African Multidisciplinary Journal of Development (AMJD)

International Research and Development Conference (IRDeC) Special Issue

Pages: 327- 342

THE INTEREST AND ANXIETY OF FEMALE SECONDARY SCHOOL STUDENTS IN LEARNING SCIENCE IN NORTHERN NIGERIA

Tukur Muhammad [1] Mbabazi Asiati[2] Umar Sodangi[3] Kanyesigye Stella Teddy[4] Silaji Turyamureeba[5] Kule Ashirafu Masudi[6]

Department of Science Education & Educational Foundations, Faculty of Education Kampala International University Western Campus Uganda,

Department of Science Education, Faculty of Education, Federal University Gusau, Nigeria

Corresponding Author: tukurmuhammad.tm@kiu.ac.ug, tukurmuhammad.tm@gmail.com

Abstract

Over the past decade, science has been recognized as a critical area the upon which scientific and technological progress depends. As a result, there has been enormous research in this area by offering a tool that may be used to improve instruction, students will become less apprehensive and more engaged at various levels. In particular, to encourage female students to be less anxious and more interested in studying science at all levels. This essay is a component of a larger, more critical investigation. It presents an avenue (Module) by which the secondary school female students' reaction towards learning science can be changed to a better one through active involvement during the science lessons. Six different lessons from a developed module were taught to the students by a trained female teacher. Also, students acted in role-playing activities for all connected lessons. The lessons and play-role activities were carried out in the science laboratory of Government Girls' Day Secondary School Shinkafi Zamfara State, Nigeria, where the more prominent study was conducted. The lessons in the module are designed using Gagne's nine instructional events. The six lessons taught to the female students in the module include the human alimentary canal and food digestion; Utilizing flat mirrors and lenses; Natural nutrient cycling (the water cycle); and Water pollution is one type of pollution. Water that is natural and processed (water hardness). The data were qualitatively collected using interviews and observations. The data was audiotaped, videotaped, and written notes. The data were transcribed, coded, and themed. The results show that female students' reactions to learning science about interest and anxiety have changed. Future research for using this means and increase female students' enthusiasm in studying science were recommended. This study is critical in boosting female students' interests and reducing their fear of learning science in secondary school so that they can achieve higher grades and be admitted to tertiary institutions to study various scientific subjects in the future.

Keywords: Anxiety, Interest, Science Module, Female Students. Reaction Towards Learning Science

Introduction

Science remains the foundation for technological advancement (Obomanu & Akporehwe, 2012; Daniel, 2015; Rauf et al., 2013; Nwachukwu, 2012; Muhammad, 2023). Despite the global awareness of the necessity of learning science by female students, there has been a challenging time for learning science, particularly among female students. (Abdullahi, et al., 2021; Egun & Tibi, 2010; Garba et al., 2021; Muhammad, 2023; Whyte, 2017; Zhang, 2018).

This situation is more peculiar to female students in Nigeria (Egun & Tibi, 2010; Ekine, 2013; Ellison & Swanson, 2010; Muhammad, & Yushau, 2022; Muhammad, et al 2022; Muhammad, 2023). In recent years, Researchers determined that science plays an important part in people's lives, as well as the advancement of science and technology for the benefit of society as a whole. For example, it has been discovered that the advancement and attainment of science and technology education is critical to both developed and developing countries' long-term technological development (Bybee, 2010; Nwachukwu, 2012). As such, science and technology can improve people's life (Rauf et al., 2013; Muhammad, 2023).

According to Ker, Ekoja, and Anejo (2010), female students in Nigeria are brainwashed by society to believe that science is not their strong suit. For this reason, girls think that studying science is only meant for boys (Njoku, 2000). Therefore, they have found learning science fearful and have developed anxiety (Greenburg & Mallow, 1982; Nwosu *et al.,* 2014; Muhammad, et al., 2019; Muhammad., 2020; Muhammad., et al., 2021; Abdullahi., et al., 2021; Garba., et al., 2021). as indicated in the literature.

Literature Review

In Nigerian settings, female students are not encouraged into thinking that they are not excellent in science as found by scholars. The issue of the differences against female students in studying science exist in many countries across the globe, but, is most peculiar in Nigeria (Dalhatu, 2013; Group, 2001; Nwachukwu, 2012; UNDP, 2001; ; Muhammad, et al., 2019; Muhammad., 2020; Muhammad., et al., 2021; Abdullahi., et al., 2021; Garba., et al., 2021). As such, the girls are losing interest and having anxiety in learning science (Evans, Schweingruber, & Stevenson, 2002; Skamp & Logan, 2005). This unfair treatment against female students has been in existence for long (Abbagana, 2013) and continues to exist at almost all levels of education (Abdu Raheem, 2012; Abur, Danyi, & Torruam, 2013; Egun & Tibi, 2010; Gusau, 2013). These problems faced by female students in learning science in Nigerian secondary schools are found to be more prominent in some villages of the northern parts of the country (Dalhatu, 2013; Gusau *et al.* 2013; Muhammad, & Yusha'u 2022; Muhammad, et al., 2022). For instance, Okenini (2009) and Gusau (2013) found that the level of participation of female students in western education especially in science in Zamfara State northern part of Nigeria is shallow compared to another part of the country. As such, leads Female students become fearful and uninterested in learning science.

In scientific education, anxiety manifests as a negative response that escalates from apparent discontent to emotional and psychological disturbance. Moore and Ashcraft (2009). Anxiety is characterized in the scientific community as a feeling of unease that arises in circumstances related to research that are thought to pose a risk to one's self-worth. In 2010 Oludipe and Awokoya. It therefore affects learning and output at almost every educational level (Vukovic et al., 2013). Because a child's interest in science is always piqued when ideas, materials, and objects from their immediate world are included into their education and used to explain the scientific method. (Muhammad & Yusu'u 2022; Olorutegbe, Ikpe, & Kukuru, 2010).

