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Perceptions of College of Education Students on Factors Causing Low Enrolment in Chemistry Education

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Abstract

The role of Chemistry in the promotion of national development cannot be over emphasized, consequently there is a need to put in place all that will sustain the acquisition of knowledge such as the number of students studying it. Therefore, the current study investigated the perceptions of college of education students on factors causing low enrolment in the learning of Chemistry. The study involved 120 students enrolled at the Kwara State College of Education (Technical) Lafiagi studying Chemistry Education. A researcher-designed scale named the Perception of College Students on Factors Causing Low Enrolment Questionnaire (PCSFCLEQ) was used to elicit information from the respondents. The reliability of the instrument was determined using Cronbach alpha and a reliability coefficient of .71 was obtained. The data gathered from the study was analyzed using frequency counts and percentage, while two null hypotheses formulated were tested using t-test. Findings from the study revealed that the students perceived 10 items as factors causing low enrolment of college students in the learning of Chemistry which were then categorized into three factors. It was also revealed that gender influenced the perceptions of the students, which was in favor of female students, whilst the students' grade level did not influence their perceptions. It was therefore recommended to use a model such as multiple representation of Chemistry concepts as well as visualization tools by teacher trainers so as to promote the abstract nature of Chemistry as it constituted a negative influence for students learning Chemistry. Also, both male and female students should be afforded equal opportunity when it comes to the learning of Chemistry.

Keywords: perceptions, college of education, low enrolment, learning of chemistry.



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Introduction

Science education encompasses the teaching and learning of science subjects in order to make progress in the development of a nation. It is described as the study of in-depth knowledge of both science and educational concepts (Okoli, Obiajulu, & Ella, 2013). In a formal setting, the teaching and learning of science begins at the basic level where trained science teachers impart their scientific knowledge to their students. Qualified science teachers are expected to have received their training from higher places of learning such as Colleges of Education or Universities. The teaching and learning of science has to be a lifelong learning for a nation wishing to develop both scientifically and technologically. The two are inseparable when it comes to national development in a country such as Nigeria which is still struggling to develop (Nwachukwu, 2012). Okoli et al. (2013) also submitted that science education is the prerequisite knowledge required for making progress in the field of technology. It can be inferred that science is one of the major concepts expected to be learned in science education in addition to the general knowledge of education.

Science is the study of natural phenomena in our environment for the survival of living beings. It is a study that deals majorly with both living and non-living things. It is being described as a process employed in determining the facts, theories, principles and laws governing natural phenomena (Okoli et al., 2013). It is the act of understanding how the natural world operates. The process of finding solutions to series of problems in ensuring national development have been attributed to scientific knowledge (Nwachukwu, 2012). The knowledge of science has been found useful in all the spheres of life ranging from food to transportation, as well as entertainment. Scientific knowledge also serves as feeder to the field of technology. As a result, the two are seen as a yardstick in measuring national development. Scientific knowledge generally exists in three major forms, which are (i) life science such as botany, biology etc., (ii) earth science such as geography, and (iii) physical science as in Physics, chemistry etc. (Omorogbe & Ewansiha, 2013).

Chemistry can be described as physical science which deals with the study of composition of matter. It is a science subject which has to do with both the quantity and quality of matter. This is because it reveals what is available in a particular matter and in what proportion. Hence, it is a scientific knowledge applicable in the provision of human need so as to make life comfortable; such as in the provision and preservation of food, drugs, clothing etc. In a like manner, it is referred to as the basis of scientific and technological development (Azmat, 2013). In order to benefit from the application of chemistry knowledge as a branch of science, its effective teaching and learning has to be emphasized.

Despite the fact that many benefits have been attributed to the knowledge of chemistry for human sustainability, the number of students studying the subject at Colleges of Education is not all that encouraging. For a country like Nigeria which is still aspiring to develop, this situation is not considered to be acceptable. Enrolment popularity for Colleges of Education is of utmost importance for the development of a nation; as the duality of roles played by students who graduate from the institutions are expected to take on the teaching of Chemistry at the basic level of learning, as well as feed into university faculties of education to continue the process of higher education teaching and learning. The low

enrolment levels for students of Chemistry at Colleges of Education is self-evident at the College of Education (Technical) Lafiagi, as shown in Table 1.

The number of students who enrolled for Chemistry Education at the College of Education (Technical) Lafiagi can be observed to have been decreasing in number starting from 2014. Although a general reduction in the number of students were seen overall, that of Chemistry, Mathematics, and Physics were the most obvious, which is not good for a country who is trying to develop scientifically and technologically. The enrolment of students in science-oriented courses at Colleges of Education needs a change of magnitude in order to be able to handle the teaching of basic level science in the country, as well as to feed into the faculties of education at universities. This change is very necessary in order for there to be an adequate number of qualified scientists and teachers of science.

