inform students about the topic of the lesson for them to ask around and generate appropriate contexts (2.43, 1.20)". The table also contained the cluster mean value of 2.68 with a standard deviation of 0.84.

Table 2: Barriers to the Teachers' use of Context-Based Instructional Strategy in Biology Teaching in Secondary Schools

Item Statements	SA	A	D	SD	$\overline{X}$	S. D
Context-based instructions consume time.	22	23	4	7	3.07	0.99
It is difficult to generate appropriate contexts for the lesson's topic.	21	24	5	6	3.07	0.95
I don't know how to write context-based Biology lesson plans.	17	28	8	3	3.05	0.82
Giving students context-based assignments is challenging for me.	6	39	8	3	2.86	0.67
I don't know how to make Biology assessments context-based.	20	25	5	6	3.05	0.94
Lack of training opportunities for service teachers on the use of context-based instructional strategy.	27	18	8	3	3.23	0.89

Acceptable Mean =2.50, Cluster Mean = 3.06, Std. Dev. = 0.78, N= 56

Table 2 above displayed the barriers to the teachers' use of context-based instructional strategy in Biology teaching in secondary schools. The barriers, their mean values, and corresponding standard deviations are respectively presented in the brackets as follows: "Context-based instructions consume time (3.07, 0.99), It is difficult to generate appropriate contexts for the lesson's topic (3.07, 0.95), I don't know how to write context-based Biology lesson plans (3.05, 0.82), Giving students context-based assignments is challenging to me (2.86, 0.67), I don't know how to make Biology assessments context-based (3.05, 0.94) and Lack of training opportunities for service teachers on the use of context-based instructional strategy (3.23, 0.89)." Table 2 also showed the cluster mean value of 3.06 with a standard deviation of 0.78.

Table 3: Possible Solutions to the Barriers to the Teachers' Use of Context-Based Instructional Strategy in Biology Teaching in Secondary Schools

Item Statements	SA	A	D	SD	$\overline{X}$	S. D
Proper planning of context-based Biology lessons.	24	27	5	0	3.34	0.64
Use contexts that are familiar to students.	33	15	5	3	3.39	0.87
Contexts should be diversified by deriving them from culture, environment experiences among others.	27	21	3	5	3.29	0.85
Teachers should be trained on how to use the context-based instructional strategy during the teaching/learning process.	21	27	5	3	3.18	0.81
Teachers should be trained on how to write context-based Biology lesson plans.	25	23	3	5	3.25	0.84
Students should be given the topic of the lesson in advance to ask around and generate appropriate contexts for it.	24	24	3	5	3.23	0.83

Acceptable Mean =2.50, Cluster Mean = 3.28, Std. Dev. = 0.68, N= 56

Table 3 above showed the possible solutions to the barriers to the teachers' use of context-based instructional strategy in Biology teaching in secondary schools. The table revealed that: "Proper planning of context-based Biology lessons" has a mean value of 3.34 and a standard deviation of 0.64. Other possible solutions with their mean values and resultant standard deviations shown in the brackets are: "Use contexts that are familiar to students (3.39, 0.87), Contexts should be diversified by deriving them from culture, environment experiences among others (3.29, 0.85), Teachers should be trained on how to use the context-based instructional strategy during teaching/learning process (3.18, 0.81), Teachers should be trained on how to write context-based Biology lesson plans (3.25, 0.84) and Students should be given the topic of the lesson in advance to ask around and generate appropriate contexts for it (3.23, 0.83). Table 3 also laid bare the cluster mean value of 3.28 and a standard deviation of 0.68.

Discussion

The results on the extent of teachers' use of context-based instructional strategy in Biology teaching in secondary schools showed that teachers use context-based instructional strategy in teaching Biology lessons as indicated by its mean value which was above the 2.5, the acceptable mean value set as a benchmark. As such, they relate the topic of the lesson to contexts familiar to students as also revealed in table1. This was further substantiated by the cluster mean value of 2.68 that was above the benchmark mean value of 2.5. Although teachers used context-based instructional strategy in Biology teaching, their Biology lesson plans are not context-based as revealed, they don't give students context-based assignments and assessments, and did not pre-inform students about the topic of the lesson for them to ask around and generate appropriate contexts for the topic of the lesson as revealed by their mean values that are below 2.5. These findings support Kasandaa, Lubbenb, Gaoseba, Kandjeo-Marengaa, Kapendaa, and Campbell (2005) who stated that the application of context-based instructional strategy is limited as a limited range of everyday contexts are used in teaching at secondary schools. The point that teachers use context-based instructional strategy in the Biology teaching/learning process but failed to write context-based lesson plans, failed to give students assignments and assessments that are context-based as well as failed to pre-inform students about the topic of the lesson for them to ask around and generate appropriate contexts for the topic of the day's lesson shows that their extent of the use of context-based instructional strategy is not robust and holistic. In this unwholesomeness in the use of the context-based strategy, students are indirectly deprived of the benefits of context-based instructions and will find it challenging transferring contents learned in science classrooms to out-of-school experiences and subsequent solving of problems encountered in their everyday lives.