According to Ashcraft & Moore (2009), Oloruntegbe, Ikpe, & Kukuru (2010), Muhammad & Yushau, 2022; Muhammad, 2023, science anxiety is characterized as a state of worry and negative reactions

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)

that arise in reaction to situations which vary from relatively slight disappointment to severe psychological and emotional disruption that can be viewed as scary to self-esteem. Research has shown that scientific anxiety becomes more prevalent as children become older, especially in female students (Dalhatu, 2013; Chiarelott & Czerniak, 1987; Muhammad, 2022; Muhammad et al., 2023). It has been reported to begin around the age of nine. It can advance to the next educational level. A negative attitude toward science, perceived challenges, society, inadequate learning and work abilities, a lack of role models, and a bad experience with science classes in the past are some of the factors that contribute to this anxiety (Gencosman & Doğru, 2012; Harari, Vukovic, & Bailey, 2013; Jugović, Baranović, & Marušić, 2012; Mallow et al., 2010; Muhammad et al., 2021).

Thus, the effects of anxiety in science learning have been researched. For instance, some studies Anxiety has been demonstrated to influence scientific and gender-related conduct (Mallow et al., 2010). While, others found that anxiety also affects students' interest in learning (Güzeller & Doru, 2012). On the other hand, when there is an intervention that can reduce students' anxiety in learning science where the interest can be stimulated. Other established that anxiety and enjoyment significantly predict achievement in science (Hembree, 1990). In contrast, Udo, Ramsey and Mallow (2004) found that anxiety does not negatively affect those who have opted for science learning, and they tend to show the lowest level of anxiety. Particularly the female students (Egun & Tibi, 2010; Muhammad, et al., 2019; Muhammad & Yushau, 2022). Hence, female students are also not connected with the ground experiences, and they are not enjoying the learning science (Aikenhead, 2006), this has resulted in a decrease in enrolment female students in the areas of science and technology fields (Abduallahi, et al., 2021; Akinsowon & Osisanwo, 2014; Garba et al., 2021; Muhammad & Yusahu, 2022). Thus, this leads to poor performance in science for the Nigerian secondary school female students nationally and internationally, particularly the female students (Alaba & Adekomi, 2012; Nwachukwu, 2012; WAEC., 2011; Muhammad & Yushaiu, 2022). The national goal of a 60:40 ratio between science and humanity has been impacted by this circumstance (Anzene, 2014; Sunday, 2015; Muhammad, 2023).

Gender variations in mean constructivist attitude levels have been the subject of attention and alarm in previous studies (Baram-Tsabari & Kaadni, 2009; Bryant et al., 2013; Muhammad & Yushau, 2022). Others investigate the causes of anxiety, the impact of mindsets and drives on the success of science and technology, and the relationship between science field and teaching environment. (Abduallahi, et al., 2021; Potvin & Hasni, 2014; Garba et al., 2021; Muhammad, 2020;; Muhammad, 2019; Muhammad., 2023; Reis, Dionne, & Trudel, 2015). These studies concluded that the age group, the gender difference was connected to the instructional strategy; hence, believed to influence science teaching and learning. However, these studies did not consider it reduce anxiety for female pupils in learning science as a critical area of investigation.

Moreover, Olatunde (2009) conducted a quantitative survey among senior secondary school students in Nigeria and Muhammad and Yusahu, (2022). The results showed that female pupils are psychologically afraid of science concepts, and students' anxiety levels are higher in science classes as a result of their dread of science subjects. However, these researchers did not consider using an avenue that is connected to daily life activities to stimulates and make female students less anxious about learning science. Therefore, the goal of the current study was to reduce the anxiety of female students studying science by implementing an instructional module that is connected to their everyday activities. It has been suggested that different channels, such a scientific teaching module, should be made available in order to help female students become more motivated and less anxious when studying science. (Egun & Tibi, 2010), whereby female students will be involved in and committed to learning the fields of scientific discipline (Blue & Gann, 2016; Yang, 2010) so that they can be confident in teaching the content of the curriculum (Abduallahi, et al., 2021; Daniel, 2015; Muhammad, et al., 2019; Muhammad, 2023).

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)

Thus, female students are anxious and not fun in learning science, which in turn, lead to desired scientific and technological progress, this problem needs to be overcome because, No nation can accomplish scientific and technical improvement, let alone economic prosperity, without a solid foundation in secondary school science (Abduallahi, et al., 2021; Ekwueme, Meremikwu, & Kalu, 2013; Muhammad 2023; Muhammad, 2021; Muhammad 2022). By making the science lessons more fun to the female students. In this study, a female students science education module was developed and tested to see how the module influence Female pupils are learning science related to their anxiety. Thus, this is a part of the more important study conducted which answered the following research question: How do the female students find the module from concerning interest and lessening their anxiety?

Methodology

The module was developed using the Gagne (1965) nine events of instruction, two rounds expert's consensus and workshop with a group of experienced science teachers. Also, the elements used in the module includes; culture, religion, health, history of great women scientists and female teacher model. Also, there are role-play activities in each lesson where the students were asked to play in the class. These role-play activities were not included in the current scientific school curriculum or textbooks. Role-playing activities were included in the lesson to help students involved in the lessons so that their anxiety could be lessened. Finally, the developed module consisted of six lessons and their related activities. The next was Three days training which was given to the female teacher on how to use the module. The lessons were video and audio taped, furthermore, the interviews with the teacher and students were conducted and also a non-participant observation was conducted during the lessons.

Moreover, Table 1.1 indicated the descriptions of the lessons taught to the students.