Table 1. School of Sciences-Student Enrolment 2012-2016

Year	Biology	Chemistry	Computing	Integrated Sciences	Mathematics	Physics
2012	548	103	192	457	174	60
2013	540	272	169	160	135	14
2014	547	196	248	372	89	124
2015	335	86	138	223	26	58
2016	217	55	112	155	27	19

It is necessary to consider student variables such as gender and grade level when investigating their perceptions with regards to the causes behind the low enrolment since researchers have varying views about the influence of these variables when conducting research in science education. While some reported significant differences in their findings, others reported no significant differences with regard to the influence of gender and grade level. For example, in the investigation of gender influence by Majere, Role, and Makewa (2012), and Odum, Akomaye, and Chinyere (2013), the former found a significant difference while the latter reported no significant difference. The difference in grade level can be regarded as the difference in students' learning experience. It is expected that the acquisition of Chemistry knowledge should progress as students move from lower to higher grade levels, matching their perception of the causes of low enrolment in Chemistry learning. Also, Cheung (2009) reported a significant difference when considering the grade level of Chemistry students.

Statement of the Problem

In the quest for finding a solution to the problem of the underdevelopment of Nigeria, as characterized by the shortage of scientists and technologists, researchers have emphasized the decreasing number of students studying the sciences across all institutions of learning, especially in Chemistry, which is considered as the bedrock of development of a country (Azmat, 2013). As a result of the contribution of science in the development of a nation, researchers continue to investigate the factors contributing to the low enrolment of students in science subjects generally, and that of Chemistry in particular. For example, Aina and Adedo (2013) carried out studies on the perceived causes of students' low enrolment in secondary school science in Nigeria. Findings from the study revealed a lack of qualified science teachers, that science teachers were not teaching well, there was not enough science teaching equipment, and that science text books were difficult to understand etc.

Also, Ugwuoke (2016) investigated the factors affecting the enrolment of students in Chemistry Education in Colleges of Education in Enugu State, Nigeria. Findings from the study revealed that many students do not enroll in Chemistry education due to parental influence, peer group influence, and students' own negative attitude towards Chemistry etc. None of these studies considered variables that relate to the students. The current study investigated the perceptions of College of Education students on factors causing low enrolment for the learning of Chemistry, as a case study of Kwara State College of Education (Technical) Lafiagi, considering the variables of students' gender and grade level.

Purpose of the Study

The primary purpose of the current study is to investigate the perceptions of College of Education (Technical) Lafiagi students on factors causing low enrolment for the learning of Chemistry. Specifically, the study determined the following:

- Perceptions of students on factors causing low enrolment in the learning of Chemistry,
- Influence of gender on the perceptions of students on factors causing low enrolment for the learning of Chemistry,
- Influence of grade level on the perceptions of students on factors causing low enrolment for the learning of Chemistry.

Research Questions

The following research questions were attempted to be answered by the study:

- What are the perceptions of students on factors causing low enrolment in the learning of Chemistry?
- Does gender influence the perceptions of students on factors causing low enrolment for the learning of Chemistry?
- Does grade level influence the perceptions of students on factors causing low enrolment for the learning of Chemistry?

Research Hypotheses

The following research hypotheses were tested in the study:

- There is no significant difference in the perceptions of male and female students on factors causing low enrolment for the learning of Chemistry.
- There is no significant difference in the perceptions of students on factors causing low enrolment in the learning of Chemistry based on their grade level.

Methodology

This study is a descriptive research of the survey type. This is thought to be appropriate according to Cohen, Manion, and Morrison (2011) who submitted that descriptive research report findings as they are, since this is what is expected of this study. The population for the study was comprised of all Chemistry Education students of the Kwara State College of Education (Technical) Lafiagi. One-hundred and twenty (120) students were randomly selected from 200 and 300 level Chemistry Education students in the college. The sampled students consist of 69 males and 51 females. The instrument used for the study was a researcher-designed questionnaire, Perception of College Students on Factors Causing Low

Enrolment Questionnaire tagged (PCSFLEQ). The questionnaire consists of two sections. Section A looks at the demographic data of the students such as gender and level of education, while Section B had 15 items used to determine the respondent's perception. The face and content validity testing of the instrument was conducted by four experts in the field of chemistry education at the College of Education.

