MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 **DOI: https://doi.org/10.59479/jiaheri.v1i001.48**

Transforming Industrial Chemistry Content into Insecticide Production as an Entrepreneurial Skill among Senior Secondary School Students in Zamfara State

Umar Sodangi[1]
Email: sodangiumar@fugusau.edu.ng
Tel: 08036076752

Ibrahim, Adamu[1]
Email: adamugwoza@fugusau.edu.ng
Tel: 08065108662

Akanbi, Ganiyu Adedo[1]
Email: adedoganiyu@fugusau.edu.ng
Tel: 07035236585

[1]**Department of Science Education Federal University Gusau, Zamfara State**

Abstract
This study examined the extent to which industrial chemistry content knowledge can be transformed into insecticide production as an entrepreneurial skill among senior secondary school students in Zamfara State. The study has four objectives, four research questions, and three null hypotheses. A quasi-experimental design of the pre-test and post-test was adopted for the study. The study population consist of all SSII secondary school students and the sample consist of 80 students in intact class of 40 for experimental and 40 for control groups. Purposive sampling was used to select the sample schools in Gusau, Educational Zone. The instruments used for data collection was a structured questionnaire on a 4-likert scale, and a Chemistry Achievement Test (CAT) with the reliability indexes of 0.72 and 0.82, respectively, using Cronbach alpha and PPMC with Spearman Brown prophecy formulas. The data were analyzed using descriptive statistics of mean and standard deviation. The hypotheses were tested using t-test statistics. The result revealed that students have gained much awareness that knowledge of industrial chemistry contents is paramount in insecticide production. The findings show that there is a significant difference in the performance and skills acquired by the experimental group that were exposed to the practical production of insecticides while the male students' performance supersedes that of female students. It was recommended that the government, nongovernmental organizations, and school administrators to encourage the students in transforming industrial chemistry content knowledge for insecticide production for entrepreneurial skills.
Keywords: Industrial Chemistry, Insecticide, Entrepreneurial Skills, Content knowledge

Introduction
Nigeria's economic situation is becoming unbearable for its citizens. It is not because the government has folded its arms; they are also working hard to make things better for ordinary

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 DOI: https://doi.org/10.59479/jiaheri.v1i001.48

citizens, but because the demands and ambitions of the people exceed the government's capacity to meet them[1]. It is past time for the government to take a comprehensive approach to education by investigating the educational material upon which each topic is founded in order to attain the stated educational goals. [2]The Federal Government of Nigeria places a premium on senior secondary entrepreneurship education, which has since been integrated into post-basic teaching and learning with the purpose of developing entrepreneurial skills in students and encouraging self-reliance. However[3] see education as a tool for effective integration of individuals into society in order for the individual to achieve self-realization, promote unity, strive for social, economic, political, scientific, cultural, and technological processes, and develop national consciousness.

However, there are some indications that any nation or country that provides better education for its citizens can compete worldwide[4]. A nation can only be formed if a solid and structured education that aids in the resolution of human problems is provided[5]. The government's inability to meet its citizens yearnings and desires has now become a treat, resulting in unemployment, poverty, and other social crimes, which have now become a canker worm deep into the fabric of each human in order to obtain a daily bread[6]. These are some of the intrinsic motivations that can lead people along the route of entrepreneurship, as well as different combinations of reasons that can inspire people to start a firm.

The rise in unemployment, crime rate, and other social vices in Nigeria can be attributed to the inappropriate implementation of good policies and the issues surrounding bad governance on the utilization of available resources to meet citizens' yearnings and aspirations. The implementation of entrepreneurship education can act as an alternative in the management and exploitation of available resources to address pressing concerns. Entrepreneurial education is a learning process that involves self-reliance, a suitable route that will substantially aid in the reduction of unemployment and the advancement of national development. If the country is to progress, needs for entrepreneurial education must be addressed, particularly in secondary school education, which can help empower our children to achieve something even after they might have graduated.

The most important aspect of entrepreneurship is that it is a cognitive process that uses mental approaches to demonstrate the potential of human knowledge; it is a process where assumption and aspiration can be established through mental innovations to become an inventor, and the sharing of these innovative ideas through interpretation is what it means to be an entrepreneur. Cognitive science demonstrates how concepts form in students' minds and, more crucially, how they are linked, which may indicate students' conceptual knowledge[8]. Students' conceptual understanding will continue to improve and will require both knowledge of mathematics and chemistry and the capacity to utilize scientific concepts based on a current scientific theory.