Table 1: Lessons Taught, Venue, Date and Time

S/N	Lesson	Venue for the Lesson	Date	Time	Duration
1	Alimentary canal and food digestion in humans.	G.G.D.S.S Shinkafi Laboratory	1. July 2017.	9:30 AM	1 Hr 3 Minutes.
2	Application of lenses and planar mirrors	G.G.D.S.S Shinkafi Laboratory	3. July 2017	9:00 AM	1 Hr 1 Minutes
3	Nutrient cycling in nature (the water cycle)	G.G.D.S.S Shinkafi Laboratory	4. July 2017	9:00 AM	1Hr 15Minutes.
4	Natural nutrient cycling (the water cycle)	G.G.D.S.S Shinkafi Laboratory	5. July 2017	9:30 AM	59 Minutes
5	Water is both natural and processed.	G.G.D.S.S Shinkafi Laboratory	6. July 2017	10:00 AM	1 Hour 5 Minutes.
6	Water (hardness)	G.G.D.S.S Shinkafi Laboratory	7. July 2017	9:00 AM	1Hour 2 Minutes.

Following the lesson delivery, data was gathered qualitatively through observation and interviews. An interview procedure comprising observations and interviews was utilized as the data collection tool. The discussion was cross-checked and approved by experts in the field of scientific education.

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)

Ten questions were initially sent to the experts, who then reviewed them and provided all relevant advice and comments. In the Shinkafi Local Government Area of Zamfara State, Nigeria, 40 female students attend Government Girls Day Secondary School. This information was gathered from them. Therefore, willing female students who were instructed in the science sessions in the module were chosen through the technique of purposive sampling. The lessons taught to the student were part of the developed science education module, which was design using the Gagne's (1979; 1962) nine events of instruction, an instructor guide. The qualified female teacher gave the students six distinct lessons and exercises that included role-playing. Students were informed about the aim of the module, and they were purposefully selected among the entire students. All the students agreed to partake in the study. The criteria used in selecting the students who participated in this study include; (a) the female students must be senior secondary school students (b) They were from the locality where the research was conducted (c) They are science students (c) They are ready to partake fully in the study voluntarily. The interviews and observations and pictures were utilized to collect the data.

Students were given an informed consent document, which they promptly signed. Several focus group interviews with selected female students were conducted, the data was videotaped, recorded and analysed. Also, synonyms were used for the interviewed students and observers.

Method of Data Analysis

The Creswell (2008) method was used for transcription and analysis of the gathered qualitative data. utilizing six steps: gathering and organizing the data; examining and categorizing the data; characterizing and formulating the themes; presenting and disseminating the results; deciphering their significance; and verifying their accuracy.

As several data and methodologies were triangulated, as well as because sufficient engagements, member checks, audit trials, and researcher positions were all provided, the reliability and validity were guaranteed. Concerning validity, it is important to present the results as actual (Merriam, 2009; Merriam & Tisdell, 2015). Also, the data collection continued until it reached the saturation stage when the researcher starts to see and hear the respondents repeat similar things and no new information was stated (Merriam, 1998; Merriam & Tisdell, 2015). Also, the researcher tried and ensured the peer review by discussing the data with some supervisors and colleagues, scanning and assessing the collected raw data, emerging findings and interpretation of the results (Merriam, 2009). Moreover, the primary instrument for the data collection was the researcher. The collected interviews data were coded and themed manually; this is because qualitative coding data manually is essential because, the purpose of is to provide the readers, sources, description and examples of the further steps of analysis (Saldaña, 2009). The process is father elaborated. An example of the transcribed data is shown below.

1 I was so comfortable during the lessons because I was comfortable during the lesson
2 and we did not feel fear or nervous during the lessons and was able played my role
3 without any stress or confusion. Because our normal lessons are not as good as
4 these in many ways. Like in these lessons there is a linkage of the health condition
5 of our community in the introduction of the lessons. By the grace of God, the
6 Almighty, I will further my studies to the university after my secondary school
7 education; I want to study scientific field. Because now I have the confidence and
1. 8 dreams to become 8 a medical midwife so that I can assist my family and
8 community particularly my female colleagues. I want to be a Pharmacist where I
9 will study a different kind of drugs, their constituents and the recommended
10 ones. I wish to further my study because I need to study Microbiology, so that can

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)

11 works in the hospital laboratory. I want to be a Dentist if admitted to the University.
12 Himmmm… Now in my future, I study Medical Laboratory to work in the

Further, the researchers coded the relevant and essential words, phrases, and sentences. The coded data were reduced to subthemes, and finally, the subthemes were collapsed to themes. Table (Table 1) below is the example of the codes formed from the transcribed data.

Table 2: Example of Codes Established from the Transcribed Data.

Respondent	Interviews Codes	Verbal Observation Codes
Female Students	Felt happy; fully engaged; paid attention, listened attentively; valued the lessons, settled normal; remained calm during the lessons, was excited; across my interest, the teacher was smiling; the teacher was laughing, facilitated learning; understood the lessons; concentrated during the lessons; enjoyed the play role activities; good introduction; good presentation; organized.	Smiling during the role play; pleased during the role play; joyful; paying attention; comfortable, looked cheerful; hastened to play the role, clapped hands, raised hands, smiled, jumped, and boldly performed the roles.

Moreover, the codes were then collapsed to sub-themes, as indicated in Table 2 below.

Table 3: Example of how Sub-themes were developed from Codes

Respondent	Codes	Observation Codes	Subtheme
Female Students	Not disturbed; did not shock when holding the materials; felt composed; remained calm; did not encounter difficulty; was comfortable; focused during the lessons; was not sweating during the lessons; did not breathe abnormally; was not confused when answering the questions; was not confused; did not shake when playing the role; was not frustrated during the lessons.	Stayed comfortable during the classes; no sweating, no shaking, no abnormal blinking of the eyes, normal breathing; answered questions without fear; held and used the materials confidently; completed the tasks without confusion.	*The concern of during the lessons*

Also, the process of data analysis continues by collapsing sub-theme themes, as indicated in Table 3.

