IJIET, e-ISSN 2548-8430, p-ISSN 2548-8422, Vol. 7, No. 2, July 2023, pp. 283-294

International Journal of Indonesian Education and Teaching
http://e-journal.usd.ac.id/index.php/IJIET
Sanata Dharma University, Yogyakarta, Indonesia

ANXIETY EFFECT ON STUDENTS AND PERFORMANCE IN BIOLOGY: A CASE STUDY AMONG SECONDARY SCHOOLS IN SOKOTO CITY, NIGERIA

Yusuf Yahaya Miya[1], Sa'eed Abdullahi Dambam[2], Jamil Hassan Abdulkareem[3], Yusuf Sarkingobir [4*], and Aminu M. Yabo[5]
[1,3]Galaxy College of Health Technology Bauchi, Bauchi State, Nigeria
[2]Almanzoor Hospital and Diagnostic Centre Bauchi, Nigeria
[4,5]Shehu Shagari University of Education Sokoto, Nigeria
*correspondence: superoxidedismutase594@gmail.com
https://doi.org/10.24071/ijiet.v7i2.6553
received 9 June 2023; accepted 13 July 2023

Abstract
The Sokoto state needs biology-based students for the making of many useful professionals that works in a diverse array of human lives. However, there is a report showing poor performance in the subject. Anxiety is an issue that may affect education; thus, this work aimed to assess the issue of anxiety among students of biology in secondary school, the related causes, and control. The study design applied was a survey (questionnaire) among 400 students in Sokoto and the data was managed using descriptive statistics. Sources revealed include: How often do you hear from your family while on campus had the greatest percentage with 40.0%, then by Lack taking in a well-balanced diet with 30.0 %, How often have you been following your time table had 20.0%, followed by Distractions or disturbances from a roommate on campus (7.5%), and the least was How often have you been angered because of things that were beyond your control on campus with 2.5%. The effects of anxiety on academics include: Anxiety distracting from the lesson (40.0%), and reduces morale in academics (30.0%). Anxiety prevents students from finishing their assignments (20.0%), and elicits absenteeism (10.0%). Anxiety management includes: Major ploy is enough time and participating in extracurricular activities. Guidance and counselling/discussions with friends are helpful. Thus, academic anxiety can be tamed for better learning. Education on anxiety, enough rest, staying focused, and exercise are needed to enhance students' academic performance.

Keywords: academic performance, anxiety, biology, science, teaching

Introduction
Education relays as a bedrock needed for national change and development, and it is good for the growth of any country in the world. It serves as a link to development as it prepares youth, adults, children, women, and men for growth and development for the sustenance of communities and individuals. education help in the growth of a person or people politically, socially, technically, and scientifically (Adan & Orodha, 2015; Chukwuma et al., 2014; Young et al., 2017). Therefore, in

This work is licensed under CC BY-SA.
Creative Commons Attribution-ShareAlike 4.0 International License.

Nigeria like in any other place, there are various systems and places of education that a person must pass before being educated for the needs of the individual and the larger society. Secondary education is a principal component of education in Nigeria that relays to primary and advanced education as enshrined in the famous National Policy of Education (NPE) aimed at providing education for all (Adan & Orodha, 2015; Chukwuma et al., 2014; Garba, 2012). Secondary education shall provide prepare an individual for later education and also has to make children that can think for development, and respect all. Skills supposed to be provided to the students, for example, agricultural, industrial, commercial, and economic foundations are taught to secondary school students to model them for advancement (Adan & Orodha, 2015; Chukwuma et al., 2014;). In turn, manpower for making useful members of society that specialize in areas such as technology, sciences, commerce, and other professionals are groomed at the secondary education level (Chukwuma et al., 2014; Garba, 2012; Umar et al., 2017; Umar et al., 2018).

