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6. The paper format should be organised in the following order: Introduction, Statement of the Problem, Purpose of the Study, Research Questions, Methodology/Materials and Methods, Results, Major Findings, Discussions, Conclusion, Recommendations, References and Appendices (if any).
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EDITORIAL

The Annals of Technology Education Practitioners Association of Nigeria (ATEPAN) is the official journal of Technology Education Practitioners Association of Nigeria (formerly, Nigerian Association of Teachers of Technology, NATT). The journal aims at disseminating information on Teacher Education in Science, Technology, Engineering and Mathematics as it publishes original empirical and theoretical studies and analyses in education that constitute significant contributions to the improvement of educational processes and outcomes within the scope of our mandate and vision.

The purpose of the journal is to serve as a forum for researchers and other stakeholders to discuss common concerns in science, technology, engineering and mathematics (STEM) education at local, national or transnational levels. The journal has a distinguished editorial board with extensive academic qualifications, ensuring that the journal will maintain high scientific standards and have a broad professional coverage. The journal is an invaluable resource for teachers, counsellors, supervisors, administrators, curriculum planners, and educational researchers as well as students. ATEPAN consolidates the gains of its predecessor: JONATT in its regular quarterly appearance, increasing demand and widespread acceptability across the nation. However, article can be submitted anytime of the year, hence they are reviewed as received in continuum and feedback sent to authors promptly. After the review process and subject to meeting the Terms of Acceptance, articles will be published immediately in the next issue of the journal. ATEPAN Special Issue is normally released as a collection of selected papers presented at the Annual National Conference of TEPAN. Every Special Issue focuses on the conference theme of that year. Topics of recent themes include TVET and Sustainable Development, National Security, and Entrepreneurship.

I have the pleasure to present to you and on behalf of the Editorial Board the Annals of Technology Education Practitioners Association of Nigeria, ATEPAN Volume 5 Issue 4 (December, 2022). This edition features high-quality scientific articles selected through a double-blind peer review process cut across the areas of teacher education, teaching methods, technologies and innovations, and issues in quality assurance and policies. We most sincerely express our gratitude to all our sponsors and other stakeholders for partnering with TEPAN to harness our collective educational and industrial experiences in Nigeria. Finally, I wish to thank all those who submitted their papers and my special thanks go to the journal Reviewers and Editorial Advisory for their valuable time and effort.

Thank you.



Dr. A. M. Hassan
Editor – in – Chief

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EFFECTS OF CONTEXT AND INQUIRY BASED INSTRUCTIONAL APPROACHES ON SECONDARY SCHOOL STUDENTS' INTEREST IN BIOLOGY IN NIGER STATE, NIGERIA

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Abstract: *The study determined the effects of context and inquiry based instructional approaches on students' interest in Biology in Niger State. The research adopted a quasi-experimental research design (pretest, posttest, non-equivalent, non-randomised experimental design). The population of the study was 57,947 Senior Secondary School two (SSII) students. The sample for the research study is 305 students, comprising 149 male and 156 female drawn from six co-educational senior secondary schools selected randomly through a stratified sampling technique. The instruments for data collection was Interest Inventory Instrument on Ecological Concepts (IIIEC) which was Questionnaire on Context and Inquiry Based Instructional Approaches, administered to students immediately after posttest to determine students' interest in Ecology after being exposed to the two instructional Approaches. The Instrument was subjected to face and content validation by 3 experts. The instrument was also pilot tested and reliability coefficient of $r = 0.91$ was obtained. Mean and Standard deviation was used to answer the three research questions, ANOVA was used to analyse research hypothesis one while Mann Whitney U-test was used to analyse research hypotheses two and three. The results revealed that the two approaches were very effective in enhancing the interest of biology students. The study also discovered that there was no significant difference in the mean interest scores of male and female students taught Ecological Concepts with Context-Based Instructional Approach while there was significant difference in the mean interest scores of male and female students taught Ecological Concepts with Inquiry-based instructional approach in favour of the female students.*

Keywords: *Context-based approach, Inquiry-based approach, Interest and Gender*

Introduction

The significance of Biology cannot be over emphasized as it is important in food production, hybridization, cross-breeding, in-vitro fertilisation, blood transfusion, marriage counseling, pest control, development of early maturing of plants and animals (Inyang, 2021). All these aspects of life mentioned above and many more are very important for the effective living of the human race on this earth and they can never be studied without the knowledge of Biology. There is need for dissemination of the knowledge of Biology using active teaching methods such as Context-based and Inquiry based instructional approaches.

