Teacher Variables as Predictors of Chemistry Teachers' Awareness of Ethnoscience Practices

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Abstract

Innovative researchers and discoveries by science educators and academics on the effectiveness of ethnic science-based instructional models and strategies remain futile in the field as a result of chemistry teachers' ongoing ignorance and scorn for ethnic scientific practices. This omission, which could be due to inadequate understanding, has stymied efforts to develop a contextualized chemistry education system that would allow for more meaningful learning and successful instruction. Hence, this study was to determine ethnoscience awareness among secondary school chemistry teachers, and to predict the value of teacher factors and school district. The study adopted correlational survey research design. Data were collected from a sample of 40 chemistry teachers drawn from two educational districts (I & V) of Lagos state. The instrument CTQAEP was validated and reliability was 0.85. Four research questions were answered at 0.05 and 0.01 level of significance using Analysis of Variance ANOVA. The study revealed that chemistry teachers' awareness of ethnoscience was below expectation with a mean average score of (3.03). The independent variables had significant composite contribution on awareness of ethnoscience ($F(4,39) = 1.734$ $p<0.05$)). The study recommended based on the findings that chemistry teachers be equipped with indigenous knowledge and also include ethnoscience in the training and re-training programs. In addition, the government and educational research institutes should boost research on ethnoscience practices profiling for inclusion in science classrooms.

Key words: Ethnoscience Practices, Teacher variables, Chemistry teacher awareness

Introduction

Ethno science practices are a type of indigenous knowledge that communicates scientific concepts through human interaction with their environment and the creation of technology that secures a community's survival. It investigates how people interact with their surroundings and create reality by combining culture and scientific (chemical) knowledge (Atran, 2007). This knowledge is unique to different societies because they are passed from one generation to another. Ethno science refers to indigenous knowledge in the form of language, customs and culture, morals, and technology developed by a group or a single individual that contains scientific information (Surdamin, 2015).

Several studies (Alebiosu, 2006; Abonyi, Achimugu, and Njoku, 2014; Fasasi, 2017; Abiam, Abonyi, Ugama and Okafor, 2016 ; Okwara and Upu, 2017) in diverse context have identified and experimented ethno science as an instructional tool and found it to have a significant effect on students' performance, achievement and interest, a perfect link with learners' immediate environment when integrated in science teaching. Thus, ensuring more meaningful science learning. Ethno science is invariably used by chemistry teachers to apply the curriculum, demonstrating chemistry's connection to industry, as well as its benefits and risks in everyday life (FME, 2007).According to Rohayati, and Nanik (2015), despite the far-reaching reported effect of ethnoscience practices on science education, Chemistry teachers are not adequately connecting students' cultural backgrounds to their science study, ensuring that pupils understand that school science is not magic or a collection of abstract facts unrelated to their lives outside of school. As a result, evaluating chemistry teachers' awareness of ethnoscience approaches becomes critical.

It cannot be overstated how important it is for science teachers to be aware of ethnoscience in order to give a culture-related education. Awareness, as defined by Cambridge Advanced Learner's Dictionary and Thesaurus (2020), refers to knowledge that something exists or understanding of a situation or subject at the present time based on

information or experience. The office of Planning, Research and Evaluation (OPRE Report, 2015) expresses awareness as the ability to acknowledge differences across cultures. Therefore, awareness is a primary feature of consciousness (Brown &Ryan, 2004), which is the essence of all that is known as education (Opateye, 2012). The science teachers who are the enablers and a stakeholder in transmission of societal knowledge and culture need to have an appreciative level of knowledge of ethnic scientific practices peculiar to the learners or area where they teach. Hence, the possibility of predicting teachers' awareness of ethnoscience practices.

Teacher experience is the amount of time a teacher has spent in the classroom. Teachers gain command of their subjects and competence in the art of teaching over time as they gain experience (Omorogbe & Wansiha, 2013). Teachers' experience becomes an interesting aspect in improving the quality of chemistry education in terms of an indigenous approach, because expertise is predicted to engineer enhanced teaching quality. In the words of Omorogbe and Ewansiha, (2013), "teaching experience improves the teaching skills and methodologies adopted" by teachers. Hence, experienced teachers are expected to be more familiar with the scientific nature of indigenous knowledge. Chemistry teachers' awareness of ethnoscience which is predicted by experience, could as well be predicted by teachers' gender.

