Original Research Article

The Influence of Fieldtrip as a Practical Skill Acquisition Technique in Biology Education

ABSTRACT

Field trips are integral to biology education, providing students with hands-on experiences that bridge theoretical knowledge with real-world applications. This study explores the impact of field trips on practical skill acquisition among biology students in Colleges of Education in Anambra State, Nigeria. Grounded in Piaget's developmental theory, the research examines how field trips enhance observational skills, critical thinking abilities, and environmental stewardship. Surveys conducted with 330 second-year biology education students reveal that field trips positively influence students' ability to recall facts, understand concepts, and excel in practicals. However, challenges such as financial constraints, large class sizes, and teacher commitment hinder the effectiveness of field trips. Strategies like subsidizing trip costs and encouraging small group activities are recommended to optimize field trip experiences. The findings underscore the significance of field trips in biology education and advocate for greater institutional support to make these excursions more accessible and impactful for students.

Keywords: Biology education, field trip, Hands-on learning, College of Education

1. INTRODUCTION

Biology education emphasizes the importance of practical activities, allowing students to actively engage in scientific exploration rather than passively absorbing information. According to [1], practical activities serve as a vital strategy to make teaching more tangible for students, bridging the gap between abstract concepts and real-world applications. [1] emphasizes that these activities should involve hands-on experiences and thoughtful engagement, utilizing various instructional materials and equipment to reinforce lesson objectives. Field trips have long been recognized as a valuable educational tool, particularly in the field of biology. These excursions offer students a unique opportunity to engage with living organisms and ecosystems in their natural habitats, thereby fostering practical skill acquisition that cannot be fully replicated within the confines of a classroom [2].

The influence of field trips on biology education extends beyond mere observation; it encompasses a multifaceted approach to learning that integrates firsthand experiences with theoretical knowledge.As a discipline, biology requires a deep understanding of complex biological processes, organismal interactions, and ecological systems. While textbooks and classroom lectures provide foundational knowledge, field trips enhance this learning by immersing students in real-world scenarios [2,3]. By directly interacting with the environment, students can apply theoretical concepts, develop critical thinking skills, and cultivate a deeper appreciation for the natural world [4,5]. Field trips promote hands-on learning by allowing students to conduct field experiments and data collection [5]. Whether studying biodiversity in a rainforest, investigating adaptations in coastal ecosystems, or analyzing water quality in freshwater environments, students gain practical experience in scientific

inquiry [6]. They learn to apply scientific methods, utilize specialized equipment, and interpret data—all crucial components of biological research [7].Beyond skill acquisition, field trips also contribute to the holistic development of students. Immersive natural experiences foster environmental stewardship and a sense of responsibility toward biodiversity conservation [7]. Additionally, such excursions often promote teamwork, communication, and problem-solving skills as students collaborate on field-based activities and navigate real-world challenges.

Furthermore, the impact of field trips on practical skill acquisition within biology education can be examined through various lenses [8,9]. Firstly, these excursions facilitate the development of observational skills [9]. Students are encouraged to closely observe organisms in their natural habitats, identifying unique characteristics, behaviors, and ecological relationships [8]. This firsthand experience enhances their ability to make detailed and accurate observations—an essential skill in biological research and ecological studies [10].The effectiveness of field trips in biology education is supported by research demonstrating their positive impact on student learning outcomes. Studies have shown that students who participate in field trips exhibit increased retention of biological concepts, improved critical thinking abilities, and greater enthusiasm for scientific inquiry compared to those solely exposed to traditional classroom settings [11,12].

The ongoing quest for effective biology teaching methods that enhance practical skill acquisition stems from the recognition that such skills are foundational for scientific inquiry and the development of critical intellectual abilities. [13] underscores that science practical skills are cultivated through experience and are essential for executing both mental and physical operations effectively. [14] advocates for the consistent use of practical activities in biology education, emphasizing that this approach should be considered essential, not optional, for biology educators. The goal is to equip students with the knowledge, skills, and competencies necessary to meet society's scientific and technological demands [15]. Therefore, this study examines the impact of field trips as a practical skill acquisition technique in biology education within Colleges of Education in Anambra State.