The view that chemistry students believed that chemistry topics are difficult; their knowledge and interest in comprehending the empirical basis of chemistry, particularly organic chemistry, remain elusive to the majority of secondary school students[9]. If chemistry students were exposed to the application of their knowledge in the production of goods, they would acquire a

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 **DOI: https://doi.org/10.59479/jiaheri.v1i001.48**

skill that would assist to reduce unemployment and make them self-sufficient on government jobs[10]. Thus, any civilization that aspires to greatness must devote appropriate attention to the education of chemistry for its citizens, given the subject's vital function and multipurpose skill acquisition. These can be translated into entrepreneurship education in order to achieve the Federal Government of Nigeria's targets as spelled out in the Sustainable Development Goals (SDG). However, the report by[11] indicates that comprehension of the theoretical perspectives of industrial chemistry can be complete if there is provision knowledge for turning chemical contents into products, which would help students understand the chemistry concepts and principles behind scientific operation.

The products, insecticides, as reported by[12], are used to destroy insects and can be classified according to their chemical structure as well as their mode of action as (i) stomach poisons, which are lethal only to insects that ingest them and were tested on target organisms through oral exposure; (ii) contact insecticides, which kill insects following external bodily contact and do not have to be ingested to impart expected toxic effects; and (iii) fumigants, which act on the insect through its respiratory system by emitting poisonous vapors that can be inhaled and enter the target organism through the respiratory system[13]. An insecticide can act in one or a combination of two or three of these modes. These classifications are taken as the tested modes of toxicity (based on trials) at the point of registration of the product and are normally given on the labels on the containers.

Insecticides are a class of synthetic chemicals used to control or kill insects that are unwanted in the environment[14]. The chemical can be prepared in different forms, depending on the specific insect that you intend to eradicate or kill. When it touches any part of the insect, it disorganizes the breathing process, leading to the death of the insect. On the other hand, the smell of the chemical can also lead to the death of the insect. Insecticide production requires lots of measures and constituents. In the reports of[15], some of the materials and procedures necessary to be taken in the production of the insecticides are displayed as follows: eucalyptus/boric acid, industrial camphor, turpentine/pine oil, DDC/DVC/DDVP or DD force, kerosene (kerosolvant), formalin, ethanol, containers, protectors, gloves, and Novan. For precautions to be taken while carrying out the production (experimentation) there, always use your protectors, avoid the healing of the flame or smell, and for the insecticide production process, their procedures need to be adhered to get effective insecticide production that can serve the purpose. The procedures (process) or steps are:

1. Get an open bowl
2. Use all your protectors
3. Measure two litters of Kerosolvent and pour it into the empty bowl
4. Measure 150ml of DDVP Force and add it to the previous solutions and stir well
5. Add 150ml of Industrial camphor
6. Add 60ml of formalin and mixed thoroughly
7. Allow it to settle for about 20minites
8. Then put in a container for use/sale

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 **DOI: https://doi.org/10.59479/jiaheri.v1i001.48**

9. Put labels.

Frequent replication of the above procedures when put into practice, can boost their entrepreneurial skills using the content knowledge of industrial chemistry learned in school. Such insecticides, when produced in large quantities, it will enhance self-profit and add to the sustainability of the economy in the country due to high rate of demand that is associated in the use of insecticides for environmental control and agricultural purposes.

In the study conducted by[16] on the students' application of industrial chemistry knowledge and use of arguments in teaching sustainability-oriented chemistry for insecticide production, the result shows that those students who are exposed to the practical demonstration on the production of insecticides and pesticides gain higher knowledge of practical demonstration and perform better in their studies. Also, another study conducted on the effectiveness of training students on the production of insecticides has provided students that are lacking in knowledge and practical orientation aspects in the production of many chemicals using industrial chemistry content knowledge in schools, and those students that were fully trained and tested after the treatments on the production process had higher grades as compared to their previous performance before the treatment commenced[17]. It is good enough to train the students on a particulate aspect before testing them, especially when it comes to practical transformation of chemistry concepts. The performance of male students over female students in some concepts in science has caused lots of misconceptions among scholars. Some researchers found that male students usually perform better than female students, but other researchers found that female students are also performing, but usually in management and social science courses. In the study conducted by[18], the production of some home maintenance insecticides and other cosmetics indicated that male students have greater results in terms of their performance than their female counterparts while carrying out the same tasks.

