READABILITY LEVEL OF RECOMMENDED CHEMISTRY TEXTBOOKS AND STUDENTS' ACADEMIC PERFORMANCE IN SENIOR SECONDARY SCHOOLS IN EKITI STATE, NIGERIA

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Abstract: *The study made use of a descriptive survey design to investigate the readability level of recommended chemistry textbooks and students academic performance in senior schools in Ekiti State. The sample consisted of 204 senior secondary school students' who were selected from five schools in the state. Two chemistry textbooks were chosen based on the most commonly used all over the state. Two research instruments were used – Cloze test and students' achievement test. The reliability coefficient of 0.72 was obtained with the use of Kuder-Richardson formula KR_{21}. The instruments were administered and data collected were analyzed using Pearson Product Moment Correlation and t-test.*

The findings revealed that readability of chemistry textbooks had significant influence on students' academic performance. Location (urban or rural) also had significant influence on readability of chemistry textbooks. No significant difference was found between the academic performance of male and female students who used the recommended chemistry textbooks. The implications of findings were discussed and recommendations made.

Keywords: *Readability, Cloze test, students' academic performance.*

Introduction

Researchers over the years have blamed poor academic performance of chemistry students in Senior Secondary Schools on inadequate science or chemistry facilities, poor methods of teaching and lack of motivation for students. The issues of readability level of recommended Chemistry textbooks as they influence the performance of students in chemistry had received very little attention. The fundamental question on 'What makes a recommended book readable for a particular set of readers needs to be addressed. This question is very important when one recognizes the strong relationship between understanding or comprehension of chemistry materials and the reading level of the material (Fletcher, 1975).

Reading is the basis for learning different subjects in schools. Whatever, the aspect of life one is considering one discovers that the ability to read efficiently enhances individual ability to

function in an effective manner (Perekeme, 2012). Readability, according to Ziriki (2009) is defined as reading ease, especially as it results from a writing style. It is also said to be the reading difficulty level of a textbook in relation to the class for which it is meant. The readability level of a book therefore, is one of the factors that determine the understanding of a subject by the students.

There is a consensus of opinion, all over the country about the fallen standard of education in Nigeria (Adebule, 2004). Parents and government are in total agreement that their huge investment on education is not yielding the desired dividend. Teachers also complain of students' low performance at both internal and external examinations. The annual releases of Senior Secondary Certificate Examination results (SSCE) conducted by West African Examination Council (WAEC) justified the problematic nature and generalization of poor secondary school students' performance in different school subjects (Adebule, 2004). This study therefore, investigated the readability level of recommended Chemistry textbooks and students academic performance in senior secondary schools in Ekiti State, Nigeria.

Statement of the Problem

A lot of researches have been carried out on inadequate chemistry facilities, poor methods of teaching and poor students' motivation as factors affecting their academic performances. Little attention has been paid to the issue of readability recommended chemistry textbooks as they influence the performance of students in chemistry. The primary purpose of this study therefore was to examine the readability level of recommended chemistry textbooks and students academic performance in senior secondary schools in Ekiti State and in the process find answers to the following general questions.

1. What is the readability level of chemistry students on their academic performance using the Close procedure?
2. What is the general performance of chemistry students from rural and urban areas that use the recommended textbooks?
3. Would gender have effects on the readability of the recommended chemistry textbooks?

Research Hypotheses

HO$_1$: Readability of chemistry textbook has no significant influence on students' academic performance in chemistry.

HO$_2$: Location has no significant influence on readability of chemistry textbooks.

HO$_3$: There is no significant difference between the performance of male and female students who use the recommended chemistry textbooks.

HO$_4$: There is no significant difference between the performance of students who use chemistry textbook 'A' and those who use chemistry textbook 'B'.

Significance of the Study

The study would serve as a reliable assessment on which the senior secondary school chemistry curriculum improvement could be made in the areas of objectives, content, learners' activities and evaluation. It is hoped that the findings of this study would pose challenges to authors and publishers on the need to re-assess their publications and make readable texts available to students in their subsequent editions. It would serve as a guide to the curriculum planners and the Ministry of Education in the recommendation and selection of appropriate chemistry textbooks for the use of senior secondary school students.

Literature Review

Abounds in literature are several studies on readability formulae that vary from one subject to the others; it is more concentrated on the languages and sciences. The method used as well as the numbers of textbooks used for the studies were also indicated. They used Cloze score, Flesch formula, Fry graph, SMOG index, use of the oral and direct questionnaire, measures of word frequency and complexity of text features, to gather information for analysis of readability of textbooks. Some of these methods were criticized and the benefit of determining readability was also identified.

The Cloze Procedure (1953) would be treated here and what other researchers said about it. Taylor (1953) published "cloze procedure" as a new tool for measuring readability. This man cited several difficulties with the readability formulas of flesh and Dale-Chall. Taylor argued that words are not the best measure of difficulty but how they relate one another. He proposed using deletion tests called 'cloze tests' for measuring an individuals understanding of a text. Cloze testing is based on the theory that readers are better able to fill in the missing words as their reading skills improve.