1.1 Research Questions

The following research questions will guide this study.

1. What is the impact of field trips on biology education students' practical skill acquisition in colleges of education in Anambra state?
2. What problems do biology education students in colleges of education in Anambra state encounter while undertaking effective field trips?
3. What strategies should be adopted for engaging in a more effective field trip by students?

1.2 Scope of the Study

The study is delimited to biology students in colleges of education in Anambra state. It will investigate the impact of field trips as a practical skill acquisition technique in biology education in colleges of education at Anambra State.This study aims to explore the influence

of field trips as a practical skill acquisition technique in biology education within colleges of education in Anambra State, Nigeria. Specifically, the study aims to achieve the following objectives:

- Assess the impact of field trips on biology education students in colleges of education in Anambra State, Nigeria.
- Identify the challenges biology education students face during field trips and understand barriers to their effectiveness.
- Propose strategies to enhance the effectiveness of field trips as a practical learning method in biology education.

By addressing these objectives, the study seeks to provide valuable insights into the role of field trips in enhancing practical skill acquisition among biology students in colleges of education in Nigeria

1.3 Theoretical Framework

This study is grounded in Piaget's developmental theory of learning and thinking [16], which serves as the theoretical framework guiding the research. A fundamental aspect of Piaget's theory is the learner's active participation in the learning process. Piaget emphasized that knowledge is not merely transmitted verbally but is actively constructed and reconstructed by the learner through interaction with the environment.According to Piaget [16] for a child to develop a comprehensive understanding of the world, they must actively engage with objects and phenomena. Through these actions and interactions, the child gains knowledge and organizes their understanding of reality. Field trips, which involve taking students to the natural environments where objects of study exist, provide an ideal opportunity for learners to actively engage with these objects. During field trips, learners can observe, identify, classify, and even manipulate objects in their natural settings, aligning with Piaget's notion of active learning through hands-on experience in real-world contexts.

In support of Piaget's theory, [17]believed that learning occurs through self-discovery. The students are exposed to basic concepts to discover things for themselves. This could be through fieldwork and practical orientation by science educators and learners. [18] supported this view that during field trips, the learner observed the different rock samples to be able to appreciate the characteristics and features of rocks to sort them into sedimentary, metamorphic, and igneous rocks. In his contribution, [19] maintained that experience is the center of learning; thus, experience and the child's environment are a strong base in considering the development of a field trip strategy. The field trip must, therefore, be within the child's experimental world. Hence, it involves learning by doing between the child and his environment [20]. The experiences involved in field trip strategy are learning by doing, problem-solving, and practical work, which agrees with the pragmatist theory.

2. MATERIAL AND METHODS

The study employed a survey design, which involves studying a group of people or items by collecting and analyzing data from a select few individuals or items considered

representative of the entire group. This approach allows for efficient data collection and analysis, drawing conclusions about the broader group based on insights gained from the sampled individuals or items.

2.1 Area of the Study

The study was conducted in Anambra State, Nigeria, located in the southeastern part of the country. Anambra State covers a total land area of 4,416 square kilometers and is situated at a generally low elevation on the eastern side of the River Niger. It shares boundaries with the states of Kogi, Enugu, Imo, Abia, and Delta. Known for its natural resources, Anambra State is rich in natural gas, crude oil, bauxite, and ceramic and boasts nearly 100% arable soil suitable for agriculture.

2.2 Population of the Study

The study population consisted of 330 second-year biology education students enrolled in two colleges within the state. Specifically, 151 students were from the Federal College of Education (Technical), Umunze, Anambra State, and 179 from Nwafor Orizu College of Education (NOCEN), Nsugbe.

2.3 Data Collection

The data collection method involved personally administering the questionnaire items to the respondents by the researcher. Respondents were asked to complete the questionnaires on the spot to ensure a 100% return rate of the completed questionnaires.