The chemistry teachers' knowledge of instruction, knowledge of the process and practice of teaching and teaching methods or approaches, as well as classroom management, enhances students' skills and development that can allow them to produce substances for use[19]. The advantages that industrial chemistry places on the empowerment of youths within and outside Nigeria cannot be quantified. It is worthy to note that the reported cases of malaria fever are increasing, especially in countries like Nigeria, due to some factors. Such cases of malaria fever are usually connected to the spread of mosquitoes. Now, industrial chemistry content knowledge can be applied in the production of insecticides that can be used to control the spread of mosquitoes and other insects that are disturbing the health of people. By doing the aforementioned the advantages attached to skills that could be gain by the secondary school students for the production of insecticide can serve as employment tools and empower other youth in general.

Objective of the study

The following objectives are to be determined:

1. To determine the awareness in the transformation of industrial chemistry content knowledge for entrepreneurial skills among senior secondary school students in Zamfara State.

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 **DOI: https://doi.org/10.59479/jiaheri.v1i001.48**

2. To assess the performance of students expose to practical production of insecticide for entrepreneurial skills development.
3. To evaluate the gender performance of students in the practical production of insecticides for entrepreneurial skills.
4. To teach the student for acquire basic scientific skill needed in insecticide production among senior secondary schools students.

Research questions

The following research questions were raised to guide the study;

1. What is the level of student's benefits in transforming industrial chemistry content knowledge in the production of insecticides for entrepreneurial skills?
2. What is the level of student's performance on developing entrepreneurial skill in the experimental group?
3. What is the level of student's performance based on gender on developing entrepreneurial skills?
4. What is the level of student's academic achievement scores in the pre-test and post-test?

Research Hypotheses

In line with the research objective, the following hypotheses were formulated

H_{O1}: There is no significant difference in the performance of the control and experimental groups in transforming industrial chemistry contents into insecticide production for entrepreneurial skills.

H_{O2}: There is no significant difference between male and female senior secondary school performance in the experimental group in production of insecticide production for entrepreneurial skills..

H_{O3}: There is no significant difference between senior secondary school student's scores in the pre-test and post-test of experimental group in production of insecticide production for entrepreneurial skills.

Research Design

The study adopted a quasi-experimental design for the pre-test and post-test. The population of the study consists of all senior secondary SSII students; a random sample of 80 students in an intact class was selected in Gusau local government area. The instrument used for data collection was a structured questionnaire on a 4-likert scale, and a chemistry achievement test (CAT) was developed by the researchers. The instruments were validated by three experts. The two instruments were pilot tested of 20 non participant using test and retest with reliability index of 0.72 and 0.82 using Cronbach alpha and PPMC, respectively, were subjected to the Spearman-Brown prophecy formula. The collected data were analyzed using descriptive statistics of mean and standard deviation. The formulated null hypotheses were tested using t-test statistics.

Result

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 DOI: https://doi.org/10.59479/jiaheri.v1i001.48

1. **Research Question One:** What is the level of student's benefits of transforming industrial chemistry content knowledge in the production of insecticides for entrepreneurial skills?

Table 1: Shows the mean decision on the level of student's benefits.

Items	N	$\bar{X}$	S. D	Decision
Are you aware that the production of some non-consumable products is made from the knowledge of chemistry chemical concepts.	20	3.7	.76	Accepted
Are you aware that the production of some insect killer products is made from knowledge of chemistry chemical concept.	20	3.1	1.0	Accepted
Are you aware that the production of some insect killer is made from combination of some elements through knowledge of chemistry chemical concepts.	20	3.6	.55	Accepted
Teaching practical production of insect killer in the classroom will help to increase student learning interest in chemistry chemical concepts.	20	3.0	1.0	Accepted
Use of practical method to teach some chemistry chemical concept in the classroom will help student learning interest in chemical concepts	20	3.6	.7	Accepted
Use of practical method to teach some chemistry chemical concept in the classroom will increase students' entrepreneurial interest	20	3.8	.5	Accepted
Exposing student to use of knowledge of chemistry chemical concepts in non-consumable products production increases student learning interest in chemistry entrepreneurial concept	20	3.6	.8	Accepted
Exposing student to use of knowledge of chemistry chemical concepts in products production increases student learning interest in chemistry entrepreneurial concept.	20	3.7	.5	Accepted
Exposing student to use of knowledge of chemistry chemical concepts in products production will assist to improve student learning understanding in chemistry entrepreneurial concept	20	3.9	.3	Accepted
Practical teaching on how to produce some product will assist in exposing students to familiarize themselves with some	20	3.7	.7	Accepted

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 **DOI: https://doi.org/10.59479/jiaheri.v1i001.48**

element's during classroom teaching this we lead to increases in student learning interest on entrepreneurial concept.