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)

Table 3: Example of how Themes were Developed from Sub-themes.

Respondent	Sub-themes	Theme	Excerpts
Female Students	Happy; Students' attention during the lessons; Students' concern of during the lessons; worry.	*Excitement and Apprehension*	**Khaltum** *"….. I felt very excited during the lessons" . We exhibited the hardness of water and the water cycle through play role exercises in class, which included the water cycle, human alimentary canal, telescope, pollution, and water pollution.* (G.G.D.S.S Shinkafi School Lab. *31st July 2017)* **Dausi: "…**I was so relaxed during the sessions since I was comfortable, and we didn't feel afraid or scared during the lessons, therefore I was able to do my role without tension or uncertainty." (G.G.D.S.S Shinkafi School Lab, 28th July 2017)

Finally, three different themes developed, which are discussed.

Findings And Discussion

This section will discuss how the female students responded to the curriculum in regions of interest and how it helped them feel less afraid. The findings show that when courses and home assignments are connected to their culture, faith, and everyday lives in their community, female students' interest levels increase and their anxiety levels decrease. Three themes emerged: heightened ambition; relevance to daily life; and excitement and concern. These subjects were covered.

Excitement and Apprehension

The findings under this theme showed that students indicated that they were happy, excited, encouraged and enjoyed the lessons also they felt less concerned throughout the lessons. It is because the lessons are relevant to their faith, culture, and daily lives in the community. For example: When pupils are asked how they felt after their lessons?
One female student (Khaltum) mentioned;

> *"….. I felt very excited during the lessons" . Because of the play role activities we demonstrated in class, such as the hardness of water and the water cycle, the types of play role activities we played in class include the water cycle, human alimentary canal, telescope, pollution, and water pollution."*
>
> *(I, 3, Line 5-7, July 31, 2017)*

"….. I felt very excited during the lessons" . Because of the play role activities we demonstrated in class, such as the hardness of water and the water cycle, the types of play role activities we played in class included the water cycle, human alimentary canal, telescope, pollution, and water pollution." (I,3, Line 5-7, July 31, 2017). Also, the introduction of the lessons in the module makes female students felt happy during the lessons, while others mentioned different reasons, as indicated below.

Researcher: Why do you feel happy with the lessons?

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)

Asmah: *The presentation of the lessons was so stimulating.*
Hauja: *We were happy with the questions asked by our teacher.*
Lubata: *The lessons are related to our daily life and religious activities.*
(I,3 Line 7-9, 31st July 2017)

To back up this assertion, Nafi said that "During lessons, some of the students commented on the excellent playing; they like it, and they were clapping using their hands during the play role activities." Sami further added that "While humans and their systems of digestion play role activities, the volunteers' students joined their hands correctly and with assurance, without any fear.". Because of this, students' level of interest has altered during the play role exercises. Specifically, during the human gastrointestinal play role exercise, students joyfully and enthusiastically joined their hands to form a tube-like person alimentary canal.

It demonstrated how much the students relished the module's lessons and associated role-playing activities. The results are consistent with those of Blue (2008), who discovered that girls showed an interest in math and science. It also demonstrates how much the student's enthusiasm in studying science was impacted by the module's lessons. However, female students came to believe in their own subjective ways that they had little interest in studying science (Akinbi & Akinbi, 2015; Akinsowon & Osisanwo, 2014).

Also, the enhancement of the interest and lessen the anxiety of female students during the lessons in the module was because the introduction of lessons consisted of the element (History, health, religion, and culture) related to interest and anxiety. The action assisted in gaining their attention during the lessons. These findings are consistent with the nine events of instruction (Number 1: Gaining the attention of the learner) for the theory Gagne theory of instruction. Because Gagne (1962, 1965) holds that gaining the attention of the learner is about the display of stimulus to confirm the response of instruction is necessary because, in order for any learning to occur, the teacher must first capture the student's attention, as curiosity stimulates learning.

In support of this, Nafi noted that "*When the tags that carry their roles were placed on the students during this roleplay activities, the students were smiling and laughing.* These results showed How the lessons encourage pupils to show excitement during role-playing exercises. Therefore, the positive feelings indicated by the female students after teaching them the lessons in the science module could be due to their full involvement throughout the lessons by exhibiting the role-playing activities. Baine (2009) found that exposing females to hands-on activities and changes in science increases their enthusiasm in learning science and mathematics.

Thus, it is indicated that Maryat demonstrated the signs of happiness with the reactions shown by her students, also, makes her felt happy as indicated above. In contrast, the findings of Blue (2016), where he established that female student are discovered to have a subjective view of being uninterested in learning science. Sami noted that the Maryat was so composed and not fear in arranging the students through the role-play activities. On the other hand, the results indicated that the female pupils are less anxious not disturbed, felt comfortable or frustrated during the lessons and they never faced any difficulty when demonstrating the play role activities in the class. Also, when asked about how they feel during the lessons?. Dausi mentioned;

"… I was so relaxed during the lessons because I was comfortable during the lesson and we did not feel fear or nervous during the lessons and was able to play a role without any stress or confusion." (I, 1, Line 1-3 28th July 2017)

In support of this Sami observed that "*The pupils were not worried when the teacher asked them to define untreated water. This is feasible because the students enjoyed the courses.".* On the other hand, some students mentioned different reasons why they were less anxious during the lessons.