2.4 Data Analysis

The data collected was analyzed using the following:

$\overline{X}$ - $\sum FX/N$

Where:

X = mean

X = score of each respondent

$\overline{\sum}$ = summation

N = total number of respondents

F = Frequency

The cut-offpointwas determinedbysummingthe nominalvalues and dividingby the total number of scaleitems.Thus,

$$\frac{5 + 4 + 3 + 2 + 1}{5} = \frac{15}{5} = 3.00$$

A0.5error margin wasadded totheproduct, 3.00+0.5=3.50.Therefore, any itemreceiving ameanresponseof 3.50orabove wasaccepted, butanyitemthat receivedameanscoreoflessthan3.50wasrejected.

3. RESULTS AND DISCUSSION

3.1 Research Question 1

WhatistheInfluenceofFieldtripasaPractical SkillAcquisitionTechnique onBiology Education Students?

Table1:MeanResponsesoftheRespondentsontheInfluenceofFieldtripasaPracticalSkill AcquisitionTechniqueonBiologyEducationStudents

S/N	Item	SA	A	UD	D	SD	N	T	R	Remark
1	Field trips help the recall of certain facts and concepts in Biology.	120 600	76 304	1 3	1 2	-	198	909	4.59	Accepted
2.	Field trips play a great role in the student's ability to recognize, analyze and answer questions in Biology examinations.	150 750	47 188	1 3	-	-	198	941	4.75	Accepted
3.	Field trips help students learn by observation and have a deep understanding of concepts.	160 800	38 152	-	-	-	198	952	4.81	Accepted
4.	Field trips increase students' zeal in participation in Biology practicals.	73 365	110 440	9 27	5 10	1 1	198	843	4.26	Accepted
5.	Only biology topics are seen during field trips are always better understood.	20 100	28 112	60 180	81 162	9 9	198	563	2.84	Rejected
6.	Field trips enable student's express short-term and long-term cognitive and non-cognitive learning gains.	127 635	69 276	2 6	-	-	198	917	4.63	Accepted
7.	Field trips increase the interest and performance of the students in Biology.	112 560	84 336	2 6	-	-	198	902	4.56	Accepted
8.	Field trips are not elaborate enough in terms of the practical application of some Biology principles.	20 100	18 72	48 144	100 200	12 12	198	528	2.67	Rejected
9.	Students who embark on field trips develop the ability to evaluate test-related scientific inquiry.	93 465	70 280	30 90	5 10	-	198	845	4.26	Accepted

10.	Fieldtrip makes students excel in Biology practicals.	80 400	107 428	4 12	6 12	l 1	198	852	4.30	Accepted

InTable1,itisevidentthatrespondentsagreedwithitemnumbers1,2,3,4,6,7,9,and10,whichhavecorresp ondingmeanscoresof4.59,4.75,4.81,4.26,4.63,4.56,4.26, and 4.30 respectivelybecause they are all above thecut-off mark of 3.50. This impliesthatfield tripshelprecallspecificfacts and playasignificantroleinthestudent's abilitytorecognize,analyze,andanswerquestionsinbiologyexaminations;italso helps students learn by observation, deeply understand concepts, etc. However, items number 5and 8, with mean scores of 2.84 and 2.67, were rejected.Thisimpliesthatnotonly are biology topicsseenduring field tripsalways better understood, but field trips also elaborate enough on practical applicationsofsomebiologyprinciples [24,25].

3.2 Research Question 2

What Problems do Biology Education Students in Colleges of Educationin Anambra State Encounter in Undertaking Effective Fieldtrip?

Table2. The MeanResponsesoftheRespondentson the ProblemsEncounteredby Biology Students in Undertaking Effective Fieldtrips

S/N	Item	SA	A	UD	D	SD	N	T	X	Remark
1l	Studentslackencouragementand supportfromtheirparentsto attend field trips.	63 315	84 336	10 30	27 54	14 14	198	749	3.78	Accepted
12.	Somestudent'spoorbehaviorand attitudecanconstituteanuisance during the trip.	55 275	108 432	28 84	6 12	l 1	198	804	4.06	Accepted
13.	Studentsareneverhappy whenever they are aware of field tripsdueto the distancetobe covered.	9 45	23 92	26 78	50 100	90 90	198	405	2.04	Rejected
14.	Studentsfinditdifficultto understandwhattheyarebeing taughtduringfield trips.	5 2s	20 80	18 54	70 140	85 85	198	384	1.94	Rejected
15.	Studentsrefusetogoonfield trips,ifnottotheirplacesofinterest.	23 115	39 156	5 15	65 130	61 61	198	477	2.41	Rejected