Context-based Instructional Strategy refers to using real-life and fictitious environmental related examples or synonyms in teaching to learn through the actual practical experience with a subject rather than just its mere theoretical parts (Sethi *et al.*, 2017.) Context-based approach is student-centred, giving students a more active and self-steering role. Fikadu and Shimeles (2019) stated that context-based educational strategy can lead to more students choosing science-related professional careers in school and can lead to an increase in science literacy. An important element of a context-based learning environment, according to Leibiger (2017) and Eshetu and Assefa (2018), is that it is active learning. The researchers further stated that the context-based learning method gives students a sense of ownership of the subject taught and are responsible for their learning. In this case, the students will be able to study independently with or without the teacher around. The research work of Gercek and Ozgur (2015) indicates that context-based learning improves students' skills of doing research, observation, scientific and critical thinking and connecting theory with practice. The second independent variable of this research work is Inquiry-based teaching approach.

Inquiry based teaching approach is a process of seeking truth or query into an idea. Marcus (2017) describes inquiry-based teaching strategy as a learning and teaching method that prioritises students' questions, ideas and analyses. The author further stated that from the teacher point of

view, inquiry-based teaching focuses on moving students beyond general curiosity into the realms of critical thinking and understanding. In this method, a teacher must encourage students to ask questions and support them through the investigation process, understanding when to begin and structure an inquiry activity. Inquiry-based learning focuses on investigating an open question or problem from students' point of view (Marcus (2017) in which students must use evidence-based reasoning and creative problem-solving to reach a conclusion, which they must defend or present. The inquiry-based curriculum has developed independent and critical thinking skills, positive attitudes and curiosity toward science and increased achievement in biological content (Franklin, 2015). Students use the Inquiry process to develop explanations from their observations (evidence) by integrating what they already know with what they have learned (Sandika & Fitrihidajati, 2018). In this case, they go from known to unknown, which always makes the learning process to be in order. Marcus (2017) stated that through Inquiry, students learn how to solve problems using practical approaches and that in Inquiry situations, students learn not only a concept but also self-direction, responsibility and social communication. The implication of this is that through the inquiry teaching method, students could develop an independent attitude.

The independent variable of this research work is interest. Interest is defined as an act of having excitement, curiosity or attention about someone or something (Judith *et al.*, 2016). It can be further defined as having a positive impression on an activity or subject that makes one enjoy doing it. Interest is the feeling of wanting to know or learn about something or someone (Zumyil, 2019) Interest is an important variable in learning because one is likely to perform positively when one is interested in an activity. Teachers must consider and pay attention to what students are interested in because interests are possibilities for development, and knowing about students' interests may help the teacher in choosing teaching strategies and the materials to use (Susanne, 2016). When teachers are aware of students' interest, this can further enlighten the teachers in a way to guide the students in choosing the subjects that will suit the students' future choices of professions. Lack of interest, according to Renninger and Hidi (2016), may be caused by uninteresting teaching methods. Studies have shown that increased interest in a subject can increase student attainment (Muhammad *et al.*, 2021).

There are two types of interest. These are individual and situational interests. Individual interest is the one that prompts the individual to learn eagerly with a focus on his/her prerequisite knowledge and emotions, while a situational interest is the type of interest sensed by students in class because of the teacher's enthusiasm for what is being taught (Krapp *et al.*, 2015). In other words, individual interest is a mindset that an individual takes from one context to the next. A good example is when someone has interest in football. Situational interest on the other hand is a momentary or situational bond which can be a specific reaction to something in a situation such as using colourful objects in the classroom for teaching or using an interesting teaching method.