Nevertheless, science has continued to be a critical parcel of secondary education that proffer students with experience and understanding of recent and future challenges. It is a study of very significance that allow students to inquire, and explore, science-based and related fields (Miya et al., 2023; Young et al., 2017). In this current world that is bedevilled with challenges and problems, science learning transmits knowledge and gives skills that reach all citizens for individual development and social change. Science calls for students that guarantee the participation of citizens in sciences and technologies, and seek social justice to interact with the environment and people (Mensah et al., 2017; Hiliya et al., 2022; Reis, 2021). A major science subject is biology. Biology nowadays has become a way of study, and an impact of living. The subject helps to inform the students about the scientific overview of the world to be competent citizens of the world. Without biology, people could not be able to live a healthy life in a well-preserved environment. Biology helps students in many ways like the followings: mastery of the nature of living organisms such as plants and animals, provision of environmental education, to give an overview of the material nature, etc (Hiliya et al., 2022; Mardonov, 2019; Mushtaq & Khan, 2012).

However, many important factors are currently militating the teaching and learning of science subjects in secondary school settings (Mahajan, 2015). A major problem affecting the learning and teaching of biology, a principal science subject is the issue of anxiety. Anxiety is a mixture of psychological states that militates cognitive, behavioural, and psychological status. It is a state of distress due to a certain condition and is universal even in many circumstances of education. Academic anxiety happens due to an issue of learning or education-related condition (Ang et al., 2006; Cimen & Yilmaz, 2015). Anxiety in academia is a good thing when it stimulates students to achieve greatness, and sometimes high level of anxiety is a great militating factor in education. When anxiety grows it becomes excessive and makes students no longer productive (Mahajan, 2015). A study in Pakistan by Ali and Mohsin, (2013) revealed that anxiety due to test significantly affects the achievement of students in sciences including biology learners. A specific study of science mathematics subject anxiety in India has revealed that mathematics anxiety significantly affects mathematics creativity in the affected study subjects (Sharma, 2014). In a Nigerian study, it was revealed that cognitive test anxiety in biology is a factor that determines achievement in the subject

(Orakwue & Okigbo, 2023). From this, the scarce data regarding biology anxiety needs to be expanded to contribute to the improvement in biology teaching and learning. Thus, this work was designed to examine the problem of academic anxiety among students of Biology in secondary school, its causes, and ways of controlling it to enhance the student's performance.

Method

Research design

Research design tends to be the methodology that a researcher utilizes to obtain the required information. Descriptive study design dealt with the gathering of data to describe, and interpret, existing situations or circumstances or beliefs, or relations. It is the discovery of meanings and concepts and it is applied in many qualitative studies, especially in education and social sciences. It uses the approach of the survey in the data collection procedure to guarantee coverage of the research area through representation. The study design utilized for the sake of this work was the descriptive survey design method to study anxiety among biology students in the study area (Creswell, 2014; Malik & Balda, 2006; Jha et al., 2022; Mardonov, 2019; Saunders et al. 2016; Young et al., 2017).

The population of the study

According to Dikko et al., (2022), the population of any study is referring to all the entire members or elements in the group that the result of the study could be generalized upon. It can all variables the problem is addressing such as cars, human beings, houses, animals, etc. They are the variables that are affected by the study. A population deals with the whole universe or all the members of a group that are being studied and sometimes the population could be large or small as the case may be. Pertaining to this work, the study population includes the entire secondary school students offering biology in Sokoto, Nigeria.

Moreover, as aforementioned, this research will focus on all the secondary school students in Sokoto Metropolis that are taking biology as a subject of study. Secondary school biology is taught in most of the secondary schools in Sokoto (at senior secondary school levels) to confer the ability to appreciate life science and to be able to study science-based courses at higher institutions of learning after leaving secondary school education. Accordingly, there are sixty-three senior secondary schools in Sokoto state, Nigeria.