The reliability of the instrument was determined using Cronbach alpha, and a reliability coefficient of .76 was arrived at after removing two items from the instrument in order. Thirteen questionnaire items were finally presented to the students. The data gathered from the study were analyzed using frequency counts and percentage, while *t*-test was used to test the null hypotheses formulated. Since the two variables of students' gender and grade level are categorical with two levels each, that is, male or female and 200 or 300 levels respectively. They are otherwise known as the independent variables, and the students' response to the 13 questionnaire items is the dependent variable. The responses are based on five-point, Likert-type scale of Strongly agree, Agree, Neutral, Disagree, and Strongly disagree, and the mean rating is 3.0, with the mean values of each of item compared in order to determine the perceived factors causing low enrolment for the Learning of Chemistry by college students.

Results

The reliability of the instrument was determined using Cronbach alpha, and a reliability coefficient of .76 was arrived at after removing two items from the instrument in order.

Research Question 1. What are the perceptions of students on factors causing low enrolment in the learning of Chemistry?

The data collected were analyzed using frequency count, percentage, mean and standard deviation. Based on the descriptive analysis, there are 10 factors which can be categorized under the following major headings: nature of Chemistry; negative attitude of students to learning of Chemistry; and, teachers' related factors, were perceived by the respondents as the causes of low enrolment in Chemistry Education. The students were unanimous in their perceptions of factors causing low enrolment of students in Chemistry Education (see Table 2). The standard deviations were relatively low, ranging from 0.619 to 1.532. This shows that the variability in response of the students were close. Table 2 shows that 114 (95%) of the respondents perceived that Chemistry was too wide a subject as one of the causes of low enrolment of students in Chemistry Education by College of Education students. While 95 (79.1%) of the students perceived that Chemistry demands many calculations, 59 (49.2%) perceived that difficulty in understanding chemical equations was a factor causing low enrolment of students in Chemistry Education. Also, 83 (69.2%) of the respondents perceived that the impossibility of seeing most things being taught in Chemistry as another factor causing low enrolment of students in Chemistry Education at the College of Education level. All these factors can be categorized under the major factor, nature of Chemistry. These factors are in agreement with the findings of Israel (n.d.), whose finding revealed that students' perception of nature of Chemistry as a difficult science subject was one of the causes of students' low enrolment in the subject. It is also in line with the finding of Aina and Adedo (2013), who reported that subject nature was one of the causes of students' low enrolment in science subjects.

Also from Table 2, it was revealed that fear of being accessed was another factor perceived by 72 (60.0%) of the respondents as a cause of students' low enrolment in Chemistry Education. While 67 (55.8%) perceived lack of excursions and field trips which results to lack of exposure as a factor contributing to a reduction in the number of students' enrolment in Chemistry Education. These two factors can be put together under the major heading of negative attitude and perceptions of students towards Chemistry. These findings are in line with that of Aina and Adedo (2013) and Ugwuoke (2016), whose findings revealed students' negative attitude and perception towards Chemistry Education. Also from Table 2, 73 (60.8%) of the respondents agreed that toughness of Chemistry teachers in giving assignments contributed to students' low enrolment in Chemistry Education; and that 82 (68.3%) of the respondents perceived the way that Chemistry teachers teach the subject as another contributor to students' low enrolment in Chemistry Education. A total of 58 (48.3%) of the respondents perceived lack of innovations, encouragement and resourcefulness as one of the factors responsible for students' low enrolment, and 65 (54.1%) of the students agreed that Chemistry teachers did not make use of teaching aids while teaching. These findings are categorized under the main heading of teacher-related factors. The study's findings are in agreement with those of Israel (n.d.) and Aina and Adedo (2013), who revealed that teacher-related factors are also responsible for low enrolment of Chemistry Education students.

Table 2. Students' Responses to Questionnaire Items

S/N	Items	Frequency	%	Mean	SD.
1	Chemistry is too broad a subject	114	95.0	4.44	0.619
2	Chemistry demands many calculations	95	79.1	3.89	1.011
3	It is difficult to understand chemical equations	59	49.2	3.19	1.386
4	I am scared of Chemistry practicals	45	37.5	2.87	1.455
5	Fear of being accessed	72	60.0	3.74	1.057
6	No excursions or field trips, so no exposure	67	55.8	3.40	1.417
7	I prefer economics or accounting to Chemistry	39	32.5	2.58	1.532
8	Chemistry teachers are too tough in their assignments	73	60.8	3.50	1.426
9	Chemistry is too abstract due to the way it is taught	82	68.3	3.81	1.056
10	Many Chemistry teachers lack innovation, encouragement and resourcefulness	58	48.3	3.28	1.415
11	My Chemistry teacher did not make use of teaching aids while teaching	65	54.1	3.32	1.366
12	We have not seen most of the things being taught in Chemistry	83	69.2	3.75	1.336
13	There are more failures in Chemistry examinations than passes	49	40.8	2.69	1.522

Research Question 2. Does gender influence the perceptions of students on factors causing low enrolment in the learning of Chemistry?

