

A Comparative Study of the Readability of Senior Secondary School Biology Textbooks Commonly used in Rivers State

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Abstract: - The purpose of the study was to determine the readability of senior secondary school biology textbooks commonly used in Rivers State. Four research questions and eight hypotheses were formulated to guide the study. The study is a descriptive survey. The population of the study was all biology textbooks recommended for teaching and learning biology in senior secondary schools in Rivers State and 96 senior secondary school biology students from public secondary schools in Rivers State. The sample size were three biology textbooks commonly used in senior secondary schools in Rivers State and 96 senior secondary school biology students in Rivers State. The instruments used to collect the data for the study were senior secondary school biology textbooks and cloze test. The findings revealed that the biology textbooks commonly used in senior secondary schools in Rivers State were modern biology, essential biology and comprehensive biology textbooks; the biology textbook commonly used in Rivers State were readable by senior secondary school students (i.e., SSI, SSII and SSIII), but difficult to read by the students below SSI; and there was significant relationship in the readability of biology textbooks commonly used in Rivers State. The study recommended that: the authors and the publishers of Biology textbooks should revise their books so as to make them more readable; the teachers should adopt their instruction according to the learners' levels so as to benefit both the high and low ability students among others.

I. INTRODUCTION

Readability can be viewed as the ease or difficult with which the text may be understood (Kasule, 2011). It can be used as a rough estimate of placing written material in appropriate grade level (Frank, 2006). Readability level of a (text) book can determine the understanding of the subject by the students (Fatoba, 2015). However, to understand biology, the biology textbooks must be readable. Fatoba (2015) asserted that the readability level of a textbook is one of the factors that determine the understanding of the subject by the students or readers. Moreover, for biology textbooks to be boring, according to Tekaya, Ozkan and Sungur (2001), it must contain too much new and unnecessary information. Therefore, to appeal to targeted audience, the biology textbooks need to meet their readability expectation.

Biology textbooks play important role in the teaching and learning of biology. Biology textbooks are most frequently used instructional materials for students and teachers at all level of education (Benson-Ogbu, Abonyi, Okafor & Omebe,

2016). However, biology textbooks are boring (Tekkaya, Ozkan & Sungur, 2001). It contains excessive details; many scientific terms; much abstract knowledge; too much new and unnecessary information; and causal relations are not emphasized in the textbook (Benson-Ogbu et al., 2016; and Tekkaya et al., 2001). It involves many disciplines such as chemistry, physics, mathematics, geology, psychology, medicine and agriculture Ezekiel (2003). This involvement constituted conceptual hurdles in readability of biology textbooks (Tekkaya et al., 2001).

Over the years, the issue of readability of textbook as it affects the performance of students had received very little attention (Fatoba, 2015). However, in recent times, research has shown that one way to improve students' performance in the subject (biology) is to ascertain the readability of its textbooks. Readability of test (R.O.T) has been known to be valuable for encouraging interest in reading and understanding of the text. In view of the effectiveness of readability of biology textbooks, the question, therefore, is how effective is the biology textbooks? Hence, the study sought to carry out a comparative study of readability of senior secondary school biology textbooks commonly used in Rivers State.

Statement of the Problem

Despite the importance of biology, students' academic performance in biology was found to be very poor in external examinations. According to chief examiners report (2010 – 2014), performance in biology was below average. The poor performance in biology was noticeable in Rivers State (WAEC, 2010-2014). This has been a source of concern to students, parents, educators, stakeholder and government. Researchers have blamed the poor performance in biology on inadequate facilities, poor methods of teaching, lack of practical sections, and readability of textbooks among others. Over the years, the issue of readability of text as it affects students' performance had received little attention. In recent times, research has shown that one way to improve students' performance in biology is to ascertain the readability of its textbooks. In view of this, the question, therefore, is how effective is the readability of biology textbook? Hence, the study sought to determine the comparative study of the readability of senior secondary school biology textbooks commonly used in Rivers State.

Purpose of the Study

The main purpose of this study is to carry out a comparative study of the readability of senior secondary school biology textbooks commonly used in Rivers State. Specifically, the study sought to:

1. determine the readability of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE);
2. determine the readability of biology textbooks commonly used in senior secondary schools in Rivers State using cloze test (CT);
3. determine the mean readability index (MRI) of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE); and
4. determine the mean readability index (MRI) of biology textbooks commonly used in senior secondary schools in Rivers State using cloze test (CT).