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)

For example, when they are asked why they did not feel difficulty and fear during the lessons? Lubata mentioned;

> *" ….. "Because our normal lessons are not as good as these in many ways. Like in these lessons, there is a linkage of the health condition of our community in the introduction of the lessons."*
>
> (I, 1 Line 3-5, 28th July 2017)

The findings indicated that the pupils become a reduced amount of disturbed, Not apprehensive, felt comfortable and relaxed during the lessons. In support of this, the results of Udo, Ramsey, and Mallow (2004) who found that the idea that anxiety does not negatively affect those who have chosen for science courses and they tend to exhibit lower levels of science anxiety. In contrast, Pollack (2013) established that female students are having a lack of confidence in studying science. Also, Sami noticed that "One of the pupils was gathering untreated water., *the student showed confident and did not feel fear*. It was also expressed by Maryat who taught the students when asked about why she felt comfortable with the lessons in the module?

Maryat mentioned; *"… It is because my students become less disturbed and not nervous during the lessons" . Nafi provided evidence for this by pointing out that "the female students were not shocked or bored when holding the materials for the play role activities." But according to Sami, "the female students were not afraid when the tags are placed on them."*

In general, the reaction of female pupils to curiosity and unease towards learning science was found positive because the female students became more interested and less anxious during the lessons. Heaverlo (2011) discovered that women are less confident in their scientific abilities and experience higher levels of anxiety, but her findings are consistent with those of Jones et al. (2000) and Paijeres (2006). The best instructional guide, Gagne's (1965) nine stages of training, made this possible. Other components that were employed in the lesson design included history, religion, and culture, all of which are connected to the courses' introduction.

Increased Ambition

The replies from female students regarding what they want to do after high school will be covered in this section. For example, when questioned about what they intended to do once they finished high school. In response, the majority of pupils said they had better plan for following secondary school. Some people said in response that they don't intend to get married. Others expressed that they want to continue their education to the universities and colleges to explore many scientific topics. This is possibly because the students do not have the ambition to further their studies before, since the teachers are not engaging them during their regular school lessons and This could be because they were fully involved in the lessons by playing role-play activities, unlike in their traditional didactic school lessons where the students are only passive learners.

For instance, when asked during a focus group interview on what is the students' plan after secondary school? Dausi mentioned;

> *"By God's grace, I plan to pursue a scientific degree at university after finishing high school. Because now I have the confidence and want to become a medical midwife so that I may help my family and community, particularly my female colleagues."*
>
> (I,1 Line 5-9 28th July 2017)

The conclusions defied the justification offered by the individual in the focus group. She stated, Since my goal is to be like great women scholars who have contributed in this regard because I am

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)

interested in helping my female colleagues and my fellow humans in general." On the other hand, when the kids were asked what field of study they would like to pursue in college or university, the answers were clear. The pupils made a long list of careers they wanted to pursue. excerpts from the transcripts of the interviews provide further details;

Researcher: What kind of studies do you want to pursue in universities and colleges?
Kuraish aspires to become a pharmacist and research various medications, their ingredients, and suggested dosages.
Nuraini aspires to study Microbiology for a career in hospital laboratories.
Maimu: If I am admitted to university, I hope to become a dentist.
Khaltum: Himmmm. In my future, I plan to study Medical Laboratory and work in a school lab.
Hajar: By the grace of God! After completing my secondary education, I plan to pursue zoology.

I, Lines 9–15, July 28, 10:30 AM

In support of the kind of ambition the students mentioned Nafi noticed that while some students were pointing at their colleagues and declaring that they would become doctors, others were stating that they would become staff nurses. It demonstrates that the science classes given to female pupils inspired them in having the great ambition to further their study and study various scientific fields. It is indicated that the module has a good idea that can make students perform excellently in their examination and further the studies. In another hand, some students mentioned different views as indicated below;

Researcher: What are your plans for when you graduate from high school?

Maimu: "Him... I want to study science at a tertiary institution level, so I won't get engaged to any man until I finish my university." My academic interest is biochemistry. I aspire to be like the accomplished women scientists who have made contributions to society. also, want to support my community overall as well as my female coworkers.
Khaltum: After high school, I don't want to get married.
because I want to help my community as a whole and have a bright future.
Nuraini did, however, provide a further response: "Because I now realize that whatever sons can do, I too can do." (I,2, Line 5-9, 30th July 2017)

In support of this, Sami noted that: *A few pupils gestured to their peers and remarked, "You would be." One of the finest female scientists ever was Elizabeth, who introduced the "Human Alimentary Canal and Digestion of Food in Humans.".*

This demonstrates the beneficial shift in the students' lives following the module's lectures, which encouraged them to pursue other goals rather than getting married as the need analysis had indicated. This demonstrated that not only did the study participants feel like they were getting married, but also that their older sisters were married after completing their secondary schooling. Furthermore, the results demonstrated that female students have revised their plans to postpone marriage after completing their secondary education in response to the use of an intervention (science module). Rather, they readied themselves to advance their education by attending postsecondary educational establishments to explore diverse scientific domains.

These results are consistent with those of Simparkins et al. (2006), who found that female students are more likely to decide to continue with science courses. Additionally, Adya and Kaiser (2005) discovered that gender discrimination against female species has its roots in modern civilization and has persisted there, influencing students' early conceptions of what careers are suitable for boys and girls. Additionally, the study's conclusions showed that female students are eager to

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)

explore a variety of scientific subjects at postsecondary institutions fields in which even male students are interested.

Relevance to everyday life

Under this theme, the study's conclusions will discuss the teachings' worth, applicability, and relevance for kids, parents, and those in the neighbourhoods where the research was conducted. The module's lessons are connected to the community's religious practices and cultural events, according to the findings. Additionally, the results showed that the kids showed that the lessons have value for their community and will inform both their parents and other residents about the applicability of science. The data indicates that students think the classes are worthwhile and pertinent to their faith and local culture. Moreover, the problems have a connection to the curriculum of their school.

