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Chemistry Education: A Panacea for Industrialisation in Nigeria-The View of University Students and Lecturers

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Abstract
The study investigated the chemistry education a panacea for industrialization in Nigeria: The view of university students and lecturers. The study was carried out in Bayelsa State and it was guided by two research questions and one hypothesis. The descriptive survey research design was adopted for the study. The population of the study comprised of 80 students and 20 Lecturers making a total of 100 respondents. The instrument for data collection was a self-structured questionnaire and the data collected were analyzed using mean and standard deviation while the hypothesis was tested using an independent t-test. Findings revealed that chemistry education is crucial to industrial development, laboratory and practical skills are essential for industrialization. The results also showed that, more government funding is needed for chemistry education and research, poor infrastructure and outdated equipment hinder chemistry education and encouraging entrepreneurship in chemistry-related fields will boost industrialization. Based on the finding it was concluded that chemistry education is seen as a panacea for industrialization in Nigeria as both students and lecturers strongly support chemistry education as a driver for industrialization.

Keywords: Chemistry Education, Industrialization, Nigeria, University Students, STEM Education

Introduction

Education has been ultimately recognized as the developmental contrivance of human venture and life enterprise. It is an essential tool for global change and a must for every person and for the survival of Nigeria economy. It is an essential innovative phenomenon for human growth and development (Charles, 2014). It has been generally assumed as a force to reckon with. Education is a vital instrument for societal advancement, and chemistry education significantly contributes to industrialization, health, and technological innovation (Adesoji, 2018). Science and technology make immense contributions to the material well-being of any country if certain requisites are met. Currently, science and technology which hinges strongly on chemistry is the key driver of development in modern society (Mohammad, 2022).

The study of chemistry is as old as man and the impact of the science of chemistry has equally being felt in the development of mankind from time immemorial across the stone age, through iron age to the jet age of the present century (Audu et al, 2022). Chemistry has been the pivot of science and hence the most needed tool, scientifically, for human capital and national development. The wheel of progress have in no small way be slow down, thereby hindering the overall development of science and chemistry education in the nation. Chemistry education is the process by which the knowledge, attitudes and skills relating to chemistry are transmitted to learners. The component knowledge includes the knowledge of the composition, structure, properties, applications and changes of matter and their applications to solving personal and societal problems. Chemistry education inculcates the knowledge, process skills and positive scientific attitudes to the learner (Chinda et al., 2023). They went further to say that, Chemistry education should be properly aligned to effectively address relevant issues of sustainable development. In Nigeria, the need for an improved chemistry education system is pressing, given its potential to drive scientific development and economic transformation. This study explores how chemistry education serves as a panacea for civilization from the perspectives of university students and lecturers.

This study is anchored on the Constructivist Learning Theory (Piaget, 1970), which emphasizes that learners construct knowledge through experience and active engagement. Chemistry education should be practical, problem-solving oriented, and linked to real-life applications to drive civilization and development. Chinda et al (2023). The study investigated the integration of peace education into chemistry education curriculum as a panacea for peace and sustainable development in Nigeria. The study was guided by three research question and two hypotheses. The study adopted the descriptive analytic survey design and was carried out in Rivers State, Nigeria. A total of 40 Chemistry education Lecturers drawn from Ignatius Ajuru University of Education and Rivers State University constituted the sample for the study. Eleven (11)-items questionnaire titled 'Chemistry Education Lecturers Perception of Peace Education Questionnaire' (CELPPEQ) was deployed to elicit the relevant data for the study. Mean and standard deviation and independent t-test were the statistical tools used to analyzed data. Result revealed that the need to integrate peace education into chemistry education curriculum as a panacea for peace and sustainable development in Nigeria

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There was no gender based significant difference in lecturers' perception of the need to integrate peace education into chemistry education curriculum. Also, there was no significant difference between senior and junior lecturers' perception. It was recommended among others, that Peace education should be integrated into chemistry education curriculum at all level of education for the promotion of peace in Nigeria. Ibrahim et al. (2017), reviewed Solving the Problems of Chemistry Education in Nigeria: A Panacea for National Development. In their narrative they said chemistry has been one of the cornerstones of science, technology and industry, that, it is apparent that chemistry plays a greater role in national development through industry in the world which will in-turn help to provide some social amenities and has been the pivot of science and hence the most needed tool, scientifically, for human, capital and national development. Their work focused on the derivable benefits of chemistry education with a view to repositioning it as a panacea for national development. Among other things, their finding revealed that poor power supply / infrastructure, poor academic foundation, poor funding and mismanagement, inadequate manpower, associated hazards, defective curriculum, lack of awareness / counseling are the noticeable factors working against the effective and qualitative chemistry education in the country. All stake holders in this sector including the government at all levels are to ensure and allow chemistry and its education to take and play its pivotal role towards national development. Therefore, it is recommended that the aforementioned problems be tackled in order for chemistry education to play its pivotal role towards national development.