Research Questions

The following research questions guided the study:

1. What is the readability of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE)?
2. What is the readability of biology textbooks commonly used in senior secondary schools in Rivers State using cloze text (CT)?
3. What is the mean readability index (MRI) of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE)?
4. What is the mean readability index (MRI) of biology textbooks commonly used in senior secondary schools in Rivers State using cloze test (CT)?

Hypotheses

The following hypotheses guided the study:

1. There is no significant relationship between the readability of modern biology and essential biology textbooks used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE).
2. There is no significant relationship between the readability of modern biology and comprehensive biology textbooks used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE).
3. There is no significant relationship between the readability of essential biology and comprehensive biology textbooks used in senior secondary schools

in Rivers State using Flesch-Reading Ease Formula (RE).

4. There is no significant relationship between the readability of modern biology and essential biology textbooks used in senior secondary schools in Rivers State using cloze text (CT).
5. There is no significant relationship between the readability of modern biology and comprehensive biology textbooks used in senior secondary schools in Rivers State using cloze test (CT).
6. There is no significant relationship between the readability of essential biology and comprehensive biology textbooks used in senior secondary schools in Rivers State using cloze text (CT).
7. There is no significant relationship between the mean readability index (MRI) of biology textbooks used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE) and cloze text (CT).
8. There is no significant difference between the mean readability index (MRI) of biology textbooks used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE) and cloze text (CT).

II. METHODOLOGY

The study was carried out in Rivers State, Nigeria. The design of the study is a descriptive survey. The population of the study comprised all the biology textbooks recommended for teaching and learning of biology in senior secondary schools in Rivers State and all senior secondary school biology students from public secondary schools in Rivers State. The sample size were three biology textbooks commonly used in senior secondary schools in Rivers State and 96 senior secondary school biology in Rivers State students. The instruments for data collection were senior secondary school biology textbooks and cloze test. The data collected for the study were analyzed using Flesch-Reading Ease Formula, mean, Pearson Product Moment Correlation (PPMC) and t-test. The Flesch-Reading Ease Formula and mean were used to provide answer to the research questions, while PPMC and t-test were used to provide answer to the null hypothesis.

III. RESULTS

Analysis of Data and Result

The data were analyzed using Flesch-Reading Ease Formula (RE) mean and t-test and PPMC. Flesch –Reading Ease Formula (RE) and mean provided answer to the research questions, while t-test and PPMC provided answer to the hypotheses. However, the results were presented according to research questions and the hypotheses that guided the study.

Research Question 1: What is the readability of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE)?

Table 4.1: Readability of Topics of Biology Textbooks commonly used in Senior Secondary Schools in Rivers State using Flesch-Reading Ease Formula (RE)

S/n	Topics	Readability of biology textbooks for SSS		
		Book 1	Book 2	Book 3
1.	Sense organ	58.9	63.2	62.0
2.	The cell	55.0	50.9	52.9
3.	Nervous system	49.9	50.4	54.4
4.	Reproduction	50.6	51.9	53.9
5.	Ecology	53.7	48.3	53.9
6.	Tissue and supporting system	55.1	59.7	57.5
7.	Microorganisms around us	43.6	45.5	48.1
8.	Regulation of internal environment	48.5	53.4	46.9
9.	Evolution	40.5	38.8	46.2
10.	Genetics	50.2	50.1	50.8
	Total	506.0	511.2	528.6
	Grand mean	50.6	51.1	52.9

Note: Selected topics from: Book 1: Modern Biology for Senior Secondary Schools by Ramalingam ST (2016); Book 2: Essential Biology for Senior Secondary Schools by Michael, M.C. (2018); and Book 3: Comprehensive Biology for Senior Secondary Schools by Nweze, C. (2004).