16.	Studentsfinditdifficulttomeet up with financial involvement in field trips	50	92	24	19	5	198	733	3.70	Accepted
		250	368	72	38	5				
17.	Lackofteachercommitmentto Field trips	81	70	30	15	2	198	807	4.08	Accepted
		405	280	90	30	2				
18.	Lackoftimetovisitallthe Departmentsduetolatearrivalto theplaceofvisitation.	39	27	11	58	75	198	527	2.66	Rejected
		195	108	33	116	75				
19.	Excessiveclasssizehindersthe propercoordinationofthetrip.	60	74	16	48		198	740	3.73	Accepted
		300	296	48	96					
20.	Studentsdonotseetherelevance of field tripsto their course of study.	10	17	20	68	83	198	397	2.01	Rejected
		50	68	60	136	83				

InTable2,therespondentsagreedwithitemnumbers11,12,16,17,and19,with corresponding meanscoresof 3.78,4.06,3.70,4.08,and3.73,respectively. This implies that lack of encouragement and support to attend field trips, poor student behavior and attitudes, inability to meet up with financial involvement,lackofteachercommitment,andexcessivelylargeclasseswereallseen as problems encountered by biology students in undertaking effectivefield trips. However,itemnumbers13,14,18,and20,withmeanscoresof2.04,1.94,2.41, 2.66, and 2.01, respectively, are below the cut-off mark, showing that the respondentsdisagreed withthoseitems.Thisimpliesthatdifficulttounderstand what is being taught during field trips, students not seeing the relevance of field trips to their course of study, etc., were not seen by the respondents as problems encountered bybiologystudentsinundertaking effectivefield trips.

3.3 ResearchQuestion3

WhatStrategiesshouldbeadoptedforengaginginamoreeffectivefield tripby Students?

Table3. TheMeanResponsesoftheRespondentsontheStrategiesthatshouldbe AdoptedTowardsEngagingin a more EffectiveFieldtripby Students

S/N	Item	SA	A	UD	D	SD	N	T	X	Remark
21.	Having students work in small groups during field trips.	111	50	20	173	-	198	849	4.29	Accepted
		555	200	60	34					
22.	Makingfield tripscompulsoryfor allstudents.	80	56	17	30	15	198	750	3.79	Accepted
		400	224	51	60	15				

23.	Ensuringthatstudentshavea priorknowledgeofthetopicof thetrip.	71 355	63 252	42 126	9 18	13 13	198	764	3.85	Accepted
24.	Consulttheschoolauthorityand gaintheirapproval.	150 750	48 192	-	-	-	198	942	4.76	Accepted
25.	Determineyourdestinationfor thevisitin time.	114 570	84 336	-	-	-	198	906	4.57	Accepted
26.	Ascheduleforitineraryshouldbe developed.	73 365	85 340	10 30	30 60	-	198	795	4.02	Accepted
27.	Remindingstudentsof expectations from themasthe dateforundertakingthefield trip draw nearer.	53 265	77 308	14 42	31 62	23 23	198	700	3.54	Accepted
28.	Schoolauthoritiesshouldbefully involved in the planning and execution of field trips.	132 660	66 2h4	-	-	-	198	924	4.67	Accepted
29.	Determinetransportationrules anddecideonthemodeof transportation.	55 275	88 352	30 90	15 30	10 10	198	757	3.82	Accepted
30.	School authorities should stimulate students' interest in field trips by subsidizing the cost of the trip.	137 685	60 240	13	-	-	198	928	4.69	Accepted

InTable3,alltheitemnumbers havemeanscoresgreaterthanthecut-off markof 3.50, showing that the respondents agreed with all the items. This implies that having students work in small groups during field trips, ensuring that students have priorknowledgeofthetopicofthetrip,involvingschoolauthorityinplanningand execution of field trips, determining transportation rules, etc., are all strategies to adoptinengaginginmoreeffectivefield tripsbystudents. The results show that field trips have an overwhelmingly positive influence on biology students.