Table 1. The population of students enrolled at Senior secondary schools in Sokoto Nigeria

S/N	Local government in Sokoto metropolis	Number of students
1	Sokoto South	8186
2	Sokoto North	24146
3	Wamakko	4059
Total	36391	

Source: Ministry of Education Sokoto, 2010

Sample and sampling techniques

Certainly, in most cases, the population of the study is too large to be taken in a study. Therefore, a trick to reduce the population to be observed has to be

utilized. A few members that are sufficient representatives of the entire population have to be selected using appropriate sampling methods. Malik & Balda, (2006) stated that the sampling is a ploy to seek some respondents to represent the entire population appropriately.

Albeit, there exist many sampling methods, for this work the best sampling strategy was employed and respondents were selected. The best sampling ploy used in this study was upon this work was the random sampling technique. In this sampling, this work used 400 self-administered questionnaires (after retrieval). The sample size utilized was obtained through a Raosoft calculator as indicated in Table 2.

Table 2. Sample size in the study

Parameter	**Value**
Margin of error	5%
Confidence limit	95%
Assumed population size of the study	36, 391
Response distribution	50%
Recommended sample size	381
Compensated sample size	400

Source: wwww.raosoft.com

Instrumentation

The instrumentation in a study is the process followed in selecting, adopting, and utilizing the right tool to collect data for the sake of the study. One of the major instrumentations for research studies is the questionnaire. Thus, for this work, a questionnaire was the instrument utilized for data collection from the respondents. Questionnaires elicit feelings, ideas, and relations from the respondents, especially in large and heterogeneous populations and it is best in this work because the subjects of the study are literate (can read and write appropriately) according to the biddings of the questionnaire objectives. The questionnaire made for this study strived and filled the aim of the study objective and research question as well Malik and Balda (2006), Renk and Smith (2007).

Validity of instrument

The validity of an instrument means the document can measure exactly what was intended (Sarkingobir & Sarkingobir, 2017). The questionnaire has subsections as follows: Section A measures the demographic information from the respondents. Section B looks for the information and asked questions on the anxiety source, section C sought the academic performance. And section D was asked about students' feel due to anxiety. The questionnaire was made with multiple choice questions for the respondents to tick. Validity to collect proper data was measured through validation by experts so that the instrument measures its intended questions.

Reliability of the instrument

Reliability is the quality of the questionnaire to measure what it was designed for. A pilot study and test-re-test methods were applied to ensure the validity of the instruments. Reliability of the instrument is when the instrument can measure what it is supposed to measure. It also shows that the instrument is reliable at different

points in time. Methods of reliability involve the test-re-test method, split-half method, and pilot study. Test-re-test method- the instrument was administered at different times to the subjects, when the results are similar, then it is reliable. Split-half method- divides the subjects and administers the instrument, if the results are similar, it is reliable. A pilot study refers to carrying out a mini-study to assess the workability of the instrument (Abdullahi et al., 2023; Dikko et al., 2022).

Method of data collection

Ethical issues had to be maintained in the collection of the data for this work. Ethics including consent, and confidentiality, were maintained (Sarkingobir et al., 2023). Respondents had to be briefed on the purpose of the work and possible benefits. The participants were then allowed to fill out the questionnaire for the study.

Data analysis

The students were allowed to fill out their questionnaires. The filled (answered) questionnaires were collected from the participants and analyzed according to research questions/objectives. Descriptive statistics tools like frequency and percentages were used. Also, advanced statistical analysis software packages such as Microsoft Excel and SPSS were employed and measured the X^2 test.

Findings and Discussion

This section addressed the information gathered to assess the impact of anxiety on the academic performance of Biology students in Secondary schools. Primary data was obtained according to information collected from students from secondary schools offering biology subjects in their curriculum. About four hundred questionnaires were distributed, and 400 respondents had been recovered. The analysis is done based on the information received from the students and interpreted to know the impact of anxiety on the academic performance of Biology secondary school students.

"The main objective of this study is to examine the effect of anxiety on the academic performance of Biology students in Secondary school"

Gender

Table 3 shows the gender and age of students in this work. Among the 400 respondents, the majority are males (64%) and the minority are females (36%).