The result in Table 4.1 shows the readability of topics of biology textbooks commonly used in senior secondary schools in Rivers State (Nigeria) using Flesch-Reading Ease Formula (RE). The findings revealed the readability mean scores of 58.9, 63.2 and 62.0 for sense organ; 55.0, 50.9 and 52.9 for the cell; 4.99, 50.4 and 54.4 for nervous system; 50.6, 51.9 and 53.9 for reproduction; 53.7, 48.3 and 53.9 for ecology; 55.1, 59.7 and 57.5 for tissue and supporting system; 43.6, 45.5 and 48.1 for microorganisms around us; 48.5, 53.4 and 48.9 for regulation of internal environment; 40.5, 38.8 and 46.2 for evolution and 50.2, 50.1 and 50.8 for genetics for modern biology textbook, essential biology

textbook and comprehensive biology textbook respectively. Moreover, the grand mean revealed mean readability scores (MRS) of 50.6, 51.1 and 52.9 for modern biology textbook, essential biology textbook and comprehensive biology textbook respectively. This means that the biology textbooks used in senior secondary schools in Rivers State is readable by the senior secondary school students (i.e., SSI, SSII and SSIII), but different to read by the students below SSI using Flesch- Reading Ease Formula (RE).

Research Question 2: What is the readability of biology textbooks commonly used in senior secondary schools in Rivers State using cloze test (CT)?

Table 4.2: Readability of Topics of Biology Textbooks commonly used in Senior Secondary Schools in Rivers State using Cloze Test (CT)

S/n	Topics	Readability of biology textbooks for SSS		
		Book 1	Book 2	Book 3
1.	Sense organ	58.9	63.2	62.0
2.	The cell	55.1	59.7	57.5
3.	Nervous system	55.0	53.4	54.4
4.	Reproduction	53.7	51.9	53.9
5.	Ecology	50.6	50.4	53.9
6.	Tissue and supporting system	50.2	50.1	52.9
7.	Microorganisms around us	49.9	50.0	50.8
8.	Regulation of internal environment	48.5	48.3	48.9
9.	Evolution	43.6	45.5	48.1
10.	Genetics	40.5	38.7	46.2
	Total	506.0	511.2	528.6
	Grand mean	50.6	51.1	52.9

Note: Selected topics from: Book 1: Modern Biology for Senior Secondary Schools by Ramalingam ST (2016); Book 2: Essential Biology for Senior Secondary Schools by Michael, M.C. (2018); and Book 3: Comprehensive Biology for Senior Secondary Schools by Nweze, C. (2004).

The result in Table 4.2 shows the readability of topics of biology textbooks commonly used in senior secondary schools in Rivers State (Nigeria) using cloze test (CT). The findings revealed the readability mean scores (RMS) of 58.9, 63.2 and 62.0 for sense organ; 55.1, 59.7 and 57.5 for the cell; 50.0, 53.4 and 54.4 for nervous system; 53.7, 51.9 and 53.9 for reproduction; 50.6, 50.4 and 53.9 for ecology; 50.2, 50.1 and 52.9 for tissue and supporting system; 49.9, 50.0 and 50.8 for microorganisms around us; 48.5, 48.3 and 48.9 for regulation of internal environment; 43.6, 45.5 and 48.1 for evolution and 40.5, 38.7 and 46.2 for genetics for modern biology textbook, essential biology textbook and comprehensive biology textbook respectively. Moreover, the

grand mean revealed mean readability score (MRS) of 50.6, 51.1 and 52.9 for modern biology textbook, essential biology textbook and comprehensive biology textbook respectively. This implies that the biology textbooks used in senior secondary schools in Rivers State is readable by the senior secondary school students (i.e., SSI, SSII and SSIII), but difficult to read by the students below SSI using cloze test (CT).

Research Question 3: What is the mean readability index (MRI) of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE)?

Table 4.3: Readability of Topics of Biology Textbooks commonly used in Senior Secondary Schools in Rivers State using Flesch-Reading Ease Formula (RE)

S/n	Topics	Readability of biology textbooks for SSS			
		Book 1	Book 2	Book 3	Mean
1.	Sense organ	58.9	63.2	62.0	61.0
2.	The cell	55.0	50.9	52.9	52.9
3.	Nervous system	49.9	50.4	54.4	51.6
4.	Reproduction	50.6	51.9	53.9	52.1
5.	Ecology	53.7	48.3	53.9	52.0
6.	Tissue and supporting system	55.1	59.7	57.5	57.4
7.	Microorganisms around us	43.6	45.5	48.1	45.7
8.	Regulation of internal environment	48.5	53.4	46.9	50.3
9.	Evolution	40.5	38.8	46.2	41.8
10.	Genetics	50.2	50.1	50.8	50.4
	Total	506.0	511.2	528.6	515.2
	Grand mean	50.6	51.1	52.9	51.5

Note: Selected topics from: Book 1: *Modern Biology for Senior Secondary Schools* by Ramalingam ST (2016); Book 2: *Essential Biology for Senior Secondary Schools* by Michael, M.C. (2018); and Book 3: *Comprehensive Biology for Senior Secondary Schools* by Nweze, C. (2004).