According to Okeke (2008), gender refers to the socio-culturally constructed or created characteristics and roles which are ascribed to males and females in any society. He characterized the male attributes as bolds, aggressive, tactful with economical use of words; while females are fearful, timid, gentle, dull, submissive and talkative. This is similar to Onyebuenyi, (2009) view that masculinity refers to attributes considered appropriate for males such as being aggressive athletic, physically active, logical and dominant in social relations with females, while, feminity refers to attribute traditionally associated with appropriate behaviour for a female such as docility, fragility, emotionally and subordinate for male Onyebuenyi, (2000). Teachers' choices of instructional material in chemistry classes, as well as their awareness of ethnoscience practices, may be influenced by these conventionally established male and female roles. This is due to differences in environmental exposure, interaction, and experience. Therefore this study seeks to determine the ethnoscience awareness among secondary school chemistry teachers, and to predict the value of teacher factors and school district in Lagos state of Nigeria.

Purpose of Study

Innovative researchers and discoveries by science educators and academics on the effectiveness of ethnic science-based instructional models and strategies remain futile in the field as a result of chemistry teachers' ongoing ignorance and scorn for ethnic scientific practices. This omission, which could be due to a lack of or inadequate understanding, has stymied efforts to develop a contextualized chemistry education system that would allow for more meaningful learning and successful instruction. From the fore going, the purpose of this study is to:

i. determine the level of senior secondary school chemistry teachers' awareness of ethnochemistry
ii. determine the relationship between experience, gender, age, School district and; chemistry teachers' awareness of ethnochemistry.
iii. determine the composite contribution of experience, gender, age, School district on chemistry teachers' awareness of ethnochemistry.
iv. ascertain the relative contribution of experience, gender, age and school district on chemistry teachers' awareness of ethnochemistry.

Research Questions

The following questions were answered in the course of the study:

i. What is the level of chemistry teachers' awareness of ethnochemistry?
ii. What is the relationship between experience, gender, age, School district and; chemistry teachers' awareness of ethnochemistry?
iii. What is the composite contribution of experience, gender, age, School district on chemistry teachers' awareness of ethnochemistry?
iv. What is the relative contribution of experience, gender, age and school district on chemistry teachers' awareness of ethnochemistry?

Methodology

The study adopted a correlational descriptive survey research design. Teacher variables examined were (Experience, Gender, Age and School district) that forms the independent variable while dependent variable is the

Chemistry teachers' awareness of ethnoscience. The target population of this study comprises of all Chemistry teachers of the Senior Secondary Schools in Lagos State, Nigeria. Twenty (20) public secondary schools in Education Districts I & V, Lagos State were randomly selected. This means that ten (10) schools were randomly selected from each of the Education District. From each school, two Chemistry teachers were selected for the study. In all, a number of forty (40) Chemistry teachers participated in the study. In this study an adapted Questionnaire was used for as a research instrument for data collection. The questionnaire was titled Chemistry Teachers' Awareness of Ethnochemistry Questionnaire (CTAEQ). The questionnaire had two sections "A" and "B". Section "A" elicited respondents' Demographic data while section "B" was a twenty-one (21) question items in a four (4) point Likert scale. A face and content validation of the instrument was done by experts in the field of Chemistry Education. The instrument was pilot tested on Ten Senior Secondary School Chemistry teachers who were not part of the sample selected for the study. The reliability coefficient of the instrument was found to be 0.84 using Cronbach alpha. Data was collected for this study by administration of CTAEQ to the sampled participants (Chemistry teachers) of the selected Schools. The researcher sought permission from the principal of the schools and consent of the teachers. The questionnaires when issued were retrieved immediately from the respondents after they had filled them. Descriptive statistics of mean and standard deviation, alongside Inferential statistics of Pearson Product Moment Correlation, Multiple Regression and Analysis of Variance (ANOVA), were used for the analysis of the data collected from the field.