Table 3. Showing gender and age of the respondents

Serial number	Frequency	Percentage
Males	64	64
Females	36	36
Age		
Less than 20	16	4
21-25 years old	344	86
26-30 years old	40	10

Table 3 shows the percentage of students based on their different ages. The ages that range 21-25 years are the most prevalent (86%), then the ages of 26-30 years (10%), and the least 4% are below 20 years old.

Sources of anxiety

In Table 4 sources of anxiety were depicted among the 400 respondents recruited in the study. The most prevalent was "How often do you hear from your family while on campus" the 40.0%, then "Lack taking in a well-balanced diet" had 30.0 %. They are followed by "How often have you been following your timetable" with a score of 20.0%, and then followed by "Distractions or disturbances from a roommate on campus" with a 7.5%. While the least score was (2.5%) "How often have you been angered because of things that were beyond your control on campus".

Table 4. Showing sources of anxiety in the student

Parameter	Frequency	Percentage
How often do you hear from your family while on campus	160	40
Lack of taking in a well-balanced diet	120	30
How often have you been following your time table	80	20
Distractions or disturbances from roommate on campus	30	7.5
How often have you been angered because of things that were beyond your control on campus	10	2.5
Total	400	100
X^2/ remarks	192.500	Significant

In this regard (Table 4), "How often do you hear from your family whiles on campus" is a great or major source of anxiety for students of Biology Secondary school.

Academic performance

In Table 5, the impacts of anxiety on the academic performance of students were shown. Out of the entire 400 students in the study, the most mentioned was "Anxiety distracts students' attention during lectures" at 40.0%, then followed by "Anxiety reduces students' academic morale" at 30.0%. The third most said (20.0%) was the "Anxiety does lead to failure in completing an assignment on time", and then followed the "Anxiety causes absenteeism in class" with a percentage score of 10.0%. While the last impact was "And lastly Anxiety does not help the students to get good grades in all courses". Certainly, it can be stated that (in Table 5) anxiety can militate the academic performance of students in Biology Secondary school.

Table 5. Effects of anxiety on the academic of students

Parameters	Frequency	Percentage
Anxiety distract students' attention during lectures	160	40
Anxiety reduces students' academic morale	120	30
Anxiety does lead to failure in completing an assignment	80	20
Anxiety causes absenteeism in class	40	10
Total	400	100
X^2/ remark	80.000	Significant

Anxiety in students' academic life

Out of the 4oo respondents, the opinions were displayed in Figure 1 showing that anxiety affects the academic life of students in biology in secondary schools in Sokoto, Nigeria. From Figure 1, the first bar showing "strongly agree", depicts that, anxiety certainly influences students' academic life with the peakiest score of 55%.