The result in Table 4.3 shows the readability of topics of biology textbooks commonly used in senior secondary schools in Rivers State (Nigeria) using Flesch-Reading Ease Formula (RE). The findings revealed the readability mean index (RMI) of 61.0 for sense organ; 52.9 for the cell; 51.6 for nervous system; 52.1 for reproduction; 52.0 for ecology; 57.4 for tissue and supporting system; 45.7 for microorganisms around us; 50.3 for regulation of internal environment; 45.7 for evolution; and 50.3 for genetics for modern biology textbook, essential biology textbook and comprehensive biology textbook respectively. Moreover, the

grand mean revealed mean readability index (MRI) of 51.5 for biology textbooks used in senior secondary schools in Rivers State. This means that the biology textbooks used in senior secondary schools in Rivers State is readable by the senior secondary school students (i.e., SSI, SSII and SSIII), but different to read by the students below SSI using Flesch-Reading Ease Formula (RE).

Research Question 4: What is the mean readability index (MRI) of biology textbooks commonly used in senior secondary schools in Rivers State using cloze test (CT)?

Table 4.4: Readability of Topics of Biology Textbooks commonly used in Senior Secondary Schools in Rivers State using Cloze Test (CT).

S/n	Topics	Readability of biology textbooks for SSS			
		Book 1	Book 2	Book 3	Mean
1.	Sense organ	58.9	63.2	62.0	61.4
2.	The cell	55.1	59.7	57.5	57.4
3.	Nervous system	55.0	53.4	54.4	54.3

4.	Reproduction	53.7	51.9	53.9	53.2
5.	Ecology	50.6	50.4	53.9	51.6
6.	Tissue and supporting system	50.2	50.1	52.9	51.1
7.	Microorganisms around us	49.9	50.0	50.8	50.2
8.	Regulation of internal environment	48.5	48.3	48.9	48.6
9.	Evolution	43.6	45.5	48.1	45.7
10.	Genetics	40.5	38.7	46.2	41.8
	Total	506.0	511.2	528.6	515.3
	Grand mean	50.6	51.1	52.9	51.5

Note: Selected topics from: Book 1: *Modern Biology for Senior Secondary Schools* by Ramalingam ST (2016); Book 2: *Essential Biology for Senior Secondary Schools* by Michael, M.C. (2018); and Book 3: *Comprehensive Biology for Senior Secondary Schools* by Nweze, C. (2004).

The result in Table 4.4 shows the readability of topics of biology textbooks commonly used in senior secondary schools in Rivers State (Nigeria) using cloze test (CT). The findings revealed the readability mean index (RMI) of 61.4 for sense organ; 57.4 for the cell; 54.3 for nervous system; 53.2 for reproduction; 51.6 for ecology; 51.1 for tissue and supporting system; 50.2 for microorganisms around us; 48.6 for regulation of internal environment; 45.7 for evolution and 41.8 for genetics for modern biology textbook, essential biology textbook and comprehensive biology textbook respectively. Moreover, the grand mean revealed mean readability Index (MRI) of 51.5 for biology textbooks used in

senior secondary schools in Rivers State. This means that the biology textbooks used in senior secondary schools in Rivers State is readable by the senior secondary school students (i.e., SSI, SSII and SSIII), but difficult to read by the students below SSI using cloze test (CT).

Hypotheses

Ho₁: There is no significant relationship between the readability of modern biology and essential biology textbooks used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE)

Table 4.5: PPMC of Null Relationship between the Readability of Modern Biology and Essential Biology Textbooks used in Senior Secondary Schools in Rivers State using Flesch-Reading Ease Formula (RE).