As demonstrated, when asked about the lessons' relevance to them and their community. Zeebe mentioned:

> *"....The lessons are really pertinent to our religious and cultural activities. Because, according to our religion, it is better to divide our stomach into three parts (one part food, one part water, and one part air) than to be an extravagance."*
>
> (I 3, Line 9-12, 31st July 2017)

This proved that the lessons learned were pertinent to the religious and cultural practices of the community. To back up this statement, Sami stated, "After the lessons, the students group collectively and expressing that the subject matter is exactly connected with the manner of the dining habit of our people." These findings are in line with those of Igbe (2007), who noted that the belief that women are God's creations—weaker vessels with shallower brains—supported the assumption that discriminatory cultural and religious beliefs against women continued to exist to some extent.

Additionally, the students gave a variety of explanations, as listed below, when questioned further about the types of associated religious and cultural events;
Investigator: What spiritual and societal pursuits are connected to the teachings?

> Khaltum: Preparing ourselves for prayer by washing with contaminated water
> Maimu: Observing the arrival of the new Ramadan and Shawwal months for our fast
> Lubata: Our community's custom of taking a ceremonial bath in river water
> Asmah: Using contaminated water for personal hygiene.
> Kuraish: The elderly residents of this neighborhood wear medical glasses.
>
> I 3, Line 9-11 31st July, 2017

Nafi provided evidence to back the statements made by the students during the interview, pointing out that several students expressed after the class that they found the teachings helpful in understanding how to clean their contaminated water and that they would make it easier for them to sign the Ramadan calendar if they could complete the at-home project. It suggests that some aspects of the community's cultural and religious activities are included in the module's lessons, which the pupils claim were absent from regular classroom instruction. Accordingly, Egun (2010) and Abbagana (2013) found that involving students—particularly female students—in their everyday lives and religious pursuits in relation to scientific ideas helps them understand the significance of the science courses and facilitates their learning of the subject. This study showed that the science module's integration of cultural and religious activities makes it beneficial for both the community and the students. As a result, kids become more interested in learning science.

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)

Conclusion

Women have been marginalized and denied for many years in Nigeria, thus the type of education provided to female students must be more contextualized so that they are more interested in learning science beginning in secondary school. As a result, interventions such as scientific lectures, which combine themes such as religion, culture, history, and health, can provide individuals with a new perspective and allow students to open up for themselves, becoming less apprehensive and more engaged in learning science. As a result, this is what this study attempted to do, and that is what makes it unique.

Implications of the study

The study has pedagogical implications for increasing female students' enthusiasm and reducing their fear about learning. It was accomplished by constructing science courses that are relevant to the students' everyday lives and religious activities. As a result, the ideas can be included into the science curriculum, allowing the overall goal of increasing female students' interest and decreasing their fear to be realized.

Suggestion for future research

The results of the study can be used to create a model that kindergarten teachers can employ to increase female children' engagement and reduce their fear. Additionally, it might be utilized to create and develop an alternative module that would increase the male students' interest and decrease their worry when learning on a different continent, since it has been demonstrated that male students lack interest and anxiety. The concept of this study could potentially be applied to evaluate the gender disparity in secondary students' interest in and worry about learning.

References

Abbagana, K. (2013). Female–child education: a critical issue for national development in nigerian. *Development, 5*(2), 1-8.

Abdu-Raheem, B. (2012). Gender differences and students 'academic achievement and retention in social studies among junior secondary schools in ekiti state. *European Journal of Educational Studies, 4*(1).

Abur, C. C., Danyi, C. J., & Torruam, J. T. (2013). The effect of low participation of female in science and technology in nigeria. *International Journal of Marketing and Technology, 3*(1), 108-115.

Adya, M., & Kaiser, K. M. (2005). Early determinants of women in the IT workforce: a model of girls' career choices. *Information Technology & People, 18*(3), 230-259.

Aikenhead, G. S. (2006). Towards decolonizing the pan-Canadian science framework. *Canadian Journal of Math, Science & Technology Education, 6*(4), 387-399.

Akinbi, J. O., & Akinbi, Y. A. (2015). Gender disparity in enrolment into basic formal education in nigeria: implications for national development. *African Research Review, 9*(3), 11-23.

Akinsowon, O., & Osisanwo, F. (2014). Enhancing Interest in Sciences, Technology and Mathematics (STEM) for the Nigerian Female Folk. *International Journal of Information Science, 4*(1), 8-12.

Alaba, S. O., & Adekomi, B. (2012). Improving Science, Technology and Mathematics Education in Nigeria: A Case Study of Obafemi Awolowo University, Ile-Ife. *World Journal of Education, 2*(6), 13.

Anzene, S. J. (2014). Trends in examination malpractice in Nigerian educational system and its effects on the socio-economic and political development of Nigeria. *Asian Journal of Humanities and Social Sciences (AJHSS), 2*(3), 1-8.

Ashcraft, M. H., & Moore, A. M. (2009). Mathematics anxiety and the affective drop in performance. *Journal of Psychoeducational Assessment, 27*(3), 197-205.

Baine, C. (2008). *Engineers Make a Difference: Motivating Students to Pursue an Engineering Education*: Bonamy Pub.

Baine, C. (2009). Women and minorities in STEM careers advancing our world. *STEM Google Scholar*.

Baram-Tsabari, A., & Kaadni, A. K. (2009). Gender dependency and cultural independence of science interest in an open and distant science learning environment. *The International Review of Research in Open and Distributed Learning, 10*(2).

Blue, J., & Gann, D. (2016). When do girls lose interest in math and science?

Bryant, F. B., Kastrup, H., Udo, M., Hislop, N., Shefner, R., & Mallow, J. (2013). Science anxiety, science attitudes, and constructivism: A binational study. *Journal of Science Education and Technology, 22*(4), 432-448.

Bybee, R. W. (2010). Advancing STEM Education: A 2020 Vision. *Technology and Engineering Teacher, 70*(1), 30-35.