This finding agrees with the observation of [21],who opined that a trip for biology students is necessary and has a great role in the student's ability to recognize, analyze, and answer questions. The finding is also in line with the observation of [22] that field trips help in the recall of several facts and details. The verification of farmers, Knapp, and Benton also affirms this, stating that field trips have both long-term cognitive and non-cognitive effects on students. The opinion of [23], who earlier stated that only topics seen during trips are always better understood, was not in agreement with item 5 of the finding. The positive influence of

field trips on biology students can be linked to the fact that the human brain can retain more of the things seen rather than the things heard [26]. Thus, field trip journeys may have afforded the students the opportunity to gain a better understanding and belief when they see practically the things they are being taught. This could explain the ability to recall facts and concepts, and recognize, analyze, and answer questions in biology.

Furthermore, the findings show that biology education students encounter some problems in undertaking effective field trips. From table II, the findings showed that biology students find it difficult to meet up with the financial involvement in making field trips a reality these days. The finding agrees with that of [27] who observed that students have a very strong desire to go on field trips whenever it is mentioned in school but cannot meet up with the financial requirement and high transportation fares. This finding also corroborates that of [13] who identified a lack of funding, and limited transportation, amongst several factors militating against the institutional use of field activity. Another finding is that students' poor behavior can constitute a nuisance during the trip making field trips ineffective. This is in line with the findings of [28] who identified poor students' behavior and attitude as a factor militating against effective field trips. The respondents further agreed that lack of teacher commitment to field trips is a problem encountered in undertaking effective field trips. This agrees with the findings of [29] which indicates that although 90% of the teachers who participated in his study still recognize field trips as being a highly valuable educational experience for students, their words cannot be ascertained to match up with their actions. [29] added that a lack of teacher commitment might jeopardize the benefits that could be derived from field trips.

A likely reason for biology students' inability to meet up with the financial involvement in making field trips a reality may be attributed to the current economic crises such as in the dispensation in Nigeria. The cost of living is so high that parents and guardians of these students may be forced to prioritize basic needs such as feeding, shelter, clothing, etc. overpaying for a field trip. Poor behavior and attitude displayed by students' lacking good up-bringing may constitute a nuisance during the trip and due to lack of concentration in the process, effective learning cannot take place in the students.

The study suggested that adopting strategies such as having students work in small groups, subsidizing the cost of field trips etc., will make field trips more effective. Findings in table 3 show that having students work in groups during field trips is an acceptable strategy to adopt for effective field trips. This agrees with the findings of [30] that having students work in small groups allows students to ask more questions, do more hands-on work, and become more involved generally with the program- all conditions which could plausibly contribute to learning. Another finding in agreement with the observation of [31] is that students' prior knowledge about a topic can influence what they learn, particularly cognitively, from field trip visits. This finding equally echoes that of [32] who discovered that in a museum setting, discussions with students suggested that they learn the most from an exhibit when they already have some understanding of the concept being presented.

The efficacy of having students work in small groups can be linked to the qualitative interaction derived from such sessions [2]. This may present an opportunity for everyone to be carried along. Thus, shy and timid students can develop the boldness and confidence to ask questions and get proper clarifications for enhanced understanding. Also, having prior

knowledge of a thing can set the topic for easier understanding of that thing when encountered again. This probably will explain why prior knowledge about a topic can influence what students learn from field trip visits, agreeing with the finding of Tuckey [28]

3.4 Summary of the Findings

The following major findings emerged from the study:

1. The respondents agreed that engaging in field activities helps recall facts, helps students learn by observation and have a deep understanding of concepts, makes students develop the ability to evaluate test-related scientific inquiry, excel in practicals etc. Field trips thus have a positive influence as a practical skill acquisition technique on biology education students.
2. Lack of encouragement and support from their parents, excessive class size, lack of teacher commitment, inability to meet up with the financial involvement and students' poor behavior and attitude are problems encountered by biology students in undertaking effective field trips.
3. Subsidizing the cost of field trips, having students work in small groups, involving the school authority in the planning and execution of field trips etc., are strategies that enhance effective field trips for biology education students.