Folasade et al. (2024) reviewed the Potential Impact of Entrepreneurial Skills on Chemistry Education Students' Achievement in the Sciences in the Federal University, Oye Ekiti. The study adopted the quasi-experimental research design with a population of 80 300l and 400l Chemistry Education Students (30 males and 50 females). The instrument use to collect data for the study was an Entrepreneurship Chemistry Achievement Test (ECAT) and the items of the instrument were structured based on the concepts within chemical production, a sub-topic under polymer chemistry. Mean and standard deviation were used to analyzed data obtained while t-test was used to test the hypothesis. Result showed that, students who participated in hands-on exercises related to chemical production exhibited superior performance compared to those who did not engage in practical activities. It was recommended based on the findings that, chemistry education graduate should be equipped with technical skills, wider and deeper knowledge of chemical analysis tools in addition to professional skills should be an integral part of the school curriculum not just for improved academic performance but also wealth creation, poverty reduction and youths' self–employ.

Audu et al. (2022) investigated the role of chemistry education in combating insecurity and economic challenges in Nigeria. The paper reviewed the current precarious situation of insecurity and economic challenges facing Nigeria visa-vis the role of chemistry education in salvaging and redeeming the lost glory of the once Giant of Africa. The explained the vital Chemistry and chemistry education have been and still playing and the fundamental roles in promoting economic growth of nations through trained skilled manpower and providing chemical raw materials for industries to strive towards total national industrialization. In terms of food security, the study revealed that chemistry education is a veritable tool for increased food production through chemical use in agriculture in the forms of fertilizers, herbicides, plant growth hormones, fungicides and pesticides. Furthermore, chemistry education all over the world is used in combating insecurity as it helps in crime detection as in forensic investigations, chemical warfare in which chemical weapons are engaged in incapacitating and decimating criminals. Some of the challenges faced by Chemistry Education as stated in the paper are; poor government financing, poor working environment and lack of capacity for quality research. Based on the finding it was recommended that increased government presence and funding coupled with the establishment of standard research laboratories in all institutions of learning, adequate and regular local and international capacity building for chemistry teachers among others as way forward.

Research Objectives

The main objective of this study is to examine the Chemistry Education as a Panacea for Civilisation in Nigeria (The View of University Students and Lecturers). The following are the specific objectives;

1. To examine the mean rating of students' views of chemistry education and industrialisation
2. To examine the mean rating of lecturers' views of chemistry education and industrialisation

Research Questions

1. What is the mean rating of students' views of learning chemistry education and industrialization?
2. What is the meaning rating of lecturers' views on learning chemistry and industrialization?

Hypothesis

There is no significant difference in the meaning rating of students and lecturers as to learning chemistry education and industrialization.

Methodology

This paper adopted the descriptive survey research design. The population of the study comprised 80 students and 20 Lecturers, making a total of 100 respondents. The instrument for data collection was a self-structured questionnaire and the data collected were analyzed using mean and standard deviation while the hypothesis was tested using an independent t-test

Results

Table 1: What is the mean rating of students view of learning chemistry education and industrialization

S/N	ITEMS	Mean	SD	REMARK
1	Chemistry education is crucial for industrial development	2.75	1.07	Agreed
2	Chemistry education adequately prepares students for industrial roles.	2.45	1.17	Disagreed
3	Laboratory and practical skills are essential for industrialization.	2.60	1.14	Agreed
4	The current chemistry curriculum is aligned with industrial needs.	2.44	1.10	Disagreed
5	Lack of industry-academic collaboration is a major challenge.	2.51	1.13	Agreed
6	Poor infrastructure and outdated equipment hinder chemistry education.	2.78	1.14	Agreed
7	There are enough job opportunities for chemistry graduates.	2.29	1.09	Disagreed
8	Universities should collaborate more with industries.	2.68	1.10	Agreed
9	More government funding is needed for chemistry education and research	2.71	1.10	Agreed
10	Encouraging entrepreneurship in chemistry-related fields will boost industrialization.	2.59	1.14	Agreed
	Total	**2.58**	**1.12**	

Standard Mean= 2.50

Table 1 showed that the mean response on students view of learning chemistry education and industrialization on item 1,3,5,6,8,9 and 10 with mean scores of 2.75, 2.60, 2.51, 2.78, 2.68, 2.71 and 2.59 which is greater that the standard (critical) mean of 2.50 indicated that students agreed that chemistry education brings about industrialization while item 2, 4 and 7 with mean scores of 2.45, 2.44 and 2.29 which is less than the standard (critical) mean indicated that student disagreed that, Chemistry education adequately prepares students for industrial roles, the current chemistry curriculum is aligned with industrial needs and also there are enough job opportunities for chemistry graduates.