Hypothesis 1. There is no significant difference in the perceptions of male and female students on factors causing low enrolment in the learning of Chemistry.

Table 3 showed that more female respondents studying Chemistry at the College of Education agreed with the items ($M = 46.96$, $SD = 7.98$) than did their male counterparts

($M = 42.62$, $SD = 6.30$), $t(118) = 3.31$, $p = .001$. Since p value is less than .05, it signifies a significant difference in the perceptions of male and female students as to the causes of low enrolment in Chemistry Education in favor of the female students. The null hypothesis formulated is therefore rejected. Hence gender had significant influence on the perceptions of the respondents. This finding is in agreement with that of Odum et al. (2013), whose finding revealed gender difference in the Assessment of secondary school Chemistry teachers' quality through identification and use of laboratory apparatus. However, it was in disagreement with Majere et al. (2012) whose findings reported no influence of gender on students Gender disparities in self-concept, attitude and perception in Physics and Chemistry.

Table 3. *t*-test Analysis of Different Between Male and Female Students' Perception

Gender	<i>n</i>	Mean	Std. Dev.	<i>t</i>	<i>Df</i>	<i>p</i>
Male	69	42.62	6.30	3.31	118	.001
Female	51	46.94	7.98			

Research Question 3. Does grade level influence the perceptions of students on factors causing low enrolment in the learning of Chemistry

Hypothesis 2. There is no significant difference in the perceptions of students on factors causing low enrolment in the learning of Chemistry based on their grade level.

Table 4. *t*-test Analysis of Different Between 200 and 300 levels Students' Perception

Grade Level	<i>n</i>	Mean	Std. Dev.	<i>t</i>	<i>df</i>	<i>p</i>
200	60	45.05	8.12	0.88	118	0.38
300	60	43.80	6.52			

As shown in Table 4, there is no significant difference in the perceptions of 200 level Chemistry Education students ($M = 45.05$, $SD = 8.11$) and 300 level students ($M = 43.87$, $SD = 6.53$), $t(118) = .88$, $p = .38$. Since the p value is greater than .05, this signifies no significant difference in the perceptions of 200 and 300 level students. The null hypothesis formulated is therefore not rejected. Hence grade level had no significant influence on the perceptions of the respondents. The finding is in disagreement with that of Cheung (2009), who reported a significant difference when considering the influence of grade level of Chemistry students on their attitudes towards Chemistry.

Conclusion and Recommendations

The findings from the current research have shown that College of Education students' perceptions of factors causing low enrolment in learning of Chemistry can be categorized in to three, which are: nature of Chemistry, negative attitude of students to the learning of Chemistry and teacher-related factors were perceived as causes of low enrolment in Chemistry Education by the questionnaire's respondents. These three factor categories may be as a result of the background knowledge of the students as well as teachers' attitudes towards teaching of the subject. The study also revealed that gender had a significant difference in favor of females; that is, the average score of the female respondents was higher than that of the males. This may be because female respondents perceived Chemistry as more difficult than their male counterparts. While it was revealed from the study that grade level had no significant difference on the perceptions of the respondents. Meaning that both 200 and 300 levels students perceived the factors causing low enrolment in

Chemistry Education in the same way. This may mean that the one-year difference in their learning experience has no impact on their perceptions of factors causing low enrolment in learning of Chemistry.

Based on the findings of the current study, the following recommendations are put forward:

- The major factors perceived as causes of low student enrolment for learning Chemistry at Colleges of Education were the nature of the subject, negative attitude of students to Chemistry, and teacher-related factors which should be addressed through multiple representations, visualization tools that help make abstract concepts concrete for students in terms of their understandability, the promotion of students interest in the subject, and teachers making better use of effective instructional strategies.
- Both male and female Chemistry students should be treated equally in the teaching and learning of Chemistry. There should be no preferential treatment, especially towards males, so that females can also contribute their own quota to the development of the nation through the acquisition of Chemistry knowledge.
- Remedies for the factors causing low enrolment in the learning of Chemistry, as perceived by the respondents, should be provided to all students equally, irrespective of their grade levels, since the two grade levels involved in the study held the same perceptions.

Notes

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