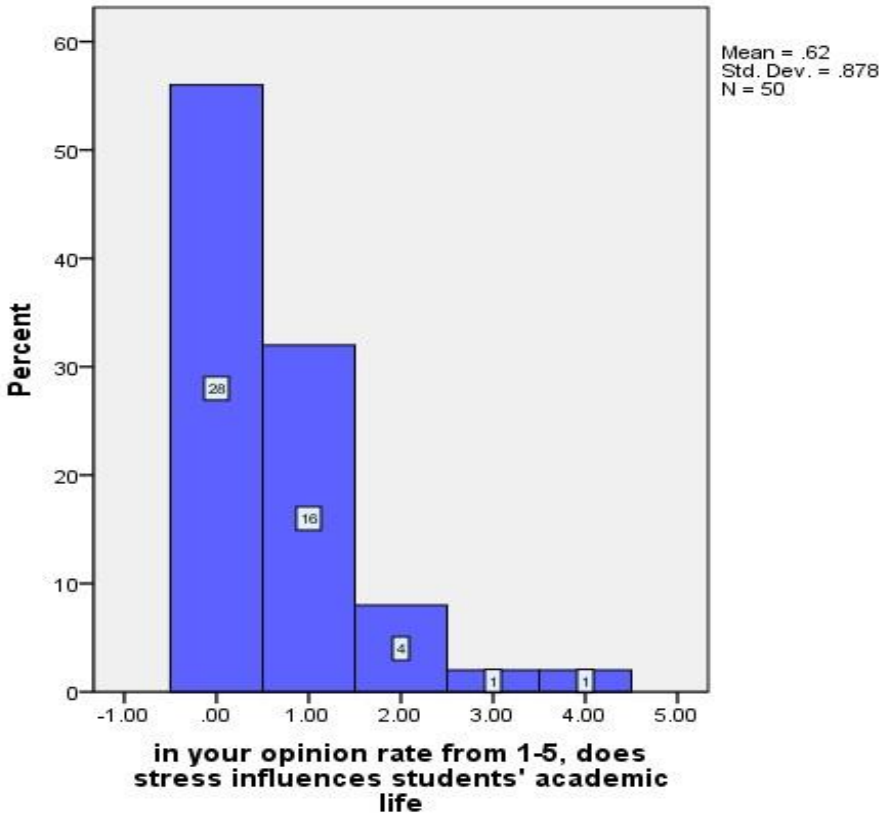


Figure 1. Anxiety as it affects students' academic life (N=400)

Anxiety awareness

Figure 2 shows the opinions of respondents on the need to teach anxiety education at schools. Out of the 400 participants, the majority (70.0%) submitted that (as depicted by the first bar, which represents "strongly agree"), it is imperative to teach shows anxiety awareness at schools.

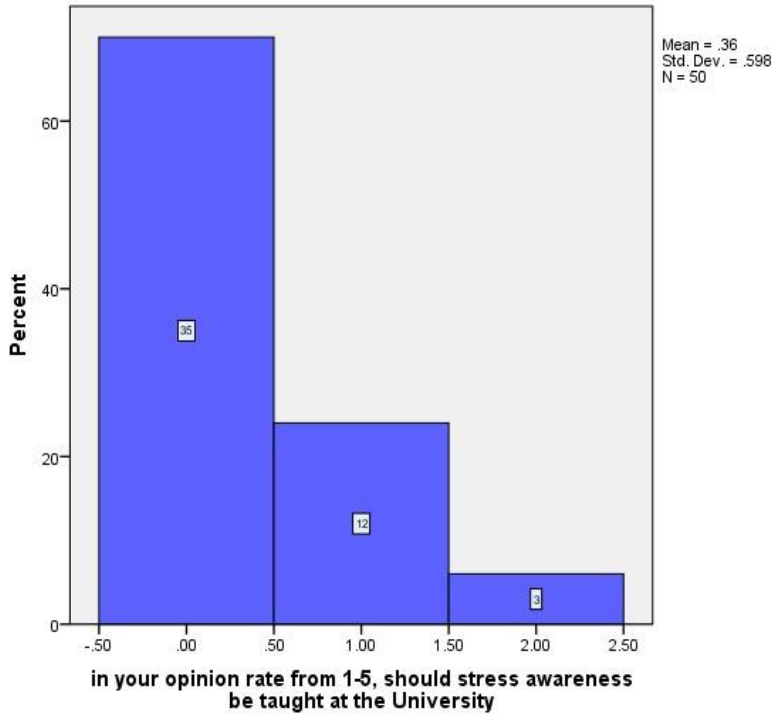


Figure 2. Should anxiety awareness be taught at the School (N=400)

Management of anxiety

In your own view, how can anxiety be managed?

Table 6. Showing responses on how to manage anxiety

Parameter	Frequency	Percentage
How do you manage anxiety?		
Meditation	100	25.0
Relaxation, and resting	60	15.0
Calming down	55	13.8
Engaging in hobbies/ physical exercise	40	10.0
Guidance and counseling	60	15.0
Study-life balance	50	12.5
Others	10	2.5
Peer engagement	25	6.3
Total	400	100
X^2/ remark	101.000	Significant

In Table 6, how to manage anxiety was stated. While most of the participants believed giving enough time, the use of extracurricular activities (such as sports, and other hobbies) is vital in receiving anxiety at schools. Likewise, craving guidance and counselling/discussing with friends are significant.