Table 1 shows the students awareness of the benefits of transforming industrial chemistry content knowledge in the production of insecticides for entrepreneurial skills. Item 1 of the table 1 have a mean decision of 3.7. implies that students are aware that the production of some non-consumable products such as insecticide are made from the industrial chemistry knowledge of chemistry and item 2, 3, 4, and 5 have mean decisions of 3.1, 3.6, 3.0, and 3.6 respectively this also shows that students are aware that the production of insect killer can be practically done, and by exposing students to it increases students learning interest in chemistry entrepreneurial in line with items 6, 7, 8, 9, and 10 from Table 1, the mean scores of 3.6, 3.8, 3.6, 3.7, and 3.9, respectively.

Hypothesis 1: There is no significant difference in the performance of the control and experimental groups in transforming industrial chemistry contents into insecticide production for entrepreneurial skills.

Table 2: Shows the T-test analysis of performance of students in both the experimental and control groups

Groups	N	Mean	SD	t	f	Sig.	P
Experimental	40	78.45	12.655	12.204	6.680	0.012	0.011
Control	40	35.08	18.578	12.204			

Table 2 shows the T-test analysis of the significant difference in the performance of the control and experimental groups in transforming industrial chemistry contents into insecticide production for entrepreneurial skills its observed that the p-vale (0.011) is less than the alpha value (0.05), then the null hypothesis is therefore, stand to be rejected. Thus. Implies there is significance difference between the performances of students exposed to transforming industrial chemistry contents into insecticide production for entrepreneurial skills.

Hypothesis 2: There is no significant difference between male and female senior secondary school performance in the experimental group in production of insecticide production for entrepreneurial skills..

Table 3: T-test analysis of the performance of students in experimental group based on gender

Gender	N	Mean	SD	t	f	Sig.	P
Male	20	88.70	7.226	8.840	0.148	0.003	0.001
Female	20	68.20	7.438	8.840			

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 **DOI: https://doi.org/10.59479/jiaheri.v1i001.48**

Table 3 shows the t-test analysis of the performance of male and female students in transforming the industrial chemistry contents into the production of insecticides for developing entrepreneurial skills among youths. Based on the results, it is clearly illustrated that the p-value (0.001) is less than the alpha value (0.05). Thus, it implies that the null hypothesis stands to be rejected. It is worth noting also that the mean performance of males is 88.70 and that of females is 68.20, and their standard deviations are 7.23 and 2.438, respectively.

Hypothesis 3: There is no significant difference between senior secondary school student's scores in the pre-test and post-test of experimental group in production of insecticide production for entrepreneurial skills.

Table 4: shows the T-Test Analysis of Pre-Test and Post-Test of Students Performance of experimental and control groups at 0.05 level of significance

TEST	N	Mean	Std. Dev.	t	F	Sig.	P
Pre-Test	40	25.64	8.617	- 9.479	82.985	0.000	0.023
Post-Test	40	55.90	27.225	- 9.479			

Reference to table 4, T-test analysis of the significant difference in pre-test and post-test performance of experimental and control groups in transforming industrial chemistry contents into insecticide production for entrepreneurial skills. It is clearly indicated that the p value (0.023) is less than the alpha value (0.05). Such implies that the null hypothesis is therefore, rejected. Clearly justifiable from the mean and standard deviation of the post-test and pre-test, which is 55.90, 27.225 and 25.64, 8.617, respectively show that the posttest performance is greater than pretest.

Discussion of the Results

The decision on the mean opinion rate of students on the benefits of transforming industrial chemistry content knowledge in the production of insecticides for entrepreneurial skills that aid in engaging them to do something during and after their secondary school education and that can also be transferred to the higher levels as preludes to getting a job in the future Table 1 results reveled that all the means are above the decision level of 2.50, this clearly indicates that students benefited from transforming industrial chemistry knowledge in the production of insecticides for entrepreneurial skill development.

Hypothesis 1, Table 2 shows that the p-value of 0.011 is less than the alpha value of 0.05, indicating that the null hypothesis is rejected. Therefore, there is a significant difference between the performance of students in the experimental with the mean and standard deviation (78.45, 12.655) and control groups with the mean and standard deviation (35.08, 18.578), respectively, this clearly show that the students' performance in the experimental group supersedes the performance of those in the control group. This finding is related to the findings[20] on the students' application of chemical concepts in industrial chemistry and the use of arguments in teaching

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 **DOI: https://doi.org/10.59479/jiaheri.v1i001.48**

sustainability-oriented chemistry for insecticide production. It shows that those students who are exposed to the practical demonstration on the production of insecticides and pesticides have higher knowledge of the practical demonstration and perform better in their studies.