There are many words that can be used in place of the word interest, other words used by some authors as alternatives to interest include attention, awareness, concentration, curiosity, emotion, attitude and motivation (Krapp *et al.*, 2015). These authors attested that all of these words above could be considered aspects of interest. It is necessary, in the context of this research, to understand the psychological aspect of interest as the positive attention, curiosity, emotion, and awareness that biology students develop toward Ecological concepts after the use of Context-based and Inquiry-based instructional strategies in teaching them. Another moderating variable of this research work is gender.

Gender is the biological sex of an individual, usually male or female. Gender is one factor that intervenes in the relationship between instructional strategy and cognitive achievement. Gender issues have been related to student's performance in academic tasks in several studies but without any definite conclusion (Aransi, 2018). Some academic studies have revealed that there was no significant difference in the academic performances of both male and female students (Bazelais *et al.*, 2016; Alzahrani *et al.*, 2018). Others discovered that females performed better than their male counterparts in their studies (Simegn & Asfaw, 2018) while Ibrahim (2016) discovered in his research work that males performed better than the females academically.

Statement of the Problem

Lack of interest may be caused by uninteresting teaching methods and increased interest in a subject can increase student achievement. The problem of under-achievement by students in Biology may be due to the nature and type of instructional strategies adopted by Biology teachers, which is mostly a lecture method which does not make learning interesting in most cases. Different kinds of Instructional strategies have been used by teachers in teaching biology and it's still facing the problem of poor performance over the years. The Chief examiner reports in WAEC 2016, 2017 & 2018 stated that students' performance in some concepts of ecology such as adaptation in organisms, ecosystem, association in organisms, soil organisms and pollution has been unsatisfactory. Poor performance of students in Biology in five years WAEC report of Niger State between 2017 and 2021 is not a good one as well. Hence, it is necessary to look into current methods of teaching science to get suitable approaches which would lead to effective teaching and learning of ecology and biology in general that will in turn improve the interest of Senior Secondary School biology Students in Niger State, hence this study focused on "effects of context and inquiry based instructional approaches on secondary school students' interest in biology in Niger state, Nigeria".

Purpose of the Study

The purpose of the study was set to:

- i. find out the effect of Context and Inquiry based instructional approaches on interest in Ecological concepts among senior secondary school students in Niger State.
- ii. determine the effect of Context-based instructional approach on the interest of male and female students taught Ecological concepts in senior secondary schools in Niger State.
- iii. determine the effect of Inquiry-based instructional approach on the interest of male and female students taught Ecological concepts in senior secondary schools in Niger State.

Research Questions

To achieve the purpose of the study, the following research questions were stated:

- i. What is the difference in the mean interest scores of students taught Ecological concepts using Context-based instructional approach and those taught with Inquiry-based instructional approach?
- ii. What is the difference in the mean interest scores of male and female students taught Ecological concepts using Context-based instructional approach?
- iii. What is the difference in the mean interest scores of male and female students taught Ecological concepts using Inquiry-based instructional approach?

Hypotheses

The following null hypotheses were formulated and was tested at a 0.05 level of significance.

HO₁: There is no significant difference in the mean interest scores of students taught Ecological concepts using Context-based instructional approach and those taught with Inquiry-based instructional approach.

HO₂: There is no significant difference in the mean interest scores of male and female students taught Ecological concepts using Context-based instructional approach.

HO₃: There is no significant difference in the mean interest scores of male and female students taught Ecological Concepts using Inquiry-based instructional approach.

Methodology

The research adopted a quasi-experimental research design (pretest, posttest, non-equivalent, non-randomised experimental design). The population of the study was 57,947 Senior Secondary School two (SSII) students. The sample for the research study is 305 students, comprising 149 male and 156 female drawn from six co-educational senior secondary schools selected randomly through a stratified sampling technique from the three (3) senatorial zones of Niger State (Zones A, B & C). Interest Inventory Instrument on Ecological concepts (IIIEC) was the instrument used for the study. This comprised of twenty (25) questions in all. The items of the questionnaires were

structured to obtain the students' personal views on the effect of the Context-Based Instructional Approach and Inquiry-Based Instructional Approach on their interest in Ecology. It contains two sections (sections A and B). Section A comprised the Demographic data of the students (respondents), including age, gender and class. Section B is the questionnaire proper, where the respondents were asked to tick (✓) one of the options they feel appropriate to their level of interest. The questionnaire was constructed based on a five-point Likert scale, and this is Highly Interesting (HI), which is 5 points, Moderately Interesting (MI) which is 4 points, Neutral (N) which is 3 points, Low Interest (LI) which is 2 points and Not Interesting (NI) which is one point. The Interest Inventory Instrument on Ecological Concepts (IIIEC) on Context-Based Instructional Approach and Inquiry-Based Instructional Approach was administered to the two experimental groups immediately after the posttest.