Variation	N	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum XY$	Df	α	R-cal.	R-crit.	Remark
Modern biology textbook using RE (X)	20	506.0	25877.9	26147.5	18	0.05	0.853	0.444	Rejected
Essential biology textbook using RE (Y)		511.2	26527.7						

The result in Table 4.5 shows a Pearson Product Moment Correlation (PPMC) of null hypothesis of significant relationship between the readability of modern biology textbook and essential biology textbook used in senior secondary schools in Rivers State (Nigeria) using Flesch-Reading Ease Formula (RE). The result showed that the calculated R-value is 0.853, while the critical R-value with 18 degree of freedom at 0.05 level of significance is 0.444. Since the calculated R-value was greater than the critical R-value, the null hypothesis of significant relationship was rejected and the alternative accepted. This means that there is significant

relationship between the readability of modern biology textbook essential biology textbook used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE).

Ho₂: There is no significant relationship between the readability of modern biology and comprehensive biology textbooks used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE).

Table 4.6: PPMC of Null Relationship between the Readability of Modern Biology and Comprehensive Biology Textbooks used in Senior Secondary Schools in Rivers State using Flesch-Reading Ease Formula (RE).

Variation	N	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum XY$	Df	α	R-cal.	R-crit.	Remark
Modern biology textbook using RE (X)	20	506.0	25877.9	26956.1	18	0.05	0.900	0.444	Rejected
Comprehensive biology textbook using RE (Y)		528.6	28138.3						

The result in Table 4.6 shows a Pearson Product Moment Correlation (PPMC) of null hypothesis of significant relationship between the readability of modern biology textbook and comprehensive biology textbook used in senior secondary schools in Rivers State (Nigeria) using Flesch-Reading Ease Formula (RE). The result showed that the calculated R-value is 0.900, while the critical R-value with 18 degree of freedom at 0.05 level of significance is 0.444. Since the calculated R-value was greater than the critical R-value, the null hypothesis of significant relationship was rejected and

the alternative hypothesis accepted. This means that there is significant relationship between the readability of modern biology textbook comprehensive biology textbook used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE).

Ho₃: There is no significant relationship between the readability of essential biology and comprehensive biology textbooks used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE).

Table 4.7: PPMC of Null Relationship between the Readability of Essential Biology and Comprehensive Biology Textbooks used in Senior Secondary Schools in Rivers State using Flesch-Reading Ease Formula (RE).

Variation	N	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum XY$	Df	α	R-cal.	R-crit.	Remark
Essential biology textbook using RE (X)	20	511.2	26527.7	27262.0	18	0.05	0.861	0.444	Rejected
Comprehensive biology textbook using RE (Y)		528.6	28138.3						

The result in Table 4.7 shows a Pearson Product Moment Correlation (PPMC) of null hypothesis of significant relationship between the readability of essential biology textbook and comprehensive biology textbook used in senior secondary schools in Rivers State (Nigeria) using Flesch-Reading Ease Formula (RE). The result showed that the calculated R-value is 0.861, while the critical R-value with 18 degree of freedom at 0.05 level of significance is 0.444. Since the calculated R-value was greater than the critical R-value, the null hypothesis of significant relationship was rejected and

the alternative hypothesis accepted. This means that there is significant relationship between the readability of essential biology textbook and comprehensive biology textbook used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE).

Ho₄: There is no significant relationship between the readability of modern biology and essential biology textbooks used in senior secondary schools in Rivers State using cloze text (CT).

Table 4.8: PPMC of Null Relationship between the Readability of Modern Biology and Essential Biology Textbooks used in Senior Secondary Schools in Rivers State using Cloze Test (CT).

Variation	N	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum XY$	Df	α	R-cal.	R-crit.	Remark
Modern biology textbook using CT (X)	20	506.0	25878.0	26190.0	18	0.05	0.948	0.444	Rejected
Essential biology textbook using CT (Y)		511.2	26556.6						

The result in Table 4.8 shows a Pearson Product Moment Correlation (PPMC) of null hypothesis of significant relationship between the readability of modern biology textbook and essential biology textbook used in senior secondary schools in Rivers State (Nigeria) using cloze test (CT). The result showed that the calculated R-value is 0.948, while the critical R-value with 18 degree of freedom at 0.05 level of significance is 0.444. Since the calculated R-value was greater than the critical R-value, the null hypothesis of

significant relationship was rejected and the alternative hypothesis accepted. This means that there is significant relationship between the readability of modern biology textbook and essential biology textbook used in senior secondary schools in Rivers State using cloze test (CT).