4. CONCLUSION

The influence of field trips as a practical skill acquisition technique in biology education is profound. These excursions offer students a dynamic platform to integrate theoretical knowledge with hands-on experience, fostering a deeper understanding of biological concepts and ecological processes. By engaging with nature firsthand, students develop essential skills and attitudes that are instrumental in shaping the next generation of biologists and environmental stewards.Based on the findings obtained thus far, the researcher proposes the following recommendations: School authorities should be more actively involved in planning and execution of field trips. They should make it compulsory for all students to undertake at least one field trip per academic year. They should also subsidize the cost of field trips since most students cannot meet up with the financial involvement, thus stimulating students' interest in field activities.It is very necessary for teachers and school authorities to update their knowledge on how to make field trips more effective. This can be done by attending seminars and conferences conducted by experts on field trips.Parents and guardians should embrace the relevance of field trips by encouraging and supporting their children/wards to attend field trips. This can be in the form of paying for the trips, playing a supervisory role etc. The importance of field trips should also be embraced by biology students who should show good attitudes towards it as it will help to improve their performance in biology.The government should play a key role in making field trips effective just the way she has supported the Industrial Training (I.T) program in higher institutions. They can subsidize the cost of field trips and encourage establishments to avail themselves of their places for field trip visitations.

REFERENCES

1. Nzewi UM. Practical approach to the effective teaching of ecological concepts for sustainable development. Science Teachers' Association of Nigeria (STAN) Biology Panel Series. 2008;2008:1-6.
2. Ikpuri EO. Teaching Efficacy of College Faculty: Addressing Inequitable Learning Experiences of Students from Culturally and Linguistically Diverse Backgrounds. language. 2023;6(10).
3. Haris N, Osman K. The effectiveness of a virtual field trip (VFT) module in learning biology. Turkish Online Journal of Distance Education. 2015 Jul 1;16(3):102-17.
4. Njoku MI, Mgbomo T. Effect of Field Trip and Demonstration Methods on the Achievement of Secondary School Students in Biology. Rivers State University Journal of Education. 2021 Dec 19;24(2):55-64.
5. Ezechi NG. Influence of field trip in teaching and learning of biology. International Journal of Engineering & Scientific Research. 2018 Oct;6(10).
6. Iqbal A, Nwokocha G, Tiwari V, Barphagha IK, Grove A, Ham JH, Doerrler WT. A membrane protein of the rice pathogen Burkholderiaglumae is required for oxalic acid secretion and quorum sensing. Molecular Plant Pathology. 2023,24(11):1400-13
7. Olaitan MO, Ujowundu CO, Nzebude CP, Ujowundu FN, Ugwu AO, Azuoma FC, Nwokocha GC. Organic wastes of Citrus sinensis Peels-a source of eco-friendly and sustainable bioactive compounds for promoting health. Asian Journal of Biochemistry, Genetics and Molecular Biology. 2024 Feb 8;16(2):21-31.
8. Patrick AO. Effects of field studies on learning outcome in Biology. Journal of Human Ecology. 2010 Sep 1;31(3):171-7.
9. Ejeh GU, Adejoh MJ, Ochu AN, Egbe-Okpenge EG. Effects of Field Trip and Discovery Methods on Senior Secondary School Students' Retention in Biology in Benue State, Nigeria. Villagemath Educational Review (VER), 2 (1), 54. 2021;77.
10. Foo SC, Foo KK. Purposeful field trip: Impact on experiential learning opportunities and critical thinking skills. Pertanika Journal of Social Sciences and Humanities. 2022 Mar;30(1):1-30.
11. Prokop P, Tuncer G, Kvasničák R. Short-term effects of field programme on students' knowledge and attitude toward biology: a Slovak experience. Journal of Science Education and Technology. 2007 Jun;16:247-55.
12. Rijal M. Field trip method as an effort to reveal student environmental literacy on biodiversity issue and context. InJournal of Physics: Conference Series 2018 May 1 (Vol. 1013, No. 1, p. 012020). IOP Publishing.
13. Ikpuri EO. Policy enactment in Nigerian secondary schools: The case of the national policy on education. South American Journal of Basic Education, Technical and Technological. 2018;5(3).
14. Nwagbo CR. Practical approach to effective teaching of local and major biotic communities (Biomes) to secondary school students, for sustainable development. Science Teachers' Association of Nigeria (STAN) Biology Panel Series. 2008;6.
15. Kinyanjui KD, Misaro J. Socio-economic status and participatory development in Kenya. International Journal of Humanities and Social Science. 2013;3(1):183-93..
16. Piaget J. The construction of reality in the child. Routledge; 2013 Jul 4.