Results

Research Question 1: What is the level of chemistry teachers' awareness of ethnochemistry in Senior Secondary Schools?

Table 1: Mean score of teachers' awareness of ethno -chemistry, he conception of indigenous resources and readiness to use indigenous resources

	N	Minimum	Maximum	Mean	Std. Deviation
Awareness	40	2.00	3.65	3.0288	.28327
Valid N (list wise)	40				

The table above shows the descriptive statistics of teachers' awareness of ethnochemistry. It portrays that the level of Chemistry teachers' awareness of ethnochemistry is above average, as it shows a mean average score of (3.03).

Research Question 2: What is the relationship between experience, gender, age, school district and Chemistry teachers' awareness of ethnochemistry?

Table 2: Summary of correlation matrix between experience, gender, age, school district and chemistry teachers' awareness of ethnochemistry

	Awareness	Gender	Age	Experience	District
Awareness	1	.111	-.302	-.085	-.317*
		.496	.059	.600	.046
Gender	.111	1	-.308	-.282	-.302
	.496		.053	.078	.059
Age	-.302	-.308	1	.529**	.224
	.059	.053		.000	.164
Experience	-.085	-.282	.529**	1	.119
	.600	.078	.000		.466
District	-.317	-.302	.224	.119	1
	.046	.059	.164	.466	
N	40	40	40	40	40

****.** Correlation is significant at the 0.01 level (2-tailed).

The table above reveals that there is a low positive insignificant relationship between gender (r= .111; p>0.05) and chemistry teachers' awareness of ethnochemistry. It also relays that there is no significant relationship between experience (r=-.085; p>0.05) and chemistry teachers' awareness of ethnochemistry, but there exist low negative significant relationships between age (r= -.302; p<0.05), school district (r= -.317; p<0.05) and chemistry teachers' awareness of ethnochemistry.

Research Question 3: What is the composite contribution of experience, gender, age, school district on Chemistry teachers' awareness of ethnochemistry?

Table 3.1: Summary of Multiple Regression Analysis Between the Predictors and Teachers' Awareness of Ethnochemistry.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.407[a]	.165	0.070	.27317

Table 3.1 above, the value of R = 0.407 at p < 0.05 shows that the contribution of experience, gender, school district and age, when combined was significant on Chemistry awareness of ethnochemistry.

Table 3.2: ANOVA showing regression of experience, gender, school district and age on Chemistry teachers' awareness of ethnochemistry

Model	Sum of squares	Df	Mean Square	F	Sig.
Regression	.518	4	.129	1.734	.165b
Residual	2.612	35	.075		
Total	3.129	39			

The table 3.2 above presents an analysis of variance of multiple regression between the independent variables and chemistry teachers' awareness of ethnochemistry to be (F(4,39) = 1.734 p>0.05); at 0.05 level of significance. This shows that there is a significant composite contribution of teacher's experience, gender, age and school district on chemistry teachers' awareness of ethnochemistry. This implies that when the four independent variables are pulled together, they significantly contributed to an increase in awareness of chemistry teachers of ethnochemistry. The R Square of .165 indicated that experience, gender, school district and age have a joint positive relationship with teachers' awareness of ethnochemistry. The Adjusted R Square value of .070 further revealed that 7% difference in the teachers' level of awareness of ethnochemistry was as a result of the joint contribution of the independent variables. The remaining 93% could be due to other variables not included in this study.

Table 4: Summary of Multiple regression analysis showing relative contribution of the independent variables on Chemistry teachers' awareness of ethnochemistry.

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	3.484	.287		12.132	.000
Gender	-.021	.095	-.037	-.219	.828
Age	-.127	.078	-.303	-1.618	.115
Experience	.043	.082	.097	.527	.602
District	-.152	.092	-.272	-1.660	.106

Table 4 above shows the result of relative contributions of each of the independent variables to the prediction of chemistry teachers' awareness of ethnoscience practices. The regression Beta values and P values show that teachers' Gender (B= -0.021; t=-0.219; p>0.05), Age (B= -0.127; t= -1.618; p>0.05), Experience (B= 0.043; t= 0.527; p>0.05)

and District (B= -0.152; t= -0.1660; p>0.05) all had no significant relative contribution to chemistry teachers' awareness of ethnochemistry.