A Cloze test uses a text with regularly deleted words (usually every fifth word) and requires the students to fill in the blanks. The percentage of words correctly entered is the Cloze score. The lower the score, the more difficult the text. Because even advanced readers cannot correctly complete more than 65% of the deleted words correctly in a sample test. Tests for assisted reading required a cloze score of 35% or more. Texts for unassisted reading need a higher score.

The Cloze scores obtained from the passages are compared with reference points of different level of comprehension. Rye (1983) used the following comprehension levels. A Cloze score of between 0% and 40% indicates that the respondent was able to read the passages in the textbook at the Frustration level. The language is difficult for readers to cope with. A score between 41% and 60% indicates reading at the instructional level. At this level, the reader is able to cope, but some assistance will be required. A score of 61% to 100% indicates an independent level of reading. The reader is able to cope with the language.

Bormuth (1968) and Rankin and Culhane (1969) as quoted in Fatoba (2014) compared cloze test and multiple-choice comprehension test scores and used the following criterion level scores. A score of less than 44% indicates reading at the frustration level. 44% to 57% for the instructional

level and above 57% for the independent level. These criterion levels are not significantly different to those proposed by Rye (1983). Bormuth proposed that textbooks should be at the instructional level-between 44% and 57%.

Cloze testing was viewed by Klare (1982) as object of intensive research with over a thousand studies published. He said that the Cloze test quickly become popular as a research tool and tended to complement reading tests. Cloze test can provide suggestive information about individual sentences, clauses, phrases and words. Cloze tests are suitable for intermediate and advanced readers. Cloze testing opened the way for much more intensive studies of the readability formulas.

Poor academic performance has been observed in science subjects especially Chemistry among Senior Secondary School Students (Adesemowo, 2005). Aremu (2000) stressed that academic failure is not only frustrating to the students and the parents, its effects are equally grave on the society in terms of dearth of manpower in all spheres of the economy and politics.

Those things that constituted obstacles to effective teaching and learning of chemistry at the secondary school level were investigated by Ayodele (2002). He found out that a major problem to effective learning of chemistry in the schools of study was that many students do not possess the recommended chemistry textbooks. He said further that some of the texts recommended for students use do not make use of examples related to their environment. The researcher also found out that there are too many topics to be taught. The concepts in Chemistry are also found to be difficult for the level of the students.

Factors responsible for the student's poor performances in Biology, Chemistry and Physics had been identified by Musa (2003) as lack of relevant textbooks, inadequate qualified teachers and socio-economic background of students. He also identified poor background of students in chemistry concepts as a factor for students' poor performances in chemistry in all Nigerian Schools.

Methodology

The design used was a descriptive research design of the survey type. This was used because of the survey type. This was used because of the largeness of the population. The population consisted of all Senior Secondary School three students in Ekiti State, Nigeria. All the chemistry textbooks recommended by the Ministry of Education, Ekiti State for the use of all senior secondary schools. The sample of this study consisted of 204 senior secondary school students who were selected from five schools in the state. Multistage random sampling technique was used in selecting the schools from both rural and urban centre in the state. The research instruments used were Cloze test and Student Achievement Test. The reliability coefficient of 0.72 was obtained with the use of Kuder-Richardson formula KR_{21}.

Data Analysis

The instruments were administered personally and data collected were analyzed using Pearson Product Moment Correlation and t-test statistics. The entire four hypotheses were tested at 0.05 level of significance.

Results and Discussion

General Question 1

What is the readability level of chemistry students on their academic performance using the cloze procedure?

To answer this question, the result of the cloze test given to students in chemistry were converted to percentage and grouped into categories according to Rye (1983) to know their comprehension or understanding levels. This is shown in Table 1

Table 1: Categorization of Chemistry Students into Levels according to their scores in Cloze test.

Chemistry Textbook 'A'

Cloze Test Score	N	%	Reading Level
0-40	40	48	Frustration Level
41-60	47	47	Instructional Level
61-100	05	5	Independent Level
TOTAL	100	100	

Chemistry Textbook 'B'

Cloze Test Score	N	%	Reading Level
0-40	77	74	Frustration Level
41-60	27	26	Instructional Level
61-100	0	0	Independent Level
TOTAL	104	100	

Combined the two Chemistry Textbooks.

Cloze Test percentage Scores	No of Students	Percentage	Reading Level
0-40 %	125	61.3	Frustration Level
41-60%	74	36.3	Instructional Level
61-100%	05	2.4	Independent Level
TOTAL	104	100	

Table 1 shows that out of over 204 students that used the two textbooks, 125 read at frustration Level, 74 Students at Instructional Level while 5 students were at independent Level.

Testing the Hypotheses

Ho_1: Readability of chemistry textbooks has no significant influence on student's academic performance in Chemistry. In order to test the hypothesis, scores on reliability in chemistry and students academic performance in chemistry were obtained and subjected to statistical analysis involving Pearson Product Moment Correlation statistics at 0.05 level of significance. The result is presented in Table 2.ll

Table 2: Pearson Product Moment Correlation Analysis of Readability of Chemistry Textbooks and Students' Academic Performance in Chemistry.