The hypothesis two on the performance of male and female revealed that the null hypothesis was rejected. It implies that there is a significant difference in the performance of male and female students in the production of insecticides through their acquired knowledge of industrial chemistry. The mean and standard deviation of male (88.70, 7.228,) and the mean and standard deviation of female (68.20, 7.438), respectively, in Table 3 clearly indicated that male students' performance in insecticide production outperformed than that of the female students in the experimental group. This finding is in agreement with the findings of[21] on the production of some home maintenance insecticides and other cosmetics, which indicate that male students have greater results in terms of their performance than their female counterparts while carrying out the same tasks.

The t-test analysis of the significance difference in the performance of students in the pre-test and post-test in Table 4 revealed that the p-value (0.023) is far less than the alpha value (0.05) level of significance, the null hypothesis is rejected. It shows that there is a significant difference in the performance of students in the pre-test and post-test administered. The mean and standard deviation of the pre-test (25.64, 8.617) and post-test mean and standard deviation (55.90, 27.335) respectively. The findings revealed that theirs positive increase in the students achievement from the posttest than in pretest.

Conclusion

This research work has investigated the potential of transforming industrial chemistry content into insecticide production for entrepreneurial skill among senior secondary school students. The students were eager to learn more about the process since the necessary skill need is acquired and found it suitable and a viable business to get in with in line with the potential to improve the livelihoods of students and their communities. The strongest approaches that can contribute to students having a solid background in the process of insecticide production include: a strong foundation in industrial chemistry concepts and skills; access to the necessary resources and equipment; and support from government, non-governmental organizations, teachers, mentors, interest and awareness the. There is a need for chemistry teachers to see how they can transform industrial chemistry content in the knowledge gain this will assist the student to have basic scientific rules and regulation that can guide in application of practical process.

Recommendations

This study recommends that;

1. Government and non-governmental organisations, including school administrators should provide equipment needed and establish partnerships between senior secondary schools and local insecticide production businesses in Zamfara State.

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 **DOI: https://doi.org/10.59479/jiaheri.v1i001.48**

2. Curriculum should be reviewed to integrates industrial chemistry contents as part of entrepreneursihp skill acquisition.
3. The teacher of chemistry must see the teaching of industrial chemistry contents beyond the classroom teaching
4. Organizing seminars and workshop for the chemistry teachers..
5. Prize award competition should be organized for students on practical transformation of industrial chemistry content. This competition could be sponsored by the government, local businesses, or non-profit organizations. The competition would help to stimulate students' interest in industrial chemistry and insecticide production, and it would also provide a platform for them to
6. Organizing a trade fair where each school can showcase their creativity and innovations on products production.

Reference

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*(2), 275–285. https://doi.org/10.1016/j.susoc.2022.05.004

Federal Government of Nigeria (2013). *National Policy on Education* 4rd Edition. NERDC press Lagos.

Akanbi G. A, Umar, S. & Adesoji, O. O. (2022) Repositioning Science Teacher Education Through Practical Oriented Application in the Teaching and Learning Process for Glob IJSGS *International journal of science for global sustainability* 8 (4), 91-98

Pawlak, K., & Małgorzata K (2020). The Role of Agriculture in Ensuring Food Security in Developing Countries: Considerations in the Context of the Problem of Sustainable Food Production. *Sustainability* 12(13), 5488-5497. https://doi.org/10.3390/su12135488.

Amutha, S. & Sudha, A (2016). Metacognitive Awareness of tertiary level chemistry. *Caribbean Journal of Science and Technology* 4(3), 914-919. From http//caribjscitech.com.

Yahaya, A. (2016). Anti Corruption Crusade and Persistence of Corruption in Nigeria a Reflection on Roadblock To Anti Corruption War. *International Journal of Research in Arts & Social Sciences*, *8*(2), 158–164.

Odiabge, S. I & Otemuyiwa. B. T. (2021). Instructional strategies for teaching entrepreneurship subject in secondary school in the federal capital territory Abuja Nigeria *AAUA journal of science and technology Education* 3(2) 122-133.