Discussion of Findings

The major purpose of this study was to ascertain chemistry teachers' awareness of ethnoscience practices as well as the predictive value of teacher variables such as experience, gender and school district on chemistry teachers' awareness of ethnoscience practices. The findings of this study are presented in tables 1 – 4 and discussed according to research question. The findings from the study clearly showed that the level of awareness of chemistry teachers of ethnochemistry is above average. This result is in contrast to the findings of Adesoji, Omilani & Francis (2019) who revealed that Chemistry teachers' awareness of ethnochemistry in the area where they teach is below expectation. In addition, findings also revealed that teachers disagree with the statement that the application of indigenous scientific knowledge to the teaching of Chemistry would make the learners lose interest in the subject. This is supported by the findings of Ugwu (2021), who stressed that students' interest in Chemistry improved significantly with the incorporation of Ethnochemistry practices into curriculum delivery. Fasasi (2017) also showed from his findings that ethnoscience instruction is effective in promoting learners' cognitive achievement in science and is recommended as an instructional strategy for learners.Based on this, it can be concluded that chemistry teachers' awareness can be improved by further exploration of cultural practices that are Chemistry related.

Furthermore, the findings of this study revealed there is no significant relationship between Chemistry teachers' Gender, Experience and awareness of ethnochemistry, but there exists a relationship, albeit low significant relationship between Chemistry teachers' Age, School district and awareness of ethnochemistry. This implies that age and school district individually influence awareness of ethnochemistry. This result is in line with the findings of Edu, Edu & Kalu (2012) who discovered in a study that teacher's gender is not a factor in teaching but factors such as school location and others affect a teacher. The finding on school district being a predictor of chemistry teachers' awareness of ethnochemistry is based on the premise that the geographical and economic location of the chemistry teachers and subsequently the school, would have influenced their awareness. This is due to the fact that each Educational District possess varying facilities and also different mindsets towards scientific cultural practices. Some districts might shun the idea of exposing the learners to such form of instruction.

The findings of this research revealed that experience, gender, age and school district showed a significant contribution to chemistry teachers' awareness of ethnochemistry. This implies that when all the independent variables were put together, they jointly influenced chemistry teachers' awareness of ethnochemistry. Hence, it can be deduced from this study that experience, gender, age and school district are composite predictors of chemistry teachers' awareness of ethnochemistry. The experience made an impact as much as gender and school district. This might have been because teachers are expected to advance in mastery as they advanced in experience, segregation in terms of gender roles in the society, and the difference in school district exposes one to an awareness in different perspectives. The study showed that the independent variables all had no significant relative contribution on the determination of chemistry teachers' awareness of ethnochemistry. This portrays that experience, age, gender and school district have no significant importance in the prediction of chemistry teachers' awareness of ethnochemistry.

Conclusion

Chemistry teachers' awareness of ethnoscience practices in these districts where they teach is above the average. This renders the possibility of a culture-related chemistry education unlikely unless steps are taken to change the current situation. The knowledge of ethnoscience among chemistry teachers could be improved by characterizing indigenous practices pertinent to science (chemistry) education. There is no significant relationship between experience (r=-.085; p>0.05) and chemistry teachers' awareness of ethnochemistry. The teacher variables experience, gender, age and school district contribute compositely to chemistry teachers' awareness of ethnoscience

Recommendation

Following the findings of this study, it was recommended that:

i. curriculum planners and other educational bodies make a concerted effort to promote culture-related chemistry education for the betterment of society.

ii. since all the predictors have no significant relationship with the level of awareness of secondary school chemistry teachers on ethnochemistry, then the government and publishers should endeavour to stress this at every level of science teacher's seminar and conferences.

iii. study shows above average awareness in the sampled districts does not mean same may be obtained in other districts, hence the study sample could be increased for a better result.

iv. training of chemistry teachers on innovative indigenous methods of instruction and newly profiled ethnoscience practices as they emerge to eliminate chemistry concept abstraction.

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