How do you feel when you are anxious?

Out of the 400 participants, the majority (67.0%) decried that, occasionally do not feel well. Others (20.0%) decried lack of sleep at night. An average portion of them (10.0%) decried, feeling tired during the day, and the last portion (3.0%)

decried of other things (3.0%). It is right to say, the majority of participants do not feel well due to anxiety.

Summarily, the purpose of this study was to assess the impact of anxiety on the academic performance of Biology students in Secondary school. The work unveiled that, the participants had felt one form of anxiety or another. Thus, the issue of anxiety is a common theme in schools and has to be controlled for the success of secondary school students, because it militates students' academic performance. The study further found that students not hearing from their families while on campus was the major source of academic anxiety even though there were other sources such as how often they had enough money on them and enough sleep.

More so, this study examined the relationship between academic anxiety and academic performance. It found that the overwhelming majority of the students affirmed that academic anxiety affected their academic performance. Finally, the findings concluded that the majority of the respondents argue that having enough time and getting engaged in extracurricular activities like sports and other entertaining hobbies play a significant role in helping to deal with anxiety. Also seeking guidance and counselling or discussing with friends helps a lot.

Biology is a popular science subject that is paramount in secondary schools in the country as a tool for advanced studies in Nigeria. Biology is a natural science that aimed to examine life, living organisms, and related ideas therewith. It helps students and scholars to appreciate the living world and has to be dealt with for the progress of various advanced fields such as medicine, agriculture, biotechnology, and other health/medical fields. Therefore, the subject is important in various fields and to several students in Sokoto, and Nigeria as well. However, for the students in this subject, there are still outcomes that are not favourable in terms of learning and examination results about biology (Orakwue & Okigbo, 2023). Thus, researchers had been on the strive to enumerate and discover factors that affect biology education. It is bound to seek factors that affect the academics of students. Anxiety is a feeling of uneasiness regarding biology and there is a quest to check for its effect and associated factors in biology education. The sources or elicitors of anxiety found in this study are determined as (shown in Table 4): How often do you hear from your family while on campus had the greatest percentage with 40.0%, followed by Lack taking in a well-balanced diet with 30.0 %, How often have you been following your time table had 20.0%, followed by Distractions or disturbances from a roommate on campus (7.5%), and the least was How often have you been angered because of things that were beyond your control on campus with 2.5%. Similarly, as shown in Table 3, the issues that are bound with academics were affected by anxiety as submitted by the participants in this study. The effects of anxiety are as follows: Anxiety distracts students' attention during lectures, Anxiety reduces students' academic morale, Anxiety does lead to failure in completing an assignment, and Anxiety causes absenteeism in class. This was in tandem with what was found by another study on the effect of anxiety on another important and perceived science course (mathematics) (Salahot, 2022). In another study, a significant effect of anxiety on the academic performance of students was related to university students of Allama Iqbal University Pakistan (Ajmal & Ahmad, 2019).

Additionally, as was depicted in Figures 1 and 2, anxiety affects academic life and participants submitted that anxiety should be taught at school as that would invariably help in making students effective in dealing with anxiety at school or

even after school. In this vein, Ajmal and Ahmad (2019) reiterated that anxiety can reduce the performances of students irrespective of the field they are learning. Teaching students about anxiety or any other health event will invariably help the students to be more knowledgeable and take appropriate measures when confronted with an issue (Dikko et al., 2022; Miya et al., 2023ab). In another study, Cimen and Yilmaz (2015) reported in their study that, high school students when taught about anxiety and self-efficacy at school help them prominently. Thus, it is important to teach students about anxiety and self-efficacy at schools.