Ho₅: There is no significant relationship between the readability of modern biology and comprehensive biology textbooks used in senior secondary schools in Rivers State using cloze test (CT).

Table 4.9: PPMC of Null Relationship between the Readability of Modern Biology and Comprehensive Biology Textbooks used in Senior Secondary Schools in Rivers State using Cloze Test (CT)

Variation	N	$\frac{\sum x}{\sum y}$	$\frac{\sum x^2}{\sum y^2}$	$\sum XY$	Df	α	R-cal.	R-crit.	Remark
Modern biology textbook using CT (X)	20	506.0	25878.0	26964.3	18	0.05	0.935	0.444	Rejected
Comprehensive biology textbook using CT (Y)		528.0	28138.3						

The result in Table 4.9 shows a Pearson Product Moment Correlation (PPMC) of null hypothesis of significant relationship between the readability of modern biology textbook and comprehensive biology textbook used in senior secondary schools in Rivers State (Nigeria) using cloze test (CT). The result showed that the calculated R-value is 0.935, while the critical R-value with 18 degree of freedom at 0.05 level of significance is 0.444. Since the calculated R-value was greater than the critical R-value, the null hypothesis of

significant relationship was rejected and the alternative hypothesis accepted. This means that there is significant relationship between the readability of modern biology textbook and comprehensive biology textbook used in senior secondary schools in Rivers State using cloze test (CT).

Ho₆: There is no significant relationship between the readability of essential biology and comprehensive biology textbooks used in senior secondary schools in Rivers State using cloze text (CT).

Table 4.10: PPMC of Null Relationship between the Readability of Essential Biology and Comprehensive Biology Textbooks used in Senior Secondary Schools in Rivers State using Cloze Test (CT)

Variation	N	$\frac{\sum x}{\sum y}$	$\frac{\sum x^2}{\sum y^2}$	$\sum XY$	Df	α	R-cal.	R-crit.	Remark
Essential biology textbook using CT (X)	20	511.2	26556.6	27298.9	18	0.05	0.959	0.444	Rejected
Comprehensive biology textbook using CT (Y)		528.6	28138.3						

The result in Table 4.10 shows a Pearson Product Moment Correlation (PPMC) of null hypothesis of significant relationship between the readability of essential biology textbook and comprehensive biology textbook used in senior secondary schools in Rivers State (Nigeria) using cloze test (CT). The result showed that the calculated R-value is 0.959, while the critical R-value with 18 degree of freedom at 0.05 level of significance is 0.444. Since the calculated R-value was greater than the critical R-value, the null hypothesis of significant relationship was rejected and the alternative

hypothesis accepted. This means that there is significant relationship between the readability of essential biology textbook and comprehensive biology textbook used in senior secondary schools in Rivers State using cloze test (CT).

Ho₇: There is no significant relationship between the mean readability index (MRI) of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE) and cloze text (CT).

Table 4.11: PPMC of Null Relationship between the Mean Readability Index (MRI) of Biology Textbooks used in Senior Secondary Schools in Rivers State using Flesch-Reading Ease Formula (RE) and Cloze Test (CT)

Variation	N	$\frac{\sum x}{\sum y}$	$\frac{\sum x^2}{\sum y^2}$	$\sum XY$	Df	α	R-cal.	R-crit.	Remark
MRI biology textbook using RE (X)	20	515.2	26801.2	26727.5	18	0.05	0.6649	0.444	Rejected
MRI biology textbook using CT (Y)		515.3	26835.0						

The result in Table 4.11 shows a PPMC of null hypothesis of significant relationship between mean readability index (MRI) of biology textbooks used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE) and cloze test (CT). The result shows that the calculated r-value is 0.665, while the critical r-value with 18 degree of freedom at 0.05 level of significance is 0.444. Since the calculated r-value was greater than the critical r-value, the null hypothesis of non-significant relationship was rejected and the alternative

accepted. This implies that there is significant relationship between the readability of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE) and cloze test (CT).

Ho₈: There is no significant difference between the mean readability index (MRI) of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE) and cloze text (CT).