Chiarelott, L., & Czerniak, C. (1987). Speaking out: Science anxiety: implications for science curriculum and teaching. *The Clearing House, 60*(5), 202-205.

Creswell, J. W. (2008). Educational research. *Planning, conducting, and evaluating quantitative and qualitative research*.

Creswell, J. W. (2014). *A concise introduction to mixed methods research*: Sage Publications.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*: Sage publications.

Dalhatu, S. (2013). Girl Child Education: The Challenges and a Road Map to the Attainment of a Qualitative Education in Nigeria. *Kabai Journal of Multidisciplinary Studies, 1*(1), 25-32.

Daniel, E. G. S. (2015). Student Biology Teachers: Passive Recipients to Active Participants (A Case Study, University of Malaya, Malaysia) *Biology Education and Research in a Changing Planet* (pp. 87-100): Springer.

Egun, A., & Tibi, E. (2010). The gender gap in vocational education: Increasing girls access in the 21st century in the Midwestern states of Nigeria. *International Journal of Vocational and Technical Education, 2*(2), 18-21.

Ekine, A. (2013). Enhancing Girls' Participation in Science in Nigeria. *Improving Learning Opportunities and Outcomes for Girls in Africa*, 41.

Ekwueme, C. O., Meremikwu, A., & Kalu, N. (2013). The National Mathematics Curriculum for BEP (Basic Education Programme) and the MDG (Millennium Development Goals) for Mathematics Teachers in Nigeria: Teachers' Perception and Readiness. *Online Submission, 3*(3), 162-171.

Ellison, G., & Swanson, A. (2010). The Gender Gap in Secondary School Mathematics at High Achievement Levels: Evidence from the American Mathematics Competitions. *The Journal of Economic Perspectives, 24*(2), 109-128. Retrieved from http://search.proquest.com/docview/212092987?accountid=28930 doi:http://dx.doi.org/10.1257/jep.24.2.109

Evans, E. M., Schweingruber, H., & Stevenson, H. W. (2002). Gender differences in interest and knowledge acquisition: The United States, Taiwan, and Japan. *Sex roles, 47*(3-4), 153-167.

Gage, N. L. (1979). The generality of dimensions of teaching. *Research on teaching*, 264-288.

Gagne, R. M. (1962). The acquisition of knowledge. *Psychological Review, 69*(4), 355.

Gagne, R. M. (1965). The conditions of learning, Holt. *Rinehart, and Winston*.

Gencosman, T., & Doğru, M. (2012). Effect of student teams-achievement divisions technique used in science and technology education on self-efficacy, test anxiety and academic achievement. *Journal of Baltic Science Education, 11*(1).

Greenburg, S. L., & Mallow, J. V. (1982). Treating Science Anxiety in a University Counseling Center. *Personnel & Guidance Journal, 61*(1).

Group, W. B. (2001). Atkinson and Merrilea Mayo Information Technology and Innovation Foundation

Gusau, A. M., Basir, S.A., & Muhammad Y. . (2013). Public perception on muslim female education in zamfara state, Nigeria. *Kabai Journal of Multidisciplinary Studies, 1*(2), 189-203.

Harari, R. R., Vukovic, R. K., & Bailey, S. P. (2013). Mathematics anxiety in young children: an exploratory study. *The Journal of experimental education, 81*(4), 538-555.

Heaverlo, C. A. (2011). *STEM development: A study of 6th--12th grade girls' interest and confidence in mathematics and science.* (3473025 Ph.D.), Iowa State University, Ann Arbor. Retrieved from http://search.proquest.com/docview/894337556?accountid=28930 ProQuest Dissertations & Theses Global database.

Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for research in mathematics education*, 33-46.

Igbe, S. (2007). Cultural evolution and next-of-kin in Benin kingdom. *Gender and Next-of-Kin in Cross-Cutural Perspective: Benin City. Joesery Associates*.

Jones, M. G., Howe, A., & Rua, M. J. (2000). Gender differences in students' experiences, interests, and attitudes toward science and scientists. *Science Education, 84*(2), 180-192.

Jugović, I., Baranović, B., & Marušić, I. (2012). The role of gender stereotypes and motivation in the explanation of mathematics achievement and anxiety. *Suvremena psihologija, 15*(1), 65-78.

Ker, B., Ekoja, O., & Anejo, E. (2010). Trends in girl-child education in Africa: Girl-Child Education in Africa. Enugu: CIDJP press.

Mallow, J., Kastrup, H., Bryant, F. B., Hislop, N., Shefner, R., & Udo, M. (2010). Science anxiety, science attitudes, and gender: Interviews from a binational study. *Journal of Science Education and Technology, 19*(4), 356-369.

Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education. Revised and Expanded from" Case Study Research in Education."*: ERIC.

Merriam, S. B. (2009). Qualitative Research: a guide to design and interpretation. *San Francisco: Jos-sey-Bass*.

Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*: John Wiley & Sons.

Muhammad, T. (2023). *Science Technology Engineering and Mathematics (STEM) Education of United States, United Kingdom, and Australia: A Lesson for Nigerian Education Reform*. Usman Danfodio University Press, Sokoto, Nigeria. (Sponsored by TETFUND)

Muhammad, T., Jibril., Isah, F.J. (2022). Comparative analysis of science, technology, engineering and mathematics (STEM) education programs in the United Kingdom, United States of America, Japan and Australia, British *Journal of multidisciplinary and Advanced Studies: Engineering and Technology*, 3(2), 191-211

Muhammad, T., Yusha'u H. (2022). Needs analysis for the development of Biology module to address interest and anxiety for female secondary school students in Gusau metropolis, Zamfara State. *Bunagana Journal of Educational Studies.*

Muhammad, T., Ibrahim D.M. & Muhammad, N. (2022). A survey of the causes of miscarriage in Shinkafi Local Government Area, Zamfara State. *Maru Journal of Science, Vocational & Technical Education.*

Garba., S.M., Samaila., A.T., Muhammad., T., Kanoma., I.K., & Dahiru., M. (2021). Prevalence of dandruff among people of varied age category. *Maru Journal of Science Vocation & Technical Education.*

Abdullahi., S., Kanoma., A.U., Muhammad., T., Muhammad., D. & Garba., S.M. (2021). Effects of laboratory facility on academic performance in senior secondary school certificate biology examination in Zamfara State. *Maru Journal of Science Vocation & Technical Education.*

Muhammad., T., Abdullahi, S., Kanoma, A.U., & Garba, S.M. (2021). Effects of miscarriage among women visiting general hospital Shinkafi, Zamfara State Maru. *Bunagana*

Journal of Educational Studies.