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Table 2: What is the meaning rating of lecturers view in learning chemistry and industrialization

S/N	ITEMS	Mean	SD	REMARK
1	Chemistry education is crucial for industrial development	2.95	1.28	Agreed
2	Chemistry education adequately prepares students for industrial roles.	2.85	1.14	Agreed
3	Laboratory and practical skills are essential for industrialization.	2.90	1.07	Agreed
4	The current chemistry curriculum is aligned with industrial needs.	2.85	1.14	Agreed
5	Lack of industry-academic collaboration is a major challenge.	2.50	0.89	Agreed
6	Poor infrastructure and outdated equipment hinder chemistry education.	2.65	1.09	Agreed
7	There are enough job opportunities for chemistry graduates.	2.55	1.19	Agreed
8	Universities should collaborate more with industries.	2.50	0.89	Agreed
9	More government funding is needed for chemistry education and research	2.95	1.28	Agreed
10	Encouraging entrepreneurship in chemistry-related fields will boost industrialization.	2.85	1.14	Agreed
	Total	**2.76**	**1.11**	

Standard Mean= 2.50

Table 2: The mean response on lecturers view of learning chemistry education and industrialization on items in Table 2 showed that lecturers agreed that chemistry education is vital to industrialization as the mean of all those items in the table is greater than the standard (critical) mean of 2.50.

Hypothesis: There is no significant difference in the meaning rating of students and lecturers as to learning chemistry education and industrialization.

Table 3: Summary of independent sample t-test on the meaning rating of students and lecturers as to learning chemistry education and industrialization.

Description	N	M	SD	Df	t-value	p-value	p<0.05
Lecturers	20	2.76	1.11				Accepted
Students	80	2.58	1.12	98	0.65	0.28	

Table 4 showed that the value of t(98) = 0.68 is not significant at 0.05 level of significance (i.e. greater than 0.05), therefore, the null hypothesis is accepted. This implies that there is a significant difference in the meaning rating of students and lecturers as to learning chemistry education and industrialization.

Discussion

Findings of this study revealed that chemistry education is a panacea for industrialization in Nigeria mote peace in Nigeria. Specifically, Chemistry education is crucial for industrial development, laboratory and practical skills are essential to industrialization, there is need for collaboration between universities and industries and encouraging entrepreneurship in chemistry-related fields amongst other will boost industrialization. This study agree with Folasade et al (2024) reviewed on the Potential Impact of Entrepreneurial Skills on Chemistry Education Students' Achievement in the Sciences in Federal University, Oye Ekiti and their findings showed students who participated in hands-on exercises related to chemical production exhibited superior performance compared to those who did not engage in practical activities. It also further agreed with Audu et al (2022) on the role of chemistry education in combating insecurity and economic challenges in Nigeria whose findings revealed that chemistry education is a veritable tool for increased food production through chemical use in agriculture in the forms of fertilizers, herbicides, plant growth hormones, fungicides and pesticides. Also, chemistry education all over the world is used in combating insecurity as it helps in crime detection as in forensic investigations, chemical warfare in which chemical weapons are engaged in incapacitating and decimating criminals.

Furthermore, the study agreed with Ibrahim et al (2017) on Solving the Problems of Chemistry Education in Nigeria: A Panacea for National Development that poor power supply / infrastructure, poor academic foundation, poor funding and mismanagement, inadequate manpower, associated hazards, defective curriculum, lack of awareness / counseling are the noticeable factors working against the effective and qualitative chemistry education in the country. In addition the study revealed that, there is a significant difference in the meaning rating of students and lecturers as to learning chemistry education and industrialization. This implies that

the perception of lecturers on chemistry education a panacea for industrialization are different from that of students.

Conclusion

Chemistry education is seen as a panacea for industrialization in Nigeria as both students and lecturers strongly support chemistry education as a driver for industrialization. Although, it is faced with challenges like irrelevance of the chemistry curriculum to industrial needs, lack of industry-academic collaboration and practical training opportunities. Poor infrastructure and lack of funding are seen as significant barriers. Also, job opportunities are another major challenge which entrepreneurship could be a viable solution.

Recommendations

Based on the above, the following recommendations were made

1. The chemistry curriculum should be revised (curriculum reform) and more industrial training, case studies and hands-on experience should be included. That is, chemistry should be more practical to meet the need of the society and industry.
2. There should be a strong industry-academic collaboration through the establishment of internships, research partnership and mentorship programs between our universities and industries.
3. Government and industries should invest on laboratory facilities to meet up with modern standards and industrial research centres
4. Entrepreneurial chemistry should be encourages for chemistry graduates to drive self-employment ad industrial growth.

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