EXPLORING THE RELATIONSHIP BETWEEN BIOLOGY TEACHERS' QUALIFICATIONS AND RESOURCE KNOWLEDGE FOR TEACHING BIOLOGY IN SENIOR SECONDARY SCHOOLS IN BAUCHI STATE

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Abstract
This study explored the relationship between biology teachers' qualifications and resource knowledge for teaching biology in senior secondary schools in Bauchi State, Nigeria. Expost facto Survey design was adopted for the study. Cluster sampling and simple random sampling techniques were used in selecting 242 Biology teachers from a population of 614 biology teachers in public senior secondary schools in Bauchi State, Nigeria. An instrument named, Biology Teachers' Resource Knowledge Test was used for data collection. The reliability coefficient of the instrument was found to be r= .84. The collected data was analysed using IBM SPSS Statistics 21 software where descriptive statistics, t-test and Point Biserial Correlation were used for the data analysis. From the analysis, it was revealed that male biology teachers had more resource knowledge than female biology teachers. Qualified biology teachers had more resource knowledge than un-qualified biology teachers. Significant relationship exist between resource knowledge and qualification of biology teacher. Significant relationship exist between resource knowledge and gender of biology teacher. It was therefore recommended that there should be retraining opportunities for female secondary school biology teachers in order to acquire more resource knowledge and the retraining of the existing un-qualified secondary school biology teachers in order to acquire more resource knowledge.

Keywords: *Resource knowledge, Teachers' Qualifications*

Introduction

Education is an instrument for national development and social change (Otuka, 2006 and Offiah, & Achufusi, 2010)).Also, it helps to improve the creative potentials and skills of the individual for self-fulfilment and general development of the society [FME, 2014). That is why the National Policy on Education (FME, 2014) stated that education should be qualitative, comprehensive, functional, and relevant to the needs of the society. The above listed

can only be achieved under the guidance of a qualified and innovative teacher

In the education sector, teachers are the fulcrum upon which education revolves. Teachers Registration Council of Nigeria [TRCN], (2010) emphasized that teachers are not only the pivot of the education system but the nation-builders, through educating and preparing the youngsters for their roles in the society, and to also achieve the objectives of education as in the National Policy in Education (FME, 2014). Specifically, secondary school biology teachers interpret and translate the content of biology curriculum and imparting same to the learners so as to acquire scientific knowledge (Ogunyinka, Okeke, Tochukwu & Adedoyin, 2015). However, the paradigm shift from Teacher Centred approach to Learner Centred approach had not been taken care adequately by the Nigerian teachers(Jibrin, Mohammed and Zayum,2020) and hence, according to Mohammed,(2012) this posed challenge to effective teaching and learning in Nigeria.

The paradigm shift from teacher as disseminator of knowledge to a guide and facilitator where individualised learning using resources take precedent (Murley, Jukes & Stobaugh, 2013 and Ong'ama, Ondigi & Omariba, 2017). Evidences from Schweisfurth (2011) and Schweisfurth (2013) analyses of learners' centred approach in developing countries context revealed that, there are challenges of inadequately trained man power, high students to teacher ratio, inadequate infrastructure and instructional materials for the effective implementation of learners' centred approach in developing countries including Nigeria. Concurrently, National Teachers' Institute [NTI] (2010), Stephen (2015) and Federal Ministry Education [FME] (2015) maintained that there are challenges in the educational system in Nigeria which include amongst others poor learning facilities; inadequate numbers of teachers generally (and qualified teachers specifically) with overcrowded classrooms and poor teacher/students ratios; as well as inadequate funding; and poor management of human, material resources, lack of skills and strategies of improvisation and inability to identified local resources for teaching.