17. Cotton DR. Field biology experiences of undergraduate students: The impact of novelty space. Journal of Biological Education. 2009 Sep 1;43(4):169-74.
18. Pakpahan FH, Saragih M. Theory of cognitive development by jean Piaget. Journal of Applied Linguistics. 2022 Jul 28;2(1):55-60.
19. Nwokocha G, Grove A. Understanding the role of the master regulator, PecS, in Agrobacterium fabrum. The FASEB Journal. 2021,35.
20. Hole TN. Working and learning in a field excursion. Cbe—life Sciences Education. 2018;17(2):ar24.
21. Nwanegbo IJ. *Implications of the Law of the Sea for African Territorial Waters and High Seas: A Case Study of Nigeria's Marine Policy 1960-1998* (Doctoral dissertation).
22. Bamberger Y, Tal T. An experience for the lifelong journey: The long-term effect of a class visit to a science center. Visitor Studies. 2008 Oct 20;11(2):198-212.
23. Ordon KJ, Bartelheimer M, Asshoff R. Biology student teachers' interest and self-efficacy in planning and conducting field trips after participation in a university course. Environmental Education Research. 2021 Jan 2;27(1):88-109.
24. Ajoke OR. Health Risk Assessment of Organochlorine Pesticide Residues in Selected Herbal Medicines Sold in Lagos State, Nigeria. Asian Journal of Biochemistry, Genetics and Molecular Biology. 2024 May 1;16(6):42-54.
25. Nwokocha GC, Adhikari P, Iqbal A, Elkholy H, Doerrler WT, Larkin JC, Grove A. Transcription factor PecS mediates Agrobacterium fabrum fitness and survival. Journal of Bacteriology. 2023,25;205(7):e00478-22
26. Oganya Ogenyi D, Luper Tsenum J. Factors Affecting the Use of Field Trip in Teaching and Learning Biology in College of Education Akwanga, Nasarawa State. ScienceOpen Preprints. 2020 Oct 29.
27. Tsybulsky D, Dodick J, Camhi J. The effect of field trips to university research labs on Israeli high school students' NOS understanding. Research in Science Education. 2018 Dec;48(6):1247-72.
28. Asikhia OA. Students and teachers' perception of the causes of poor academic performance in Ogun State secondary schools [Nigeria]: Implications for counseling for national development. European Journal of Social Sciences. 2010;13(2):229-42.
29. Kiesel J. Creating meaningfulfield trips. Science Activities. 2006;43(2):7-10.
30. Ogbu GC. *Factors contributing to the poor academic performance of students in social studies in junior secondary school in Nkanu East local government area of Enugu State* (Doctoral dissertation, Godfrey Okoye University Ugwuomu-Nike, Enugu).
31. Appiah C, Jecty R, Arthur C, Kwofie L. Using Field Trips and Worksheets to Assist JHS 1 Learners of a Basic School in AssinAtonsu Address Their Refusal to Accept the Concept of Malaria Taught In School. Global Journal of Human-Social Science. 2021 Dec 15;21(G15):41-59.
32. Goulder R, Scott GW, Scott LJ. Students' Perception of Biology Fieldwork: The example of students undertaking a preliminary year at a UK university. International Journal of Science Education. 2013 Jun 1;35(8):1385-406.