The results on the barriers to the teachers' use of context-based instructional strategy in Biology teaching in secondary schools revealed such barriers to include context-based instructions consume time, difficulty in generating appropriate contexts for the lesson's topic, difficulty in writing context-based Biology lesson plans, challenges in giving students context-based assignments and assessments, and lack of training opportunities for service teachers on the use of context-based instructional strategy. The mean values of those barriers to teachers' use of context-based instructional strategy were above the fixed mean value of 2.5. The high cluster mean-value in table 2 which is also more than 2.5 is an indication that teachers' inability to use context-based instructional strategy holistically is associated with those barriers. The findings support Gilbert, Bulte, and Pilot (2011) who revealed that contextualized instructions are hampered as trivial contexts may be generated. It also supports Avargil, Herscovitz, and Dori (2011) who discovered that the application of context-based instructional strategy is a major challenge for teachers. The educational system fraught with those barriers in its science classrooms will make science foreign to students. In such a remote situation, students perceive science subjects including Biology as avenues for copying copious uninteresting lesson notes that appear irrelevant for national development. Also, the condition will not allow students to profit from the science curricula whose contents are developed for the general good of the public.

Seeking for the solutions to the barriers to the teachers' use of context-based instructional strategy, the findings in table 3 showed that by proper planning of context-based Biology lessons, using contexts that are familiar to students, diversifying contexts by deriving them from culture, environment experiences among others, training teachers on how to use the context-based instructional strategy during teaching/learning process and on how to write context-based Biology lesson plans, and by giving students the topic of the lesson in advance to ask around and generate appropriate contexts for it, will help to ameliorate and even eradicate the identified barriers to the use of context-based instructional strategy from schools. For example, proper planning of context-based instructions makes it consumes lesser time. The findings support Parchmann and Luecken (2010) who stated that training of teachers is necessary for the effective implementation of context-based instructional strategy. It is ideal for science teachers generally and Biology teachers, in particular, to be trained on how to make their science teaching context-based, write context-based lesson plans as well as ensure holistic use of contextualized instructions in assignments and assessments. Through such practices, the alienation gaps in science classrooms perpetuated by a lack of connections in what the teacher teaches with the learners' environment will be reduced. Thus, students will optimally benefit from science and find its contents interesting to the level of applying the knowledge, skills, and attitudes thereof for the sustainable development of the society.

Conclusions

The era of using pedagogical approaches that do not enable students to see the connection of what they learn in classrooms to real-life situations is winding up. The Biology curriculum whose contents envisaged as a good (product) prepared for the general good of the public will not be fully harnessed by the students for national development if the instructions that go on in science classrooms are not contextualized. In as much as the curriculum has recommended the use of context-based instructions and there have been empirical supports for its use, it is discovered that although Biology teachers use context-based instructional strategy in the teaching/learning process to an extent, the usage is not holistic since they reneged in writing context-based lesson plans, failed to give students assignments and assessments that are context-based as well as failed to pre-inform students about the topic of the lesson for them to ask around and generate appropriate contexts for the topic of the day's lesson. These developments are made perennial by some barriers that have been discovered with solutions also identified. It is concluded that contextualizing Biology instructions can be made holistic by tackling the barriers forestalling the effective use of context-based instructional strategy so as students will optimally apply the knowledge, skills, and attitudes for solving pertinent problems in the society for the general good of the public.

Recommendations

It is recommended that:

i. Teachers' use of context-based instructional strategy should be holistic by ensuring that apart from using it in teaching curriculum contents, should also make students' assignments and assessments context-based.
ii. Teachers should be trained on how to write context-based lesson plans.
iii. There should be training opportunities for service teachers through workshops and conferences on how to contextualize students' assignments and assessments.
iv. The government should sponsor service teachers to attend science workshops and conferences on pedagogical approaches that are context-based to effectively enable them to guide students' learning in a way that they gain from science as a product for the general good of the public.

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