In Nigeria, the challenge of inadequate qualified teachers is very obvious (especially in science subjects) which biology is one of the core science subjects. The expectation of the National Policy on Education (FME, 2014) is that teaching in Nigeria shall attain the highest standards possible. Therefore, it asserted that, no education system can rise above the quality of its teachers. It is also impossible to attain such standard or achieve the objectives of senior secondary school biology curriculum with large number of unqualified biology teachers in our secondary school system and poor state of instructional materials (Saladin, 2019).Also, Nwiyi (2017) emphasizes that a teacher is a person who is professionally trained in the principles of teaching and for someone to be called a teacher, he needs to acquire the basic professional skills and techniques of teaching. Hence, a qualified teacher is a person who had under gone teacher education programme in teacher training institutions (TRCN, 2008). During teacher training programme, prospective

teachers acquired instructional strategies, techniques and resource knowledge required for teaching (Zombwe, 2013 & Shravan, (2017).In this case science teachers including biology teachers are expected to use the knowledge acquired while on training to be able to source for teaching materials. Where the instructional materials are lacking, the teacher has a sole responsibility of improvising and using alternatives (Mohammed, 2012). In order to carry out this task effectively, secondary school biology teachers need adequate or in-depth resource knowledge for teaching biology.

Resource knowledge is the general understanding, familiarity with instructional materials and their improvisable alternatives used for teaching and learning. It also encompasses first of all knowing the instructional materials, for what concept(s) to be taught, how and when to use it during instructional process (Atadogo & Onaolapo, 2008). Acquiring resource knowledge is very essential to biology teachers because of abstract nature of Biology. Secondary biology students cannot fully understand most of the concepts of Biology when taught without instructional materials. Therefore, teachers would have to select the appropriate instructional materials that will enable them to deliver their lessons in way that students would learn meaningfully and retain the concepts learned (Habib, 2018).Therefore in the absent of the factory made materials, the teachers would use the resource knowledge and venture into improvisation of instructional materials for teaching (Mohammed, 2012). Resource knowledge is a very important factor that determines whether a biology teacher would be able to select appropriate instructional material(s) suitable for the topic to be taught and as well as be able to effectively use it in order to enhance teaching and learning of biology in the classroom (Atadogo & Onaolapo, 2008 & Saladin, 2019). That is why according to Berken, (2015) & Habib, (2018) pre-service teachers took compulsory course in educational technology and would be able to improvise instructional materials for effective teaching..

Hence, the realization of the secondary school biology objectives is solely determined by the quality as well as quantity of the biology teachers in their ability to teach well. However, this can be influenced by the availability of adequate teaching and learning resources in secondary schools (Ogunyinka Okeke & Adedoyin, 2015). According to Daworiyel, Alagoa, Enaregha and Erimasi (2015) this will result to quality teaching in biology and hence enhance students' academic performance.

In the light of this, Effiong (2015) stated that where instructional materials are available and the teachers always utilized them, it makes teaching effective, students learn meaningfully and retain the concept(s) learned, while on the other hand Tety (2016) revealed that lack of sufficient skills and creativity to improvise instructional materials show a great impact in the teaching and learning process. This has been identified as teachers' poor knowledge which consequently resulted in lecture method Alabere, (2017).

Despite the efforts of Science Teachers' Association of Nigeria (STAN), NTI and Federal Government of Nigeria to organize annual workshops/seminars and

exhibitions, which aim at encouraging and exposing teachers to improvisation and utilisation of instructional materials in teaching-learning process; yet the problems still remained persistent. This leads to the question that do biology teachers have adequate resource knowledge, qualifications and techniques for utilisation of instructional material?

From the above challenges in Nigerian secondary schools reported by several authors, little or no study had established a strong connection or otherwise of it with resource knowledge among biology teachers, particularly in Bauchi State. Therefore, it imperative to explore the resource knowledge biology teachers, with the view of determine the adequacy of their resource knowledge and difference of resource knowledge possess by qualified and un-qualified biology teachers as well as male and female secondary school biology teachers in Bauchi State, Nigeria.