Table 4.12: A Composite t-test Table of Significant Difference between the Mean Readability Index (MRI) of Biology Textbooks used in Senior Secondary Schools in Rivers State using Flesch-Reading Ease Formula (RE) and Cloze Test (CT)

Source of Variation	N	X	SD	SD ²	Df	α	t-cal.	t-crit.	Remark
MRI biology textbook using RE (X)	20	514.2	71.69	515.21	18	0.05	0.009	0.585	Accepted
MRI biology textbook using CT (Y)		515.3	71.70	515.47					

The result in Table 4.12 shows a t-test of null hypothesis of significant difference between the mean readability index (MRI) of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE) and cloze test (CT). The result showed that the calculated t-value was 0.009, while the critical t-value with 18 degree of freedom at 0.05 level of significance was 0.585. Since the calculated t-value was less than the critical t-value, the null hypothesis of significant difference was accepted. This means that there is no significant difference between the mean readability index (MRI) of biology textbooks commonly used in senior secondary schools in Rivers State using Flesch-Reading Ease Formula (RE) and cloze test (CT).

IV. SUMMARY OF MAJOR FINDINGS

Based on the result of the study, the following findings were made:

1. The biology textbooks commonly used in senior secondary schools in Rivers State are modern biology, essential biology and comprehensive biology textbooks.
2. The biology textbooks commonly used in senior secondary schools in Rivers State were readable by senior secondary school students (i.e., SSI, SSII and SSIII), but difficult to read by the students below SSI.
3. There was significant relationship/ no significant difference in the readability of the biology textbook commonly used in senior secondary schools in Rivers State.

V. DISCUSSION OF FINDINGS

The study carried out a comparative study of the readability of biology textbooks commonly used in senior secondary schools in Rivers State. The result in Table 4.1 – 4.4 shows the biology textbooks commonly used in senior secondary schools in Rivers State, Nigeria. The findings revealed that the biology textbook commonly used in senior secondary schools in Rivers State were modern biology, essential biology and comprehensive biology textbooks. This finding is somewhat in line with Benson-Ogbu, Abonyi, Okafor and Omebe (2016) who stated that the biology textbooks commonly used in senior secondary schools in Nigeria (Rivers State) were modern biology, essential biology, comprehensive biology and college biology textbooks.

The result in Table 4.1 – 4.4 shows the readability mean scores of senior secondary school biology textbooks commonly used in Rivers State, Nigeria. The findings revealed that the biology textbooks were readable by senior secondary school students (i.e., SSI, SSII and SSIII). The findings is somewhat contrary to Benson-Ogbu, Abonyi, Okafor and Omebe (2016) who stated that one of the commonly used biology textbooks used in senior secondary schools was difficult to read. However, the biology textbooks commonly used in senior secondary schools in Rivers State is readable by senior secondary school students (i.e., SSI, SSII and SSIII), but difficult to read by students below SSI.

The result of Table 4.5 – 4.12 indicated no significant relationship. The study revealed that there was significant relationship of the readability of the biology textbooks commonly used in senior secondary schools in Rivers State. The findings is somewhat contrary to the findings of Benson-Ogbu, Abonyi, Okafor and Omebe (2016) who stated that one of the recommended biology textbooks used in senior secondary schools was difficult to read. However, the biology textbooks commonly used in senior secondary schools in Rivers State is readable by senior secondary school students (SSI, SSII and SSIII), but difficult to read by students below SSI.

VI. CONCLUSION

Based on the findings of the study, it was deduced that the biology textbooks commonly used in senior secondary schools in Rivers State are: modern biology, essential biology and comprehensive biology textbooks. The biology textbooks are readable by senior secondary school students (i.e., SSI, SSII, and SS III), but difficult to read by the students below SSI. And there was significant relationship/no significant difference in the readability of biology textbooks commonly used in Rivers State. This is because the language of biology is the same.

VII. RECOMMENDATIONS

Based on the results and findings from the study, the following recommendations were made:

1. Authors and publishers of biology textbooks should write biology textbooks in a language that is readable to the learner to aid text readability.
2. The biology teachers should use student-centred and activity-oriented approach of instruction to bridge the gap between readability and perception of learning.

3. Biology teachers should teach with teaching aids to counter the effects of complexity of concepts in the biology.
4. The teachers should rewrite the test to meet the readability level of the students.
5. The students should be encouraged to show interest in biology lessons.
6. Parents should provide biology textbooks to their wards and encourage them to study.
7. Government should provide funds to public schools for purchase of instructional materials for biology instruction.

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