Results

Table 1: Mean and Standard Deviation analysis on interest scores of Context and Inquiry based instructional approaches on Secondary School Students' interest in Ecological concepts

Group	N	Mean	Sd
Context-based	152	85.46	15.52
Inquiry Based	153	82.26	16.38

Table 1 shows the mean and standard deviation analysis of the interest scores of the two experimental groups (Context-based and Inquiry-based) The result revealed that the mean and standard deviation scores of post interest rating of Context-based are $\bar{X} = 85.46$, $SD = 15.52$ respectively. Similarly, the mean and standard deviation of interest rating of Inquiry-based are $\bar{X} = 82.26$, $SD = 16.38$ respectively. The results also revealed that Context-based had the highest mean of 85.46 compared to Inquiry-based that has 82.26.

Table 2: Mean and Standard Deviation analysis of context-based instructional approach on male and female students' interest in Ecological concepts in senior secondary schools

Context-based	N	Mean	Sd	Mean Difference
Male	77	85.58	14.71	0.25
Female	75	85.33	16.40	

Table 2 shows the mean and standard deviation analysis of context-based instructional approach of male and female students' interest in Ecological concepts in senior secondary schools in Niger State. From the result, the mean and standard deviation of male and female are: male $\bar{X} = 85.58$, $SD = 14.71$, female $\bar{X} = 85.33$, $SD = 16.40$, the mean difference is 0.25.

Table 3: Mean and Standard Deviation analysis of inquiry-based instructional approach on male and female students' interest in Ecological concepts in senior secondary schools

Inquiry-based	N	Mean	Sd	Mean Difference
Male	72	79.15	15.31	5.87
Female	81	85.02	16.88	

Table 3 shows the mean and standard deviation analysis of inquiry-based instructional approach on male and female students' interest in Ecological concepts in senior secondary schools in Niger State. From the result, the mean and standard deviation of male and female are; male $\bar{X} = 79.15$, $SD = 15.31$, female $\bar{X} = 85.02$, $SD = 16.88$, the mean difference is 5.87.

Table 4: ANOVA Analysis of Mean Interest Inventory Scores of Students Taught Ecological Concepts with Context and Inquiry-Based Instructional Approaches

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	780.347	1	780.347	3.065	0.08
Within Groups	77153.306	303	254.631		
Total	77933.652	304			

Table 4: shows that $F_{cal}(1, 303)$ p-value $0.08 > 0.05$ level of significance ($p > 0.05$). This revealed that the treatment has no significant effect on the mean interest rating of students taught using Ecological Concepts with both Context and Inquiry-based instructional approaches. There is no significant difference in the mean interest inventory scores of students taught Ecological Concepts with Context and Inquiry-based instructional approaches, the null hypothesis one is hereby retained.

Table 5: Mann Whitney U-test Analysis of mean Interest Scores of Male and Female Students taught Ecological Concepts with Context -Based Instructional Approach

Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	Sig.
Male	77	76.29	5874.50	2871.500	5874.500	.059	0.95
Female	75	76.71	5753.50				

Table 5 shows the Mann Whitney U-test analysis of the mean interest scores of male and female students taught Ecological Concepts with Context-based instructional approach. The table reveals value of $p = 0.95$, indicating there was no significant difference in the mean interest scores of male and female students taught Ecological Concepts with Context-based instructional approach. Therefore, hypothesis two is retained.