The objectives of the study are to explore the:-

1. Resource knowledge of male and female biology teachers;
2. Resource knowledge of qualified and un-qualified biology teachers;
3. mean scores difference between biology teachers 'resource knowledge and their qualifications;
4. Relationship between resource knowledge and gender.

Research Questions

The following research questions guided the study:-

1. What are the resource knowledge mean scores of male and female secondary school biology teachers?
2. What are the resource knowledge mean scores of qualified and unqualified secondary school biology teachers?
3. What is the mean difference between biology teachers' resource knowledge and their qualifications in Bauchi State?
4. What is the relationship between biology teachers' resource knowledge and gender

Hypotheses

The following research hypotheses were tested at .05 level of significance:

H_{01}: There is no significant difference in the resource knowledge mean scores of male and female secondary school biology teachers.

H_{02}: There is no significant difference between the resource knowledge mean scores of qualified and un-qualified secondary school biology teachers.

H_{03}: There is no significant relationship between biology teachers' resource knowledge and their qualifications in Bauchi State.

Research Methodology

This study adopted expost facto Survey Research Design. The population of this study consists of all 614 Biology Teachers teaching in Public Senior Secondary Schools in Bauchi State for 2018/2019 academic session. The sample for this study was 242 Biology Teachers teaching in Senior Secondary Schools in Bauchi State, Nigeria. The sampling techniques adopted were cluster sampling technique and simple random sampling technique. The criteria for the use of cluster sampling

is that, Bauchi State has three education zones with varying number of biology teachers. In order to ensure wide coverage of the area of study, hence the zones were treated as clusters.

In this study, the instrument used for data collection was developed by researchers called Biology Teachers' Resource Knowledge Test (BTRKT) which consist of 60 items. The instrument consists of two parts: Part 'A' explored the demographic information of the respondents to include sex, qualifications and area of specialisations, working experience. Part B (1) consists of 20-item 4-option multiple choice test items and 10 short response questions while Part B (2) consists of 30 semi-structured open ended items adapted from Ahmed (2008) and modified to suit the purpose of this study. The instrument for data collection was validated by experts in biology education in the Department of Science Education, Faculty of Technology Education, Abubakar Tafawa Balewa University, Bauchi.

The instrument was pilot tested on thirty two biology teachers from some secondary schools in part of Gombe state. Because they are not within the study area. The method employed was test retest. The data obtained was subjected to reliability test using Kuder-Richardson 20 (KR-20) method. The reliability coefficient was found to be .84. This according to Grande (2019) is suitable for study of this nature.

The data was collection by the three research assistants that were trained for two weeks on how to collect the data. Under the supervision of the researchers, the research assistants were given the questionnaires and administered to the respondents over period of one week so as meet all the respondents. The questionnaires were filled and collected on the spot to avoid non return of the questionnaires. Data collected were presented for analysis using Statistics Package for Social Science (SPPS). Descriptive statistics such as frequencies, percentages, means, and standard deviations where used to answer the research questions; while inferential statistics such as Independent Sample t-test and Point Biserial Correlation (PBC) were used to test the null hypotheses 0,05 level of significance.

Results

The results were presentation as follows.

Table 1: Demographics of the Participants

S/No	Category	Group	Frequency	Percentage
1	Gender	Male	155	64.05%
		Female	87	35.95%
	Total		242	100%
2	Criteria	Qualified biology teachers	154	63.64%
		Unqualified biology teachers	88	36.36%
	Total		**242**	**100%**

Source: Field data (2019)

Table 1 shows the characteristics of biology teachers from the sample senior secondary schools in Bauchi State. Analysis of the data shows that the participants consisted of 64.05% male and 35.95% female; 63.64% qualified biology teachers and 36.36% unqualified biology teachers. In all, the total number of participants from the selected senior secondary schools was two hundred and forty two (242).

Research Question 1: What are the resource knowledge mean scores of male and female secondary school biology teachers?

Table 2: Mean Scores of Resource Knowledge of Male and Female Secondary School Biology Teachers.