Variable	N	Mean	S.D	r_{cal}	r_{tab}
Readability	204	29.65	16.18	0.389	0.195
Academic Achievement Scores	204	11.65	5.83		

  $P< 0.05$

Table 2 shows that r_{cal}. (0.389) is greater than r_{tab} (0.195) at 95% confidence level. The null hypothesis is rejected. This implies that readability of recommended Chemistry textbooks has significant influence on student's academic performance in Chemistry.

Ho_2: Location has no significant influence on readability of Chemistry textbooks. The hypothesis was tested by comparing chemistry readability scores in urban and rural schools using t-test statistic at 0.05 level of significance. The result is presented in Table 3.

Table 3: t-test Comparison of Influence of School Location on Readability of Chemistry Textbooks.

School Location	N	Mean	S.D	df	t_{cal}	t_{tab}
Urban School	104	20.97	14.96	202	7.891	1.960
Rural School	100	36.64	13.32			

  $P< 0.05$

Ho_3: There is no significant difference between the performance of male and female students who use the recommended Chemistry textbooks.

To test the hypothesis, the mean scores of male and female student's academic performance in chemistry were compared using t-test statistic at 0.05 of significance. The result is presented in Table 4.

Table 4: t-test Comparison of the Influence of Gender on Students Academic Performance in Chemistry.

Gender group	N	Mean	S.D	DF	t_{cal}	t_{tab}
Male	130	11.65	5.65	202	0.627	1.960
Female	74	11.65	6.17			

P>0.05

Table 4 shows that t cal (0.627) is lesser than t-tab (1.960) at 0.05 level of significance. The null hypothesis is accepted. Therefore, there is no significant difference between the performance of male and female students who used the recommended Chemistry textbooks. It implies that gender will not significantly influence the performance of students in chemistry.

Ho$_4$: There is no significant difference between the performances of students who use chemistry textbook 'A' and those who use chemistry textbook 'B'.

The hypothesis was tested by comparing the performance scores of students in chemistry textbook 'A' and chemistry textbook 'B' using t-test statistics at 0.05 level of significance. The result is presented in Table 5.

Table 5: t-test Comparison of Student's Performance in Chemistry Textbooks 'A' and 'B'.

Variable	N	Mean	S.D	df	t-cal	t-tab
Chemistry Textbook 'A'	100	29.31	14.10			
Chemistry Textbook 'B'	104	24.49	18.39	202	2.10	1.96

P< 0.05

Table 5 shows that t cal (2.10) is greater than t-tab (1.96) at 0.05 level of significance. Since the t calculated is greater than the table value, the null hypothesis is rejected. Therefore, there is significant difference between the performance of student who use Chemistry Textbook 'A' and those who use Chemistry textbook 'B'.

The result in Table 1 categorized students into Frustration, Instructional and Independent readers according to their percentage scores in Cloze test. Majority of the students were found to be reading at frustration level (61.3%). This indicated that the recommended chemistry textbook used in some secondary schools are too difficult. The students may not be able to read and understand or comprehend the text materials without the assistance of teachers.

Some of the Students were also found at the instructional level (36%). This indicated that the recommended chemistry textbooks were appropriate for few students but teachers support and guidance are needed. Minority of the students were at the independent level (2.4%). This minority

may not need the assistance of teachers because the textbooks are too easy for them to read and understand on their own.

The findings in hypothesis 1 showed that readability of recommended Chemistry textbooks have significant influence on student's academic performance in chemistry. The finding was in agreement with those of Chavkin (1997), Seweje and Idiga (2003) who reported that achievement of students in science depended greatly on the readability of the textbooks.

Hypothesis 2 showed that location had significant influence on readability of chemistry textbooks. This findings is in agreement with Ayodele (2009), Mc Claffey, Torres and Mitchell (2000), who said that significant differences were found between the readability of chemistry and physics students from rural and urban schools.

The result also revealed that there was no significant difference between the performance of male and female students who used the recommended Chemistry textbooks. This finding agreed with the view of Barrington and Hendricks (1988). Ayodele (2009) and Fatoba (2014).

Conclusion and Recommendations

It is concluded that the level of understanding and academic performance of students in chemistry, to a large extent are determined by the readability of the textbook in use.

Based on the findings of this research the following recommendations are hereby made. Teachers should provide feedback on the readability of chemistry textbooks to the publishers and authors who in tern should revise the recommended chemistry textbooks in the light of comments raised.

- Since the recommended textbook is seen to be difficult the authors should revise them by bearing in mind word difficulty and sentence complexity.
- The textbooks should be written at the independent level of the students so that they can read and understand the texts on their own.
- The evaluate unit of ministry of Education should revise the recommended Book list and drop the difficult ones for readable ones.
- Students should be encouraged to read available textbooks that are written at their independent or instructional levels of comprehension.

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