Ogundeji, O. M., Madu, B. C., and Onuya, C. C., (2019). Scientific explanation of phenomena and concept formation as correlates of students' understanding of physics concepts. *European Journal of Physics Education.* 10 (3), 10 − 19.

Alejos, H. (2017). Basic Process Skills and Attitude Toward Science: Inputs to an Enhanced Students' Cognitive Performance "Laguna State Polytechnic University". In *Universitas*

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 **DOI: https://doi.org/10.59479/jiaheri.v1i001.48**

Nusantara PGRI Kediri, 5(2),67-76. http://www.albayan.ae

Rashid, L. (2019). Entrepreneurship education and sustainable development goals: A literature review and a closer look at fragile states and technology-enabled approaches. *Sustainability (Switzerland), 11*(19), 1–23. https://doi.org/10.3390/su11195343

Tbilisi, G. (2012). Student Active Searing in Science Collection of Papers. *A final conference paper presented on 29th-30th August, 2012* held at Ilia State University Tbilisi, ISBN 978-9941-18-117-7, Georgia.

Sande, D., Mullen, T., Wetzstein, M., & Houston, J. (2011). Environmental Impacts from pesticide use: A case study of soil fumigants in Florida tomato production. International Journal of Environmental Research and Public Health, 8(3), 4649-4661

Sande, D., Mullen, T., Wetzstein, M., & Houston, J. (2011). Environmental Impacts from pesticide use: A case study of soil fumigants in Florida tomato production. International Journal of Environmental Research and Public Health, 8(3), 4649-4661

Ifunanya, A. M., Ngozi, O. C., & Roseline, I. I. (2021). Teacher Education as a Viable Tool for National Development. Journal of Educational and Social Research, 3(8), 69–74. https://doi.org/10.5901/jesr.2013.v3n8p69

Souto, Augusto, L., Muriel, S., Elisabeth, D. T., Josean, F. T., Barbosa-Filho, J.B., & Cebrián Torrejón, G. (2021). Plant-Derived Pesticides as an Alternative to Pest Management and Sustainable Agricultural Production: Prospects, Applications and Challenges, *Molecules*, 26(16) 4835-4845.

Zidny, R., Laraswati, A. N., & Eilks, I. (2021). A Case Study on Students' Application of Chemical Concepts and Use of Arguments in Teaching on the Sustainability-Oriented Chemistry Issue of Pesticides Use under Inclusion of Different Scientific Worldviews. *Eurasia Journal of Mathematics, Science and Technology Education*, *17*(7), 1–17. https://doi.org/10.29333/EJMSTE/10979

Odiabge, S. I & Otemuyiwa. B. T. (2021). Instructional strategies for teaching entrepreneurship subject in secondary school in the federal capital territory Abuja Nigeria *AAUA journal of science and technology Education* 3(2) 122-133.

Wrigley-Asante, C., Ackah, C. G., & Frimpong, L. K. (2023). Gender differences in academic performance of students studying Science Technology Engineering and Mathematics (STEM) subjects at the University of Ghana. *SN social sciences*, *3*(1), 12. https://doi.org/10.1007/s43545-023-00608-8

Asiyai, A. A. (2018). *Chemistry Teachers' Pedagogical Content Knowledge and Teaching Effectiveness among Secondary Schools in Bayelsa and Delta States*. An Unpublished PhD Thesis Submitted to the Department of Science Education, Delta State University, Abraka.

Zidny, R., Laraswati, A. N., & Eilks, I. (2021). A Case Study on Students' Application of Chemical Concepts and Use of Arguments in Teaching on the Sustainability-Oriented Chemistry Issue of Pesticides Use under Inclusion of Different Scientific Worldviews. *Eurasia Journal of Mathematics, Science and Technology Education*, *17*(7), 1–17. https://doi.org/10.29333/EJMSTE/10979

MAAUN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH AND INNOVATIONS (MIMJRI)
A Publication of the Institute of Africa Higher Education Research and Innovations (IAHERI)
in Collaboration with
Maryam Abacha American University of Niger (MAAUN) Maradi, Niger Republic

Maiden Edition/Volume 1, October, 2023

ISSN: 3027 – 0294 **DOI: https://doi.org/10.59479/jiaheri.v1i001.48**

Wrigley-Asante, C., Ackah, C. G., & Frimpong, L. K. (2023). Gender differences in academic performance of students studying Science Technology Engineering and Mathematics (STEM) subjects at the University of Ghana. *SN social sciences*, *3*(1), 12. https://doi.org/10.1007/s43545-023-00608-8