Variable	N	Mean	SD	MD
Male Teachers	155	31.00	8.95	
				3.30
	87	27.70	7.48	
Female Teachers				

Table 2 displays the resource knowledge mean scores analysis of male and female secondary school biology teachers. The results showed that male biology teachers had resource knowledge mean score of 31.00 and standard deviation of 8.95 while their female counterpart had 27.70 with standard deviation 7.48 and their mean difference = 3.30. Since the mean difference is 3.30, it implies that male biology teachers are better than female biology teachers in terms of resource knowledge for teaching biology.

Hypotheses Testing

H_{01}: There is no significant difference in the resource knowledge mean scores of male and female secondary school biology teachers.

Table 3: Mean Scores and t-test Analysis of Resource Knowledge of Male and Female Biology Teachers.

Variable	N	Mean	SD	MD	Df	t	p	Remark
Male Bio. Teachers	155	31.00	8.95					
				3.30	240	2.91	.004	Significant
Female Bio. Teachers	87	27.70	7.48					

Significant at p≤ 0 .05 level

Moreover, Table 2 also displays the results of corresponding null hypothesis tested. The results of the t-test revealed that t calculated is 2.91at the degree of freedom of 240 and P value calculated is .004. The P value calculated is less than .05. However, there was a statistically significant evidence to accept the alternate hypothesis against the null hypothesis. Therefore, there is significant difference between the resource knowledge of male and female biology teachers.

Research Question 2: What are the resource knowledge mean scores of qualified and unqualified secondary school biology teachers?

Table 4: Resource Knowledge Mean Scores of Qualified and Unqualified Secondary School Biology Teachers.

Variable	N	Mean	SD	MD
Qualified Biology Teachers	154	31.18	8.30	
				3.74
Unqualified Biology Teachers	88	27.43	8.60	

Similarly Table 3 displays the resource knowledge mean scores analysis of male and female secondary school biology teachers showed that male biology teachers' resource knowledge mean score of 31.18 and standard deviation of 8.30 while their female counterpart had 27.43 with standard deviation of 8.60. Since the mean difference is 3.74, it implies that qualified biology teachers are better than un-qualified biology teachers in terms of resource knowledge for teaching biology**.** There is no significant difference between the resource knowledge mean scores of qualified and unqualified secondary school biology teachers.

Table 5: t-test Analysis of Resource Knowledge Mean Scores of Qualified and Un-qualified Biology Teachers.

Variable	N	Mean	SD	MD	Df	t	p	Remark
Qualified Biology Teachers	154	31.18	8.30					
				3.74	240	3.33	.001	Significant
Un-qualified Biology Teachers	88	27.43	8.60					
Total	242	29.81	8.59					

Significant at p ≤ .05 level

Moreover, Table 5 also displays the results of corresponding null hypothesis tested. The results of the t-test revealed that t = 3.33 and degree of freedom = 240, while P calculated= .001. However, there was a statistically significant evidence to accept the alternate hypothesis against the null hypothesis since p < .05. Therefore, qualified biology teachers have more resource knowledge for teaching secondary school biology than un-qualified biology teachers in Bauchi State.

Research Question 4: What is the mean of biology teachers' resource knowledge and their qualifications of secondary school biology teachers in Bauchi State?

Table 6: Mean Scores of Resource Knowledge and Qualifications Biology Teachers.

Variable	N	Mean	SD	MD
Resource knowledge	154	29.35	8.22	
				0.23
Qualifications	88	29.31	8.45	
Total	242	29.81	8.59	

Results in table 6 indicated a mean score of 29.35 for biology teachers' resource knowledge with standard deviation of 8.22 while that of their qualification is 29.31 and the standard deviation is 8.45. From the two mean scores, a difference of 0.23 exist.

H_{03}: There is no statistically significant relationship between resource knowledge and qualification of secondary school biology teachers in Bauchi State.