Table 6: Mann Whitney analysis of mean interest scores of male and female students taught Ecological Concepts with Inquiry-based instructional approach

Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	Sig.
Male	72	68.10	4903.50	2275.500	4903.500	-2.342	0.02
Female	81	84.91	6877.50				

Table 6 shows the Mann Whitney U-test analysis of the mean interest scores of male and female students taught Ecological Concepts with Inquiry-based instructional approach. The table reveals value of $p = 0.02$, indicating that there was significant difference in the mean interest scores of male and female students taught Ecological Concepts with Inquiry-based instructional approach in favour of the female students therefore, hypothesis seven is rejected.

Findings of the Study

1. There was no significant difference in the mean interest scores of students taught Ecological Concepts with Context and Inquiry-based instructional approaches.
2. There was no significant difference in the mean interest scores of male and female students taught Ecological Concepts with Context-based instructional approach.
3. There was significant difference in the mean interest scores of male and female students taught Ecological Concepts with Inquiry-based instructional approach.

Discussion of Findings

There was no significant difference in the mean interest inventory scores of students taught Ecological Concepts with Context and Inquiry-based instructional approaches. The two experimental methods indicated significant influence on the interest of the students of both groups. This is in support of the findings of Cem and Ozgur (2015), Karakaya et.al (2022) and Esra and

Figen (2015) who worked on effects of context-based on students' interest and discovered that context-based instructional approach influences students' interest positively. However, the outcome of this study is not in line with the outcome of the study of Pozas *et.al.* (2020) who studied the effects of Context-based Problem-solving Tasks on Students' Interest and Metacognitive Experiences and discovered that context-based did not improve students' interest. Similarly, this study is in line with the outcome of the studies of Aniaku (2012) who studied the effects of guided and unguided inquiry teaching methods on students' achievement and interest in Biology and discovered that the two inquiry teaching methods affect students' interest in biology positively. On the other hand, the outcome of this study is not in support of the outcome of the study of Iweka (2016) who studied the effects of inquiry and laboratory approaches of teaching Geometry on students' Achievement and interest and revealed that the laboratory approach had significantly improved students' interest in geometry more than the inquiry approach.

There was no significant difference in the mean interest scores of male and female students taught Ecological Concepts with Context-based instructional approach. This study is in support of the study of Nkok and Anietie (2022) who investigated the interaction effect of gender and teaching methods on students' interest, achievement and retention in sexual reproduction in plant, the outcome of the study showed that gender has no significant difference on the interest of both male and female students. However, the study is not in support of the findings of Karakaya *et al.* (2022) who investigated the effect of context-based instructional approach on secondary students' interest in biology and the results showed that there was significant difference the interest rate of male and female students, the female students are found to be higher in interest rate than the male students.

There was significant difference in the mean interest scores of male and female students taught Ecology concepts with inquiry-based instructional approach in favour of the female students. The present study is in support of the study of Lee & Boo (2022) who investigated the effects of teachers' instructional styles on students' interest in learning school subjects and academic achievement: Differences according to students' gender and prior interest. It was discovered from the findings that the ratio of female interest in mathematics is higher than that of male students. However, this study is not in support of the study of Aniaku (2012) who investigated the effect of inquiry based instructional approach on secondary students' interest in biology and the results showed that there was no significant difference in the interest rate of both male and female students.

Conclusion

The study investigated Context and Inquiry Based Instructional Approaches on Secondary School Students' interest in Biology in Niger State, Nigeria. From the findings of the study, the following conclusions were made:

Interest of biology students in Ecological concepts and other biology aspects can be significantly improved by Context and Inquiry based instructional approaches. The problem of gender differences in the interest of biology students on Ecological concepts and other biology aspects could be eliminated with use of Context-based instructional approach in schools because the approach is gender friendly. Gender has influence on male and female taught Ecology concepts with Inquiry based instructional approach in favour of the female students

Recommendations

Based on the findings of this study, the following recommendations were raised:

- 1) Science teachers should incorporate the idea of using Context and Inquiry based instructional approaches in teaching science subjects in secondary schools since the study have shown that the students taught with the two experimental methods displayed their interest in both methods.
- 2) The Context-based instructional approach is gender friendly, it is therefore recommended to be use as means of disseminating instructions in secondary schools in order to reduce the gap in the performance and interest of male and female students.

- 3) The school administration should organise and sponsor teachers to attend workshops, seminars and training courses to encourage teachers on the use of Context and Inquiry based instructional approaches.

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