Muhammad., T., Abdullahi, S., Kanoma, A.U., & Garba, S.M. (2021). Gender difference in Nigerian science classes: the way forward. *Bunagana Journal of Educational Studies.*

Muhammad., T. (2020). Effect of gender on student's achievement in biology among Nigerian certificate in education two with different cognitive preferences in college of education Maru. *Bunagana Journal of Educational Studies.*

Muhammad, T., Abd. Rauf. A. & Daniel, E. (2019). Female teacher's experience in teaching science using role play. *Journal of Issues in Education,* 42.

Muhammad, T., Daniel, E. & Abd. Rauf. A. (2019). Changing of parents' perception in educating female students in nigerian science education. *Malaysian Online Journal of Education Science (MOJES).*

Njoku, Z. (2000). Image of Females in Science: A Gender Analysis of Science and Technology Activities in Nigerian Primary Science Textbooks. *Journal of Primary Education I (3-12).*

Nwachukwu, C. O. (2012). Revisiting Science Education and National Development: Nigerian Situation and the Way Forward. *Kuwait Chapter of Arabian Journal of Business and Management Review, 33*(846), 1-21.

Nwachukwu, C. O. (2012). Revisiting Science Education and National Development: Nigerian Situation and the Way Forward. *Kuwait Chapter of Arabian Journal of Business and Management Review, 33*(846), 1-21.

Nwosu, S. N., Etiubon, R. U., & Udofia, T. M. (2014). Tackling inhibitions to careers in science and technology through differentiated mentoring approach. *International Education Studies, 7*(8), 124.

Obomanu, B., & Akporehwe, J. (2012). The Effect of Home Related Science Activities on Students' Performance in Basic Science. *World Journal of Education, 2*(1), 131.

Okenini, J. E. (2009). *Girl child education and its challenges to the universal basic education in Zamfara state.* (PGDE Project PGDE Project), National teachers institute Kaduna, Gusau branch, Zamfara State, Nigeria.

Oloruntegbe, K., Ikpe, A., & Kukuru, J. (2010). Factors in students' ability to connect school science with community and real-world life. *Educational Research and Reviews, 5*(7), 372.

Oludipe, D., & AWOKOYA, J. O. (2010). Effect of cooperative learning teaching strategy on the reduction of students' anxiety for learning chemistry. *Journal of Turkish science education, 7*(1), 30.

Pajares, F., Valiante, G., & Cheong, Y. F. (2006). Writing Self-Efficacy and Its Relation to Gender, Writing Motivation and Writing Competence: A Developmental Perspective. *Writing and motivation*, 141.

Pollack, E. (2013). Why are there still so few women in science? *The New York Times, October, 3*, 2013.

Potvin, P., & Hasni, A. (2014). Interest, motivation and attitude towards science and technology at K-12 levels: a systematic review of 12 years of educational research. *Studies in Science Education, 50*(1), 85-129.

Rauf, R. A. A., Rasul, M. S., Mansor, A. N., Othman, Z., & Lyndon, N. (2013). Inculcation of science process skills in a science classroom. *Asian Social Science, 9*(8), 47.

Reis, G., Dionne, L., & Trudel, L. (2015). Sources of anxiety and the meaning of participation in/for science fairs: A Canadian case. *Canadian Journal of Science, Mathematics and Technology Education, 15*(1), 32-50.

Saldaña, J. (2009). An introduction to codes and coding. *The coding manual for qualitative researchers, 3*.

Simpkins, S. D., Davis-Kean, P. E., & Eccles, J. S. (2006). Math and science motivation: A longitudinal examination of the links between choices and beliefs. *Developmental psychology, 42*(1), 70.

Skamp, K., & Logan, M. (2005). Students' interest in science across the middle school years. *Teaching Science, 51*(4), 8.

Social Module. Retrieved from http//: open knowledge.

Sunday, E., A. (2015, Monday 2nd February 2015).) STEM Courses Crucial to Nations' Technological Advancement. *The Guardian News Paper, Nigeria* pp. 1-14.

Udo, M., Ramsey, G., & Mallow, J. (2004). Science anxiety and gender in students taking general education science courses. *Journal of Science Education and Technology, 13*(4), 435-446.

UNDP. (2001). United Nation Development Project. *Human Development Report 2001: Making new technologies work for human development*. New York and London: , Oxford University Press Retrieved from http://www.undp.org/

WAEC. (2011). *West African Examination Council. SSCE released results.* Retrieved from http://www.nairaland.com/733160/may-june-2011-2012-wassce.

Whyte, J. (2017). *Girls into science and technology: The story of a project*: Routledge.

Yang, L. (2010). Toward a deeper understanding of student interest or lack of interest in science. *Journal of College Science Teaching, 39*(4), 68-77.

Zhang, S. (2018). A systematic review and meta-analysis on flipped learning in science education. *HKU Theses Online (HKUTO)*.

ISSN: 2518-2951 https://doi.org/10.59568/AMJD-2023-12-3-25 African Multidisciplinary Journal of Development (AMJD)