Table 7: Point Biserial Correlation Analysis of the Relationship between Biology Teachers' Resource Knowledge and their Qualification

Variables		**Resource Knowledge**	**Qualification of participants**
Resource Knowledge	Pearson Correlation	1	-.210**
	Sig. (2-tailed)		.001
	N	242	242
Qualification of Participants	Pearson Correlation	-.210**	1
	Sig. (2-tailed)	.001	
	N	242	242

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

Table 4 displays the results of Point Biserial Correlation Analysis to determine the relationship between Biology Teachers' Resource Knowledge and their qualifications. From the results of the analysis, it shows that r_{pb} = -.21, n = 242, p = .001 indicating negative correlation between qualification and resource knowledge, which was statistically significant since p < .05. Further analysis revealed that the negative r_{pb} = -.21, revealed that high performance in resource knowledge was associated to qualified biology teachers as shown in Table 2 and figure 1. With this evidence, the null hypothesis was rejected and meaning that statistically significant relationship does exist between resource knowledge and qualification of biology teacher.

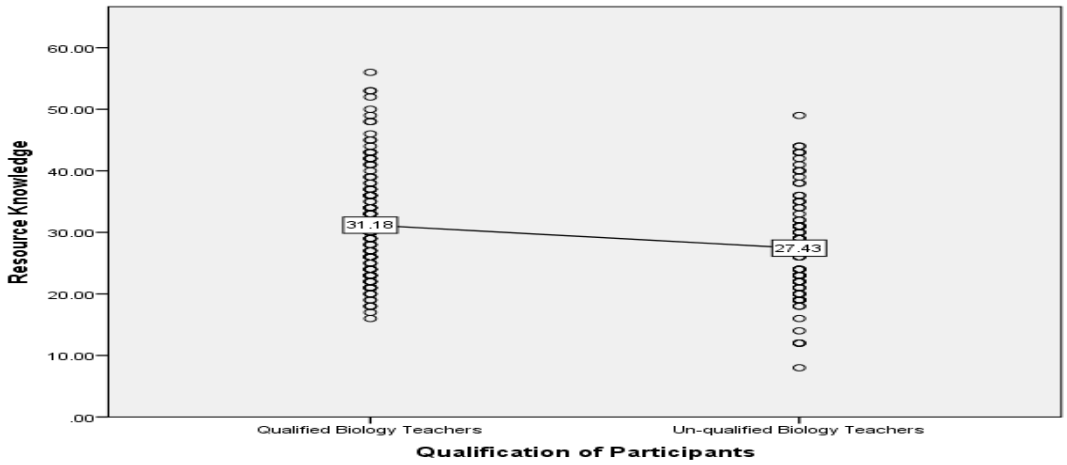

Figure 1: Scatterplot of Qualification of Biology Teachers' Verses their Resource Knowledge Mean Scores.

Research Question 4: What is the relationship between resource knowledge and gender of biology teachers in Bauchi State?

Table 8: Point Biserial Correlation Analysis of the Relationship between Biology Teachers' Qualification and their Resource Knowledge.

Variables		Resource Knowledge	Gender of participants
Resource Knowledge	Pearson Correlation	1	-.185**
	Sig. (2-tailed)		.004
	N	242	242
Gender of Participants	Pearson Correlation	-.185**	1
	Sig. (2-tailed)	.004	
	N	242	242

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

Decision rule: reject null hypothesis if p ≤ .05 otherwise accept.

Table 5 displays the results of Point Biserial Correlation Analysis conducted to determine the relationship between Biology Teachers' Resource Knowledge and their gender. From the results of the analysis, it shows that r_{pb} = -.185, n = 242, p = .01 indicating negative correlation between qualification and resource knowledge, which was statistically significant since p < .05. Further analysis revealed that the negative r_{pb} = -.185, revealed that high performance in resource knowledge was associated to male biology teachers as shown in Table 3 above and figure 2. With this evidence, the null hypothesis was rejected and conclusion was made that significant relationship does exist between resource knowledge and gender of biology teacher.