However, on how to manage anxiety at schools, the findings made submissions accordingly. The submissions given by the participants relate to ways to manage anxiety at schools in Sokoto, Nigeria. Most of the participants echoed that, ample/ sufficient time and involvement in extracurricular activities (such as sports and hobbies) are vast in dealing with anxiety at school. Similarly, the sought of guidance and counselling; and discussion with peers is important in helping to curb anxiety at school. The use of counsellors in anxiety management, teaching coping skills, and communication with families of students were corroborated by Akinsola and Nwajei, (2013). Training teachers on anxiety management is another way to deal with anxiety at schools as related by Jha et al., (2022). Thus, anxiety can be dealt with using a composite of strategies.

Conclusion

This study was done to assess the anxiety in biology students in Secondary schools in Sokoto state, Nigeria, and discovered that there exists anxiety experienced by the students. Sources of anxiety among biology students in secondary schools in Sokoto were discovered, as ways to manage the issue. In the same vein, their issue can affect the academic anxiety on the performance of students as well. Some of the discovered effects include class absenteeism, reduction in academic morale among students, and failure to do assignments on time. Thus, academic anxiety has negative effects on students' performance. The more the anxiety, the less the student will perform at school. From the side of students, it is good to say, to address the issue, students need to be focused, rest enough, exercise to prevent anxiety, and proper time management is good, to boost the academic performance of students.

References

Abdullahi, M.A., Sarkingobir, Y., & Yabo, A.G. (2023). Open defecation practices in rural areas threat public health: An assessment of selected area in Sokoto, Nigeria. *Journal of International Environmental Application & Science*, *18*(2), 40-47.

Adan, M.A., & Orodha, J.A. (2015). Constraints of implementing free secondary education in Mandera West sub-county, Mandera County, Kenya. *Journal of Education and Practice, 6*(9), 102-11.

Ajmal, M. & Ahmad, S. (2019). Exploration of anxiety factors among students of distance learning: A case study of Allama Iqbal Open University. *Bulletin of Education and Research*, *41*(2), 67-78.

Akinsola, F., & Nwajei, A. D. (2013). Test anxiety, depression and academic performance: Assessment and management using relaxation and cognitive restructuring techniques. *Psychology*, *4*(6A1),18-24.

Ali, M.S., & Mohsin, M.N. (2013). Relationship of test anxiety with students achievement in science. *International Journal of Educational Science and Research*, *3*(1), 99-106.

Ang, R., & Huan, V. S. (2006). Academic expectations anxiety inventory: development, factor analysis, reliability and validity. *Educational and Psychological Measurement*, *3*, 522-539. https://doi.org/10.1177/0013164405282461

Chukwuma, E.T.C., Nworie, G.O., Okoye, P.U., & Ovri, F.B. (2014). Administering and managing secondary education in Nigeria through effective school-community partnership initiative. *Journal of Teacher Perspective*, *8*(1), 1-19.

Cimen, O., & Yilmaz, M. (2015). Evaluating high school student's anxiety and self-efficacy towards biology. *Educational Research and Reviews*,*10*(7), 987-993.

Dikko, M., Sarkingobir, Y., Abdullahi M.A., Salihu, I., & Tukur, U. (2022). Assessing immunization status and factors influencing vaccination coverage among children in rural suburbs of Sokoto State, Nigeria. *Al-Athfal: Jurnal Pendidikan Anak*, *8*(2), 129-140. http://dx.doi.org/10.14421/1l-athfal.2022.82-04.

Garba, A. (2012). Secondary education in Nigeria: A synthesis of basic student-specific concerns from guidance and counselling perspective. *Journal of International Cooperation in Education*, *15*(2), 195-205.

Hiliya, A.A., Jabo, A.J., Naabu, A., Sarkingobir, Y., & Muhammad, B.I. (2022). The role of elementary school teachers as perceived by students in the Nasarawa local government area, Kano, Nigeria. *International Journal of Advances in Social and Economics*, *4*(2), 37-43. https://doi.org/10.33122/ijase.v4i2.231.