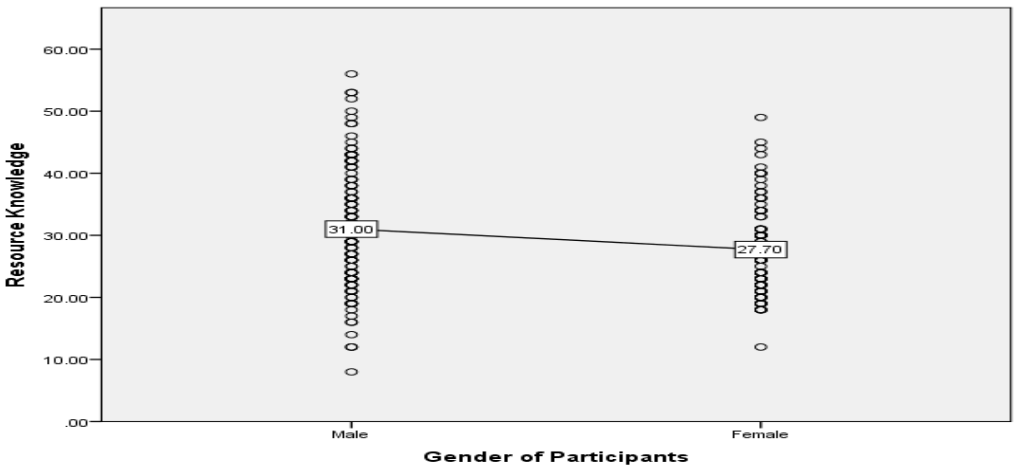

Figure 2: Scatterplot of Gender of Biology Teachers' Verses their Resource Knowledge Mean Scores

Discussions

From the analysis of resource knowledge mean scores of male and female secondary school biology teachers, it was categorically clear that male biology teacher had more resource knowledge (above average) than

female biology teachers (below average). The analysis of the disparity shows that it was statistically significant. The findings of this study disagree with that of Enanya and Muhammad (2018) who concluded no significant difference between female and male Biology teachers in sourcing out resources for improvisation of instructional materials.

Similarly, the analysis of resource knowledge mean scores of qualified and un-qualified secondary school biology teachers, it shows that qualified biology teacher had more resource knowledge (above average) than unqualified biology teachers (below average). The analysis of the disparity shows that it was statistically significant. The findings of this study agree with that of Nwiyi (2017) who emphasizes that a teacher should acquire the basic professional skills and techniques of sourcing out .materials for an effective teaching.

Again, the analysis of the relationship between resource knowledge and qualification; confirms that statistically significant relationship does exist between resource knowledge and qualifications of biology teachers. However, the negative point Biserial values implying that higher performance in resource knowledge is associated with qualified secondary school biology teachers. The findings of this study agree with that of Olu-Ajayi (2017) who maintained that knowledge in research provision utilization is associated to teaching qualification.

Similarly, the analysis of the relationship between resource knowledge and gender; confirms that statistically significant relationship does exist between resource knowledge and gender of biology teacher. However, the negative point Biserial values implies that higher performance in resource knowledge is associated with male secondary school biology teachers. The findings of this study is similar to that of Nyagarma, Enoch and Arkorfula (2017) who maintained that inadequate training of teachers at the teachers' training institution could result to inadequate knowledge on how to acquired and provide teaching materials while teaching.

Conclusion

In conclusion, most of the female and unqualified biology teachers in Bauchi state have inadequate resource knowledge for teaching biology.

Recommendations

Based on the above, it was recommended that,

1. Government should provide retraining opportunities for female secondary school biology teachers' to acquire more resource knowledge for teaching.
2. Government, NGO's and professional bodies should emphasise the retraining of the existing unqualified secondary school biology teachers to acquire more resource knowledge for teaching.

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