Jha, K. S., Kudachi P. S., & Goudar, S. S. (2012). Perceived anxiety and academic performance among Medical Students – A cross sectional study. *International Journal of Basic and Applied Physiology*, *1*(1), 123–126.

Mahajan, G. (2015). Academic anxiety of secondary school students in relation to their parental encouragement. *International Journal of Research in Humanities and Social Sciences*, *3*(4), 1-7.

Malik, P., & Balda, S. (2006). High IQ adolescents under anxiety: Do they perform poor in academics? *Anthropologist*, *8*(2), 61-62.

Mardonov, Z. (2019) The importance of biological education at school. *European Journal Of Research And Reflection in Educational Sciences*, *7*(12), 1-4.

Mensah, H. K., Fosu, F. A., & Oteng-Abayie, E. F. (2017). Occupational anxious among school non-academic staff: Results from a representative public school in Ghana. *International Journal of Business Excellence*, *13*(2), 200-216.

Miya, Y.Y., Hassan, J.A., Saeed, S., Bandam, S.A., Sarkingobir, Y., Yabo, A.M., & Bello, Z. (2023b). Issues affecting Almajiri schools in Nigeria: Water, sanitation, and hygiene (WASH) parameters in Sokoto. *Interdisciplinary Social Studies*, 2387-2395.

Miya, Y.Y., Livinus, R., Umar, A.I., Sarkingobir, Y**.**, Butuwo, M.T., & Bello, Z. (2023a). Pattern of cannabis, and cigarette abuse among adolescents in Sokoto and assessment of antinutritional components of the two drugs.

Journal of Community Service Science and Engineering, *2*(1), 1-14. https://doi.org/10.36055/jocse.v2i1.19802.

Mushtaq, I., & Khan, S. N. (2012). Factors affecting students academic performance. *Global journal of Management and Business Research, 12*(9), 887-89.

Orakwue, J.N., & Okigbo, E.C. (2023). Cognitive test anxiety as predictors of secondary school students' achievement in biology in Ogidi educational zone. *International Journal of Innovative Research and Advanced Studies*, *10*(1), 11-16.

Reis, P. (2021). Challenges of science education in troubled times. *Cienca & Educacao*, *27*(e21000), 1-9.

Renk, K., & Smith, T. (2007). Predictors of academic-related anxiety in college students: An examination of coping, social support, parenting, and anxiety. *Naspa Journal*, *44*(3), 405- 431.

Salahot, E.D. (2022). The effects of mathematics anxiety on mathematics performance among secondary school students in Tanzania: A case of Arusha city council. *International Journal of Scientific Research and Management*, *10*(12), 425-436.

Sarkingobir, Y., & Sarkingobir, S. (2017). Open defecation, a threat to public health and sustainable development goals: A case study of Gwadabawa local government, Sokoto state, Nigeria. *International Journal of Medical and Biosciences*, *1*(1), 28-37.

Sarkingobir, Y., Waheed, S.A., Abubakar, M., & Gilani, N. (2023). Plastic waste materials in a classroom environment: An assessment of nursery classes in Sokoto state, Nigeria. *Pakistan Journal of Social Science*, *43*(2), 217-226.

Sharma, Y. (2014). The effects of strategy and mathematics anxiety on mathematical creativity of school students. *International Journal of Mathematics Education, 9*(1), 25-37.

Umar, A.I., Umar R.A., Wasagu R.S.U., & Oche M.O. (2017). assessment of iodine levels of secondary schools girls in Sokoto State Nigeria. *International journal of food and Nutritional Science, 2*(1), 020 –027.

Umar, A.I., Umar, R.A., Wasagu, R.S.U., & Oche, M.O. (2018). Effect of inadequate iodine status on academic performance of secondary schools girls in Sokoto State Nigeria. *Greener Journal of Epidemiology and public Health, 6*(1), 029- 033.

Young, J.L., Feille, K.K., & Young, J.R. (2017). Black girls as learners and doers' of science: A single-group summary of elementary science achievement. *Electronic Journal of Science Education*, *